RandomForest

June 14, 2020

[49]:
```python
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
from statsmodels.tsa.seasonal import seasonal_decompose
```

[2]:
```python
import h2o
from h2o.estimators import H2ORandomForestEstimator
```

[3]:
```python
h2o.init()
```

```
Checking whether there is an H2O instance running at http://localhost:54321
… not found.
Attempting to start a local H2O server…
; Picked up _JAVA_OPTIONS: -Xms1024M -Xmx6144M251-b08, mixed mode)
  Starting server from e:\documents\university\timeseries\venv\lib\site-
packages\h2o\backend\bin\h2o.jar
  Ice root: C:\Users\babar\AppData\Local\Temp\tmpm1rsz501
  JVM stdout:
C:\Users\babar\AppData\Local\Temp\tmpm1rsz501\h2o_babar_started_from_python.out
  JVM stderr:
C:\Users\babar\AppData\Local\Temp\tmpm1rsz501\h2o_babar_started_from_python.err
  Server is running at http://127.0.0.1:54321
Connecting to H2O server at http://127.0.0.1:54321 … successful.

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H2O_cluster_uptime:         03 secs
H2O_cluster_timezone:       Europe/Belgrade
H2O_data_parsing_timezone:  UTC
H2O_cluster_version:        3.30.0.4
H2O_cluster_version_age:    13 days
H2O_cluster_name:           H2O_from_python_babar_n045b7
H2O_cluster_total_nodes:    1
H2O_cluster_free_memory:    5.333 Gb
H2O_cluster_total_cores:    4
H2O_cluster_allowed_cores:  4
H2O_cluster_status:         accepting new members, healthy
H2O_connection_url:         http://127.0.0.1:54321
H2O_connection_proxy:       {"http": null, "https": null}
```

```
H2O_internal_security:      False
H2O_API_Extensions:         Amazon S3, Algos, AutoML, Core V3, TargetEncoder, Core V4
Python_version:             3.7.7 final
--------------------------  ---------------------------------------------------------
```

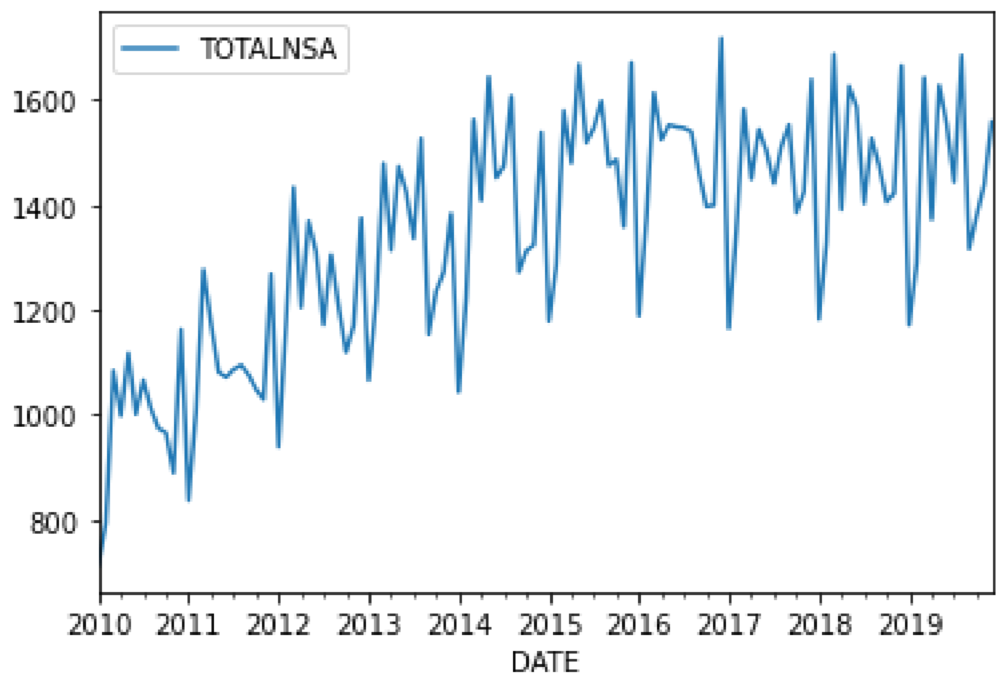
[107]:
```
# Load data from CSV
df = pd.read_csv('TOTALNSA.csv', parse_dates=True, index_col='DATE')
df.index.freq = "MS"
```

[108]:
```
df.tail()
```

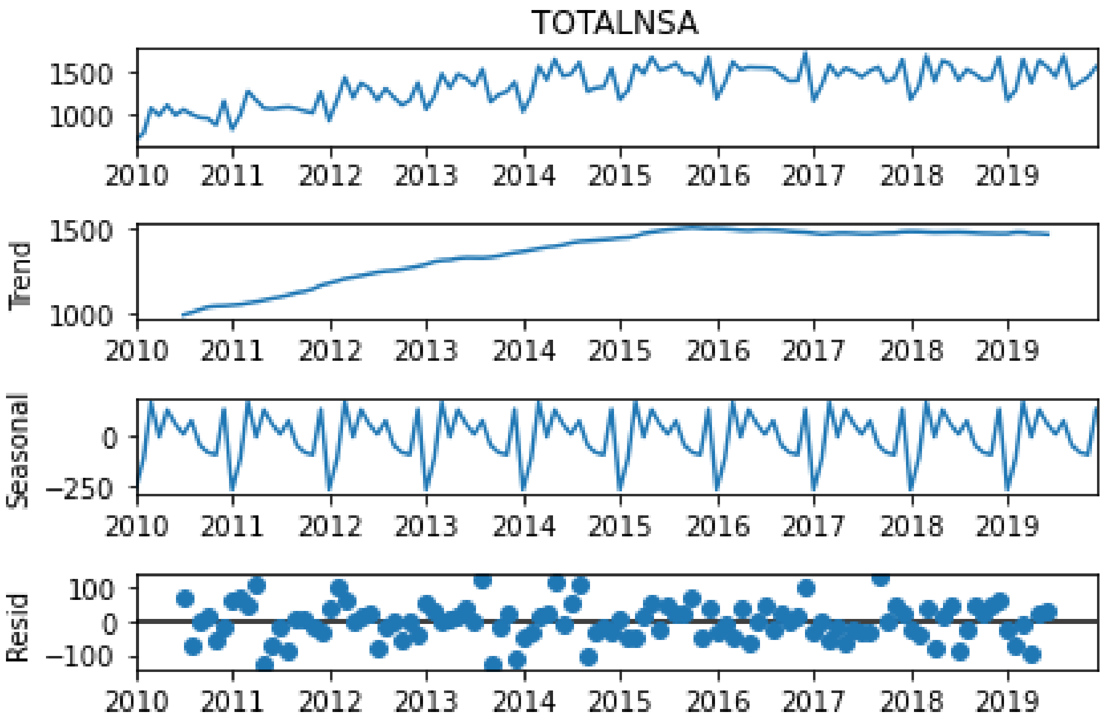
[108]:
```
            TOTALNSA
DATE
2019-08-01  1685.339
2019-09-01  1315.678
2019-10-01  1380.174
2019-11-01  1438.444
2019-12-01  1558.430
```

[109]:
```
df.plot()
```

[109]: <matplotlib.axes._subplots.AxesSubplot at 0x1ce3a5245c8>



[110]:
```
result_sd = seasonal_decompose(df.TOTALNSA)
result_sd.plot();
```



[111]:
```
# add trend to variables
df1=df.copy()
df1['trend'] = result_sd.trend
df1.tail()
```

[111]:

DATE	TOTALNSA	trend
2019-08-01	1685.339	NaN
2019-09-01	1315.678	NaN
2019-10-01	1380.174	NaN
2019-11-01	1438.444	NaN
2019-12-01	1558.430	NaN

[112]:
```
# add previous value to variables
df1['lag1'] = df1.TOTALNSA.shift(1)
df1.dropna(inplace=True)
df1.tail()
```

[112]:

```
            TOTALNSA        trend       lag1
DATE
```

```
2019-02-01  1288.278  1473.112208  1171.495
2019-03-01  1642.746  1473.054042  1288.278
2019-04-01  1372.696  1465.343500  1642.746
2019-05-01  1628.074  1464.947292  1372.696
2019-06-01  1554.747  1461.145167  1628.074
```

[113]:
```
# add seasonality 12 to variables
df1['lag12'] = df1.TOTALNSA.shift(12)
df1.dropna(inplace=True)
df1.tail()
```

[113]:

DATE	TOTALNSA	trend	lag1	lag12
2019-02-01	1288.278	1473.112208	1171.495	1328.140
2019-03-01	1642.746	1473.054042	1288.278	1687.609
2019-04-01	1372.696	1465.343500	1642.746	1391.226
2019-05-01	1628.074	1464.947292	1372.696	1626.484
2019-06-01	1554.747	1461.145167	1628.074	1586.664

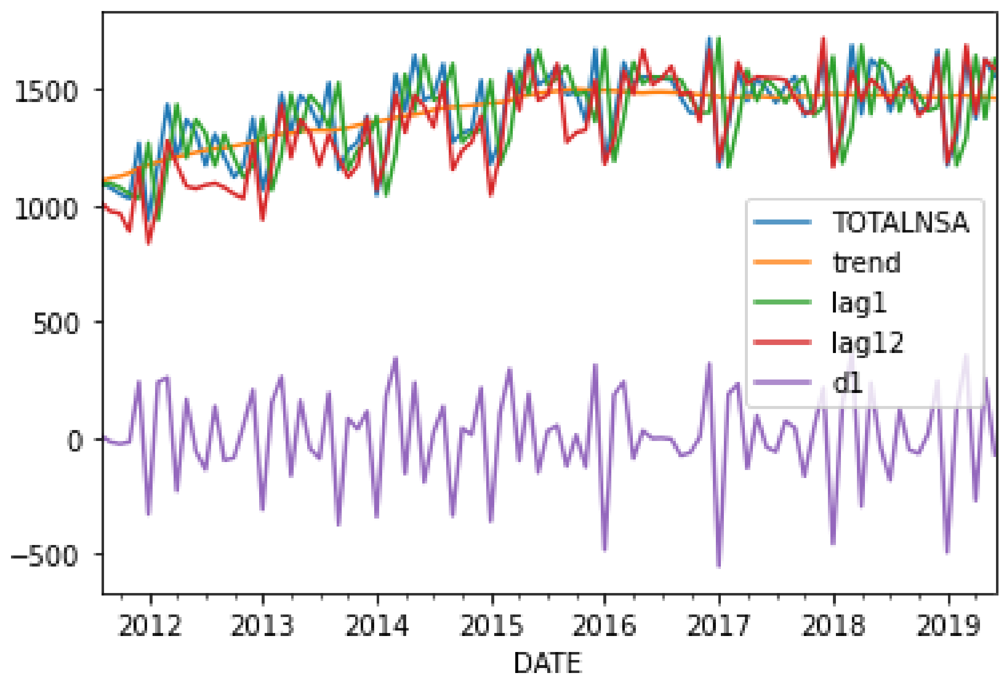
[114]:
```
# add diff to variables
df1['d1'] = df1.TOTALNSA.diff(1)
df1.dropna(inplace=True)
df1.tail()
```

[114]:

DATE	TOTALNSA	trend	lag1	lag12	d1
2019-02-01	1288.278	1473.112208	1171.495	1328.140	116.783
2019-03-01	1642.746	1473.054042	1288.278	1687.609	354.468
2019-04-01	1372.696	1465.343500	1642.746	1391.226	-270.050
2019-05-01	1628.074	1464.947292	1372.696	1626.484	255.378
2019-06-01	1554.747	1461.145167	1628.074	1586.664	-73.327

[115]:
```
df1.plot()
```

[115]: <matplotlib.axes._subplots.AxesSubplot at 0x1ce3bbbba08>



[116]:
```
train=h2o.H2OFrame(df1.iloc[:-12])
test=h2o.H2OFrame(df1.iloc[-12:])
```

```
Parse progress: |                                          | 100%
Parse progress: |                                          | 100%
```

[117]:
```
x=['lag12', 'lag1', 'trend', 'd1']
y='TOTALNSA'
```

[118]:
```
model = H2ORandomForestEstimator(ntrees=100, max_depth=30, nfolds=15)
model.train(x=x, y=y, training_frame=train)
```

```
drf Model Build progress: |                                | 100%
```

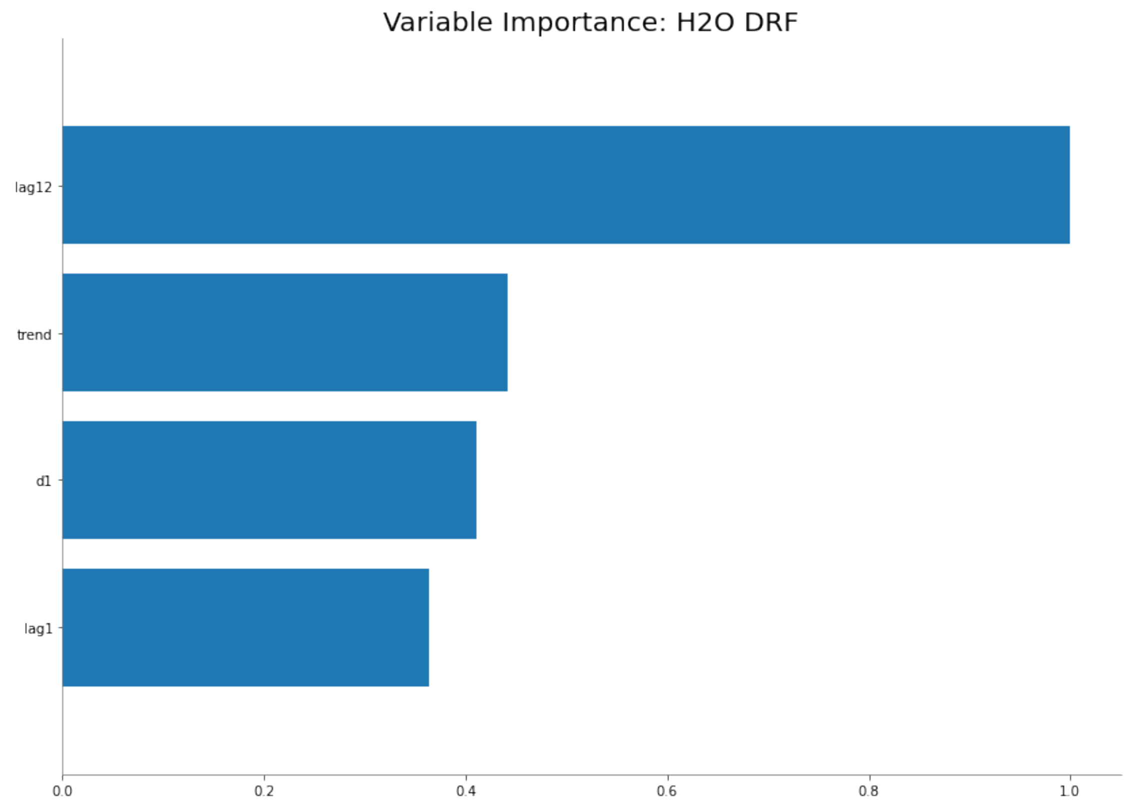
[119]:
```
performance = model.model_performance(test_data=test)
print(performance)
```

```
ModelMetricsRegression: drf
** Reported on test data. **

MSE: 1811.9511771167126
RMSE: 42.56701982893227
MAE: 38.775986226399745
RMSLE: 0.029440548464803748
```

```
Mean Residual Deviance: 1811.9511771167126
```

[120]:
```python
model.varimp_plot()
```



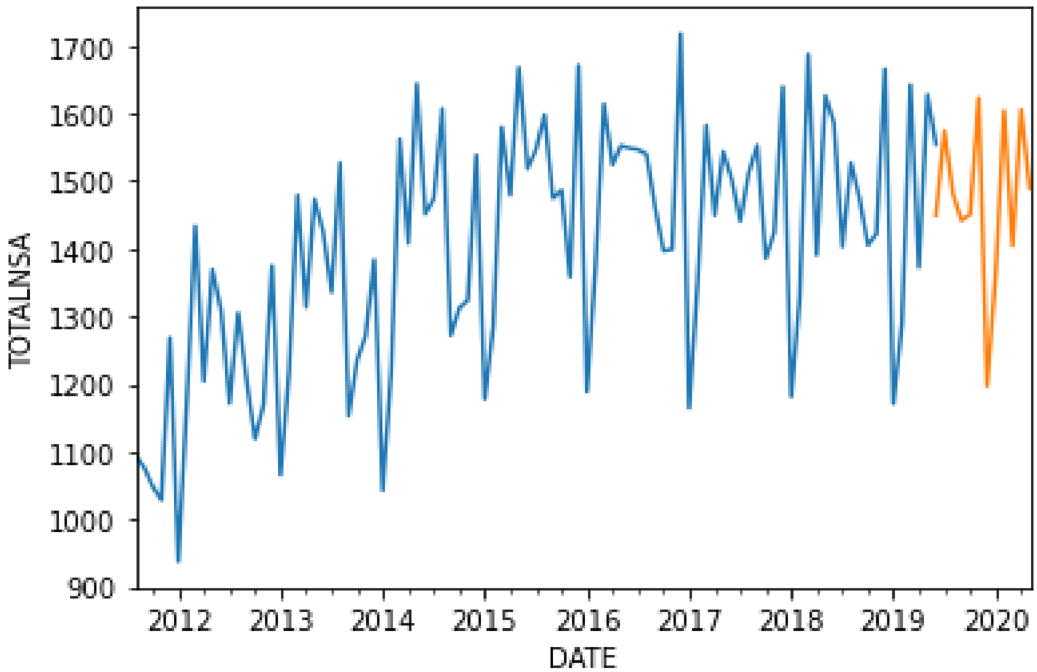
[121]:
```python
predictions = model.predict(test)
```

```
drf prediction progress: |                                    | 100%
```

[122]:
```python
predictions_df = predictions.as_data_frame()
```

[124]:
```python
predictions_df.index = dates_new = pd.date_range(str(df1.index[-1]),
 ↪periods=12, freq='MS')
```

[127]:
```python
ax = df1.TOTALNSA.plot()
predictions_df.predict.plot()
plt.ylabel("TOTALNSA")
plt.show()
```


1700
1600
1500
1400
1300
1200
1100
1000
900
TOTALNSA
2012
2013
2014
2015
2016
2017
2018
2019
2020
DATE