AR_time_series_forcast

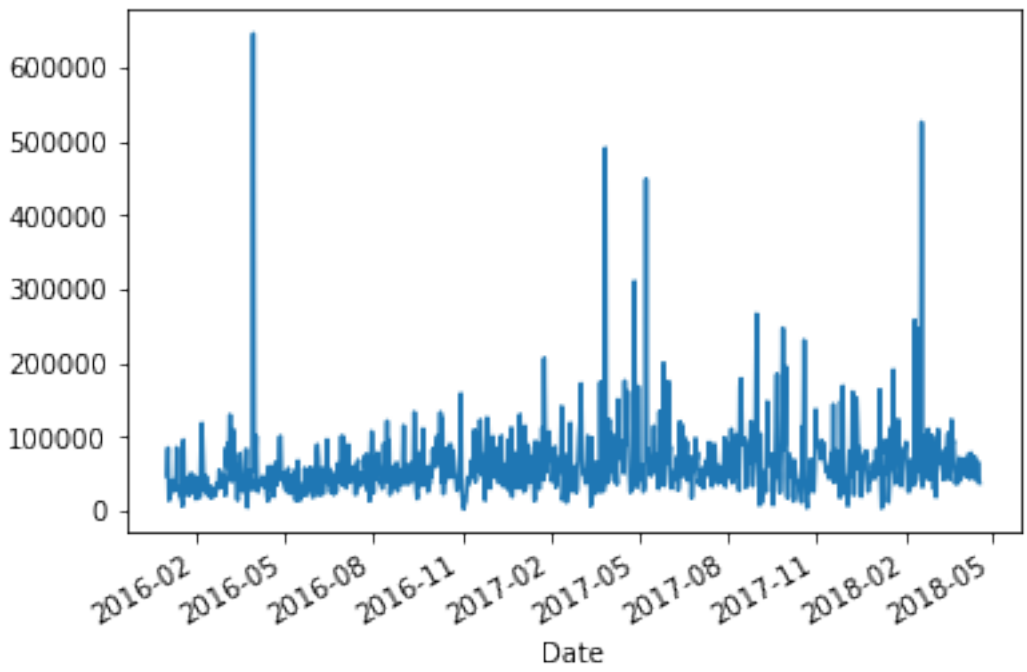
April 25, 2018

```
In [165]: import pandas as pd
          from pandas import Series, read_csv
          import datetime
          import matplotlib.pyplot as plt
          from sklearn.metrics import mean_squared_error
          from statsmodels.tsa.ar_model import AR
```

```
In [166]: df = read_csv('sms_usage.csv',header=0, parse_dates=[0], index_col=0, squeeze=True )
```

```
In [167]: df.plot()
```

```
Out[167]: <matplotlib.axes._subplots.AxesSubplot at 0x7f239fb76ef0>
```




```
In [168]: x = df.values
```

```
In [169]: train,test = x[1:len(x)-30], x[len(x)-30:]

In [170]: m = AR(train, freq='D')

In [171]: model  = m.fit()

In [172]: window = model.k_ar
          window

Out[172]: 20

In [173]: coef = model.params
          coef

Out[173]: array([ 3.53403778e+04,  2.94168323e-02,  2.17323539e-02,  4.07625060e-02,
                  5.15336513e-02, -6.00946940e-03, -2.82351442e-02,  1.52405209e-01,
                  2.49960026e-02, -1.48437914e-02, -6.86162603e-05, -1.80994608e-02,
                  3.17640459e-02, -1.23444125e-02,  4.84720800e-02, -6.21836354e-02,
                  3.45568064e-02,  3.80755500e-02,  4.24499058e-02, -1.43472369e-03,
                  7.39092238e-02])

In [174]: history = train[len(train)-window:]
          history = [history[i] for i in range(len(history))]
          predictions = []

In [175]: for t in range(len(test)):
              lag = [history[i] for i in range(len(history)-window,len(history))]
              yhat = coef[0]
              for d in range(window):
                  yhat += coef[d+1] * lag[window-d-1]
              obs = test[t]
              predictions.append(yhat)
              history.append(obs)
              print('predicted=%f, expected=%f' % (yhat, obs))

predicted=70612.821693, expected=123509.000000
predicted=61931.749631, expected=87692.000000
predicted=63035.876977, expected=95519.000000
predicted=74674.181824, expected=61324.000000
predicted=73605.011150, expected=37358.000000
predicted=65281.194802, expected=47771.000000
predicted=62751.767407, expected=36790.000000
predicted=72246.380855, expected=55217.000000
predicted=63136.417558, expected=72082.000000
predicted=70107.758238, expected=41376.000000
predicted=61538.916484, expected=52877.000000
predicted=57517.943144, expected=64568.000000
predicted=58501.104843, expected=70620.000000
predicted=63977.697411, expected=58782.000000
```

```
predicted=66965.345722, expected=67550.000000
predicted=65621.084396, expected=46139.000000
predicted=64012.918030, expected=67730.000000
predicted=65142.213347, expected=68652.000000
predicted=64932.020645, expected=77316.000000
predicted=67125.185238, expected=43441.000000
predicted=68519.774434, expected=78592.000000
predicted=66164.490914, expected=73999.000000
predicted=62206.702508, expected=47154.000000
predicted=59302.777827, expected=46329.000000
predicted=63036.802701, expected=73324.000000
predicted=64642.430483, expected=55897.000000
predicted=56857.882510, expected=40892.000000
predicted=60515.319337, expected=66625.000000
predicted=67598.396196, expected=45260.000000
predicted=57209.476957, expected=37927.000000
```

```
In [176]: # predicted = model.predict(start=len(train),end=len(train)+len(test)-1,dynamic=False)
```

```
In [177]: 'standard errors: ',model.bse
```

```
Out[177]: ('standard errors: ',
           array([7.59053884e+03, 3.59829021e-02, 3.60002219e-02, 3.59766581e-02,
                  3.59826514e-02, 3.59977458e-02, 3.59204011e-02, 3.58795574e-02,
                  3.62929856e-02, 3.62807231e-02, 3.62791803e-02, 3.62690957e-02,
                  3.62701089e-02, 3.62733441e-02, 3.58582397e-02, 3.58906848e-02,
                  3.59768966e-02, 3.59373289e-02, 3.59225388e-02, 3.59392583e-02,
                  3.59266510e-02]))
```

```
In [195]: print('MSError: ', mean_squared_error(predicted, test))
          print('Final prediction error: ',model.fpe)
```

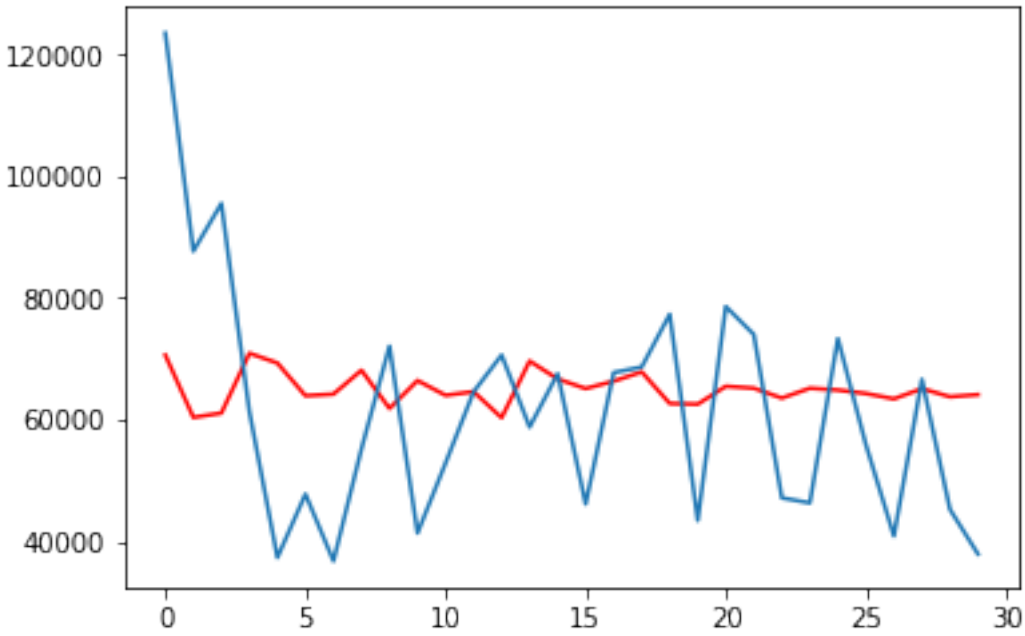
```
MSError:  386574124.25381887
Final prediction error:  2483658408.41798
```

```
In [196]: print('No of trend term:  ', model.k_trend)
          print('Lag length: ', model.k_ar)
```

```
No of trend term:   1
Lag length:  20
```

```
In [183]: plt.plot(predicted,color='red')
          plt.plot(test)
```

```
Out[183]: [<matplotlib.lines.Line2D at 0x7f23a40c58d0>]
```


120000
100000
80000
60000
40000
0
5
10
15
20
25
30