Untitled10

October 24, 2020

0.0.1 Kaggle Competition

[1]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
%matplotlib inline
```

[2]:
```
data = pd.read_csv("/Users/graceyin/Downloads/phase1_training_data.csv").
↪to_numpy()
```

[3]:
```
X_all = data[data[:, 0] == "CA"]
```

[4]:
```
y_can = X_all[:, 3]
```

[5]:
```
y_can = X_all[:, 3]
y_can = np.reshape(y_can, (y_can.shape[0], 1))
y_can = y_can.astype(float)
```

[ ]:
```

```

[6]:
```
#retrieve data thats canadian alone
def get_feature(X, col_name):
    X = X_all[:, col_name]
    X = np.reshape(X, (X.shape[0], 1))
    X = X.astype(float)
    return X
```

[7]:
```
X_can_all = np.delete(X_all, [0, 1, 3], axis = 1)
X_can_all = np.reshape(X_can_all, (X_can_all.shape[0], 3))
X_can_all = X_can_all.astype(float)
```

[8]:
```
time_series = y_can
```

[9]:
```
import pandas as pd
from matplotlib import pylab as plt
from statsmodels.tsa.arima_model import ARMA
import seaborn as sns
```

```
import statsmodels.api as sm
import random
import numpy as np
import statsmodels
```

[10]:
```
time_series = y_can
```

[11]:
```
def trend(t, amp=1):
    return amp*(1 + np.sin(t/10))

#length of time series
n_time_steps = 250
#amplitud of time series
amplitud=10
noise_frac_aplitud= 0.5
#initializing the time series
time_series = np.zeros(n_time_steps)
time_series[0] = trend(0, amplitud)

#The AR(1) parameter. Our goal will be to find this parameter.
alpha = 0.1
#making the time series
for t in range(1,n_time_steps):
    time_series[t] = (1 - alpha)*time_series[t - 1] + alpha*trend(t,␣
 ↪amp=amplitud) + alpha*np.random.normal(0,noise_frac_aplitud*amplitud)

#passing the time series to a pandas format
dates = sm.tsa.datetools.dates_from_range('2000m1', length=len(time_series))
time_series_pd= pd.Series(time_series, index=dates)
```

[12]:
```
window = 40
n_iter = n_time_steps - window
alpha_list = []
alpha_elite_list = []
#n_time_steps
for i in range(n_iter):
    #not rolling window but intervals... to fix
    temp_time_series_pd = time_series_pd[i:window + i]
    plt.plot(temp_time_series_pd)
    res = sm.tsa.detrend(temp_time_series_pd, order=2)
    mod = ARMA(res, order=(1,0))
    ar1_fit = mod.fit()

    score = statsmodels.tsa.arima_model.ARMAResults(mod,ar1_fit.params)

    #The alpha parameter is...
    alpha_list.append(1 - ar1_fit.params[1])
```

```
    if score.pvalues[1] < 0.001:
        alpha_elite_list.append(1 - ar1_fit.params[1])

print("real alpha = ", alpha)
print("estimated alpha = ", np.mean(alpha_elite_list))
print("standard deviation = ", np.std(alpha_elite_list))
```

```
/opt/anaconda3/lib/python3.7/site-
packages/pandas/plotting/_matplotlib/converter.py:103: FutureWarning: Using an
implicitly registered datetime converter for a matplotlib plotting method. The
converter was registered by pandas on import. Future versions of pandas will
require you to explicitly register matplotlib converters.

To register the converters:
        >>> from pandas.plotting import register_matplotlib_converters
        >>> register_matplotlib_converters()
  warnings.warn(msg, FutureWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-packages/scipy/signal/signaltools.py:1341:
FutureWarning: Using a non-tuple sequence for multidimensional indexing is
deprecated; use `arr[tuple(seq)]` instead of `arr[seq]`. In the future this will
be interpreted as an array index, `arr[np.array(seq)]`, which will result either
in an error or a different result.
  out_full[ind] += zi
/opt/anaconda3/lib/python3.7/site-packages/scipy/signal/signaltools.py:1344:
FutureWarning: Using a non-tuple sequence for multidimensional indexing is
deprecated; use `arr[tuple(seq)]` instead of `arr[seq]`. In the future this will
be interpreted as an array index, `arr[np.array(seq)]`, which will result either
in an error or a different result.
  out = out_full[ind]
/opt/anaconda3/lib/python3.7/site-packages/scipy/signal/signaltools.py:1350:
FutureWarning: Using a non-tuple sequence for multidimensional indexing is
deprecated; use `arr[tuple(seq)]` instead of `arr[seq]`. In the future this will
be interpreted as an array index, `arr[np.array(seq)]`, which will result either
in an error or a different result.
  zf = out_full[ind]
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
```

```
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
```

```
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
```

```
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
```

```
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/kalmanf/kalmanfilter.py:221: RuntimeWarning: divide by
zero encountered in true_divide
  Z_mat, R_mat, T_mat)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
```

```
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
```

```
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
```

```
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
```

```
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
```

```
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
```

```
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
```

```
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
```

```
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
```

```
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
```

```
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
```

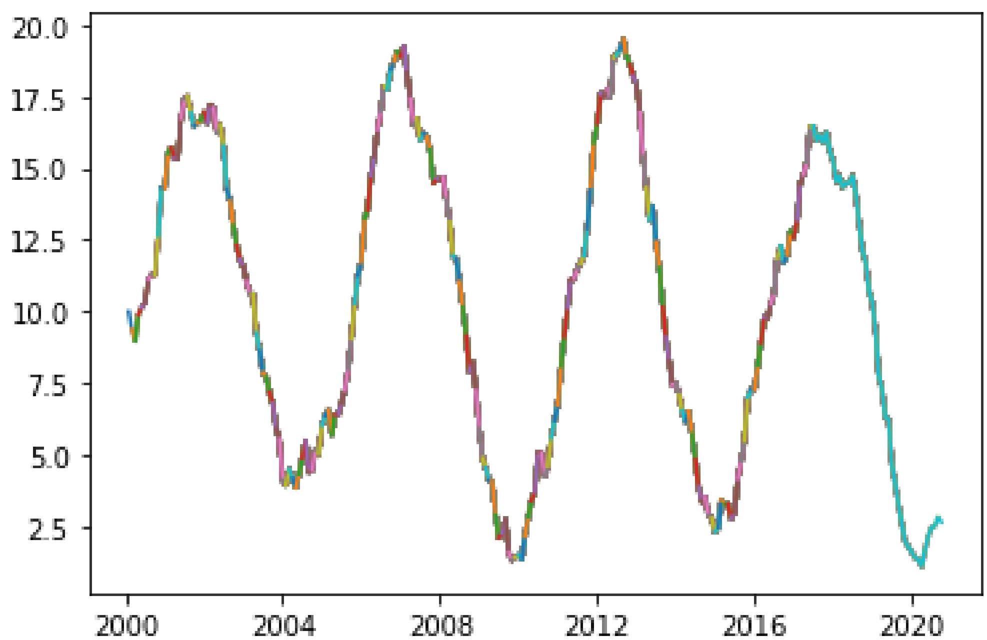
```
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
```

```
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
```

```
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
```

```
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
/opt/anaconda3/lib/python3.7/site-
packages/statsmodels/tsa/base/tsa_model.py:165: ValueWarning: No frequency
information was provided, so inferred frequency M will be used.
  % freq, ValueWarning)
```

```
real alpha =  0.1
estimated alpha =  0.1584267886753695
standard deviation =  0.1051980894213107
```



[13]:
```
print("real alpha = ", alpha)
```

```
real alpha =  0.1
```

[14]:
```
def trend(t, amp=1):
    return amp*(1 + np.sin(t/10))

#length of time series
n_time_steps = 250
#amplitud of time series
amplitud=10
noise_frac_aplitud= 0.5
#initializing the time series
time_series = np.zeros(n_time_steps)
time_series[0] = trend(0, amplitud)

#The AR(1) parameter. Our goal will be to find this parameter.
alpha = 0.1
#making the time series
for t in range(1,n_time_steps):
    time_series[t] = (1 - alpha)*time_series[t - 1] + alpha*trend(t,␣
 ↪amp=amplitud) + alpha*np.random.normal(0,noise_frac_aplitud*amplitud)

#passing the time series to a pandas format
dates = sm.tsa.datetools.dates_from_range('2000m1', length=len(time_series))
time_series_pd= pd.Series(time_series, index=dates)
```

[15]:
```
def trend(t, amp=1):
    return amp*(1 + np.sin(t/10))
```

[16]:
```
trend(0, 250)
```

[16]:
```
250.0
```

[ ]:
```

```

[17]:
```
        y_can = np.reshape(y_can, (y_can.shape[0], 1))
        y_can = y_can.astype(float)
        #retrieve data thats canadian alone
        def get_feature(X, col_name):
            X = X_all[:, col_name]
            X = np.reshape(X, (X.shape[0], 1))
            X = X.astype(float)

            return X

        X_can_all = np.delete(X_all, [0, 1, 3], axis = 1)
        X_can_all = np.reshape(X_can_all, (X_can_all.shape[0], 3))
        X_can_all = X_can_all.astype(float)
```

```
X_can_cases = get_feature(X_all, 2)
X_can_cases_14_100k = get_feature(X_all, 4)
X_can_cases_100k = get_feature(X_all, 5)
```

[13]:
```
y_world = X_world[:, 3]
y_world = np.reshape(y_world, (y_world.shape[0], 1))
y_world = y_world.astype(float)

X_world_cases = X_world[:, 2]
X_world_cases = np.reshape(X_world_cases, (X_world_cases.shape[0], 1))
X_world_cases = X_world_cases.astype(float)
```

```
␣
↪---------------------------------------------------------------------------

TypeError                                 Traceback (most recent call␣
↪last)

<ipython-input-13-23cb2675b65a> in <module>
----> 1 y_world = X_world[:, 3]
      2 y_world = np.reshape(y_world, (y_world.shape[0], 1))
      3 y_world = y_world.astype(float)
      4
      5 X_world_cases = X_world[:, 2]


/opt/anaconda3/lib/python3.7/site-packages/pandas/core/frame.py in␣
↪__getitem__(self, key)
   2978             if self.columns.nlevels > 1:
   2979                 return self._getitem_multilevel(key)
-> 2980             indexer = self.columns.get_loc(key)
   2981             if is_integer(indexer):
   2982                 indexer = [indexer]


/opt/anaconda3/lib/python3.7/site-packages/pandas/core/indexes/base.py␣
↪in get_loc(self, key, method, tolerance)
   2895                 )
   2896             try:
-> 2897                 return self._engine.get_loc(key)
   2898             except KeyError:
   2899                 return self._engine.get_loc(self.
↪_maybe_cast_indexer(key))


pandas/_libs/index.pyx in pandas._libs.index.IndexEngine.get_loc()
```

```
pandas/_libs/index.pyx in pandas._libs.index.IndexEngine.get_loc()

TypeError: '(slice(None, None, None), 3)' is an invalid key
```

[ ]: