time_series_analysis_190808

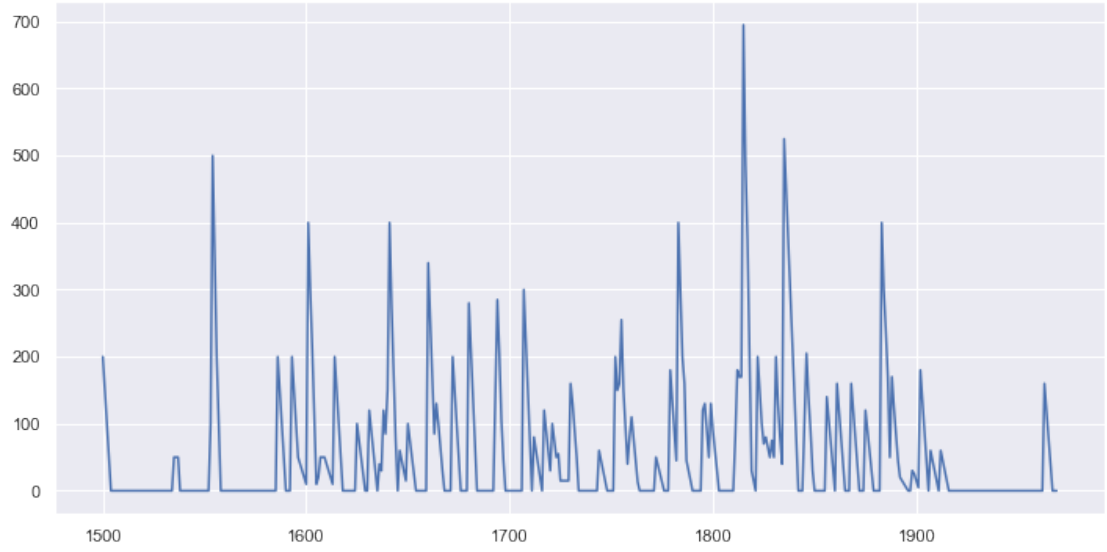
August 8, 2019

In [1]:
```
import matplotlib.pyplot as plt
import pandas as pd
import seaborn
import statsmodels.api as sm
import statsmodels.tsa.api as tsa
import statsmodels.graphics.tsaplots as tsaplt
from scipy import stats
seaborn.set()
```

In [2]:
```
data = pd.read_csv('C:\\Users\\poposoto\\Desktop\\model\\808\\1.csv')
data.index = range(1500, 1970)
```

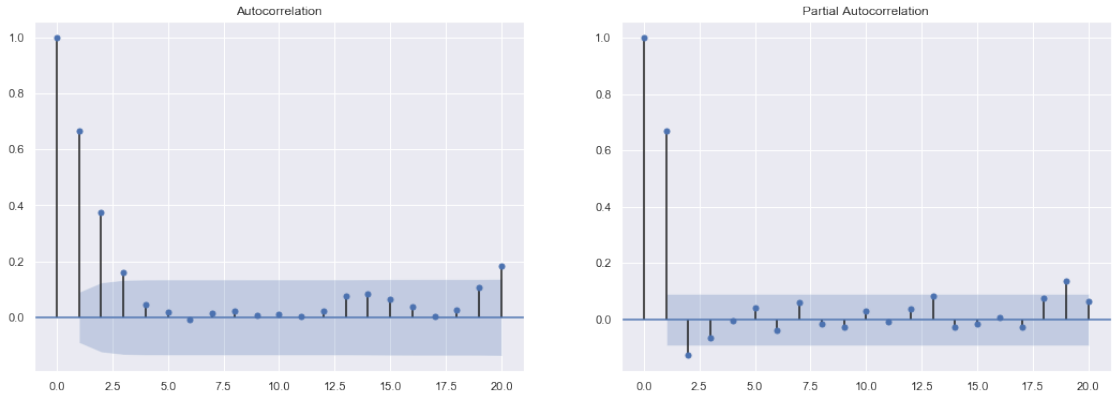
1

In [3]:
```
fig, ax = plt.subplots(figsize=(12, 6))
ax.plot(data);
```



2

```
In [4]: fig, ax = plt.subplots(1, 2, figsize=(18, 6))
        tsaplt.plot_acf(data, lags=20, ax=ax[0])
        tsaplt.plot_pacf(data, lags=20, ax=ax[1]);
```



3

```
In [5]: try:
            model1 = tsa.ARIMA(data, order=(2, 0, 0)).fit()
            print(model1.summary())
        except:
            print('error')
```

```
                              ARMA Model Results
==============================================================================
Dep. Variable:                      x   No. Observations:                  470
Model:                     ARMA(2, 0)   Log Likelihood               -2662.544
Method:                       css-mle   S.D. of innovations             69.783
Date:                Thu, 08 Aug 2019   AIC                           5333.088
Time:                        14:52:38   BIC                           5349.699
Sample:                             0   HQIC                          5339.623

==============================================================================
                 coef    std err          z      P>|z|      [0.025      0.975]
------------------------------------------------------------------------------
const         57.5233      8.596      6.692      0.000      40.676      74.371
ar.L1.x        0.7533      0.046     16.465      0.000       0.664       0.843
ar.L2.x       -0.1268      0.046     -2.769      0.006      -0.216      -0.037
                                    Roots
=============================================================================
                  Real          Imaginary           Modulus         Frequency
-----------------------------------------------------------------------------
AR.1            2.0014           +0.0000j            2.0014            0.0000
AR.2            3.9418           +0.0000j            3.9418            0.0000
-----------------------------------------------------------------------------
```

```
In [6]: try:
            model2 = tsa.ARIMA(data, order=(0, 0, 3)).fit()
            print(model2.summary())
        except:
            print('error')
```

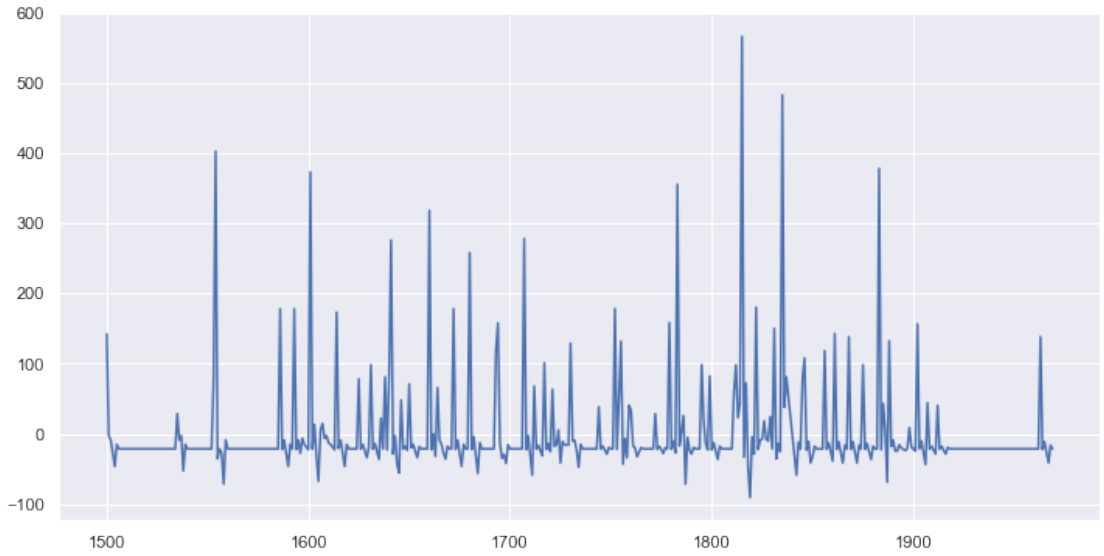
```
                              ARMA Model Results
==============================================================================
Dep. Variable:                      x   No. Observations:                  470
Model:                     ARMA(0, 3)   Log Likelihood               -2661.694
Method:                        css-mle   S.D. of innovations             69.655
Date:                Thu, 08 Aug 2019   AIC                           5333.388
Time:                        14:52:38   BIC                           5354.152
Sample:                             0   HQIC                          5341.557

==============================================================================
                 coef    std err          z      P>|z|      [0.025      0.975]
------------------------------------------------------------------------------
const         57.4575      7.653      7.507      0.000      42.457      72.458
ma.L1.x        0.7438      0.045     16.352      0.000       0.655       0.833
ma.L2.x        0.4513      0.050      8.994      0.000       0.353       0.550
ma.L3.x        0.1916      0.044      4.337      0.000       0.105       0.278
                                    Roots
=============================================================================
                  Real          Imaginary           Modulus         Frequency
-----------------------------------------------------------------------------
MA.1           -1.8059           -0.0000j            1.8059           -0.5000
MA.2           -0.2746           -1.6776j            1.6999           -0.2758
MA.3           -0.2746           +1.6776j            1.6999            0.2758
-----------------------------------------------------------------------------
```

```
In [7]: try:
            model3 = tsa.ARIMA(data, order=(2, 0, 3)).fit()
            print(model3.summary())
        except:
            print('error')
```

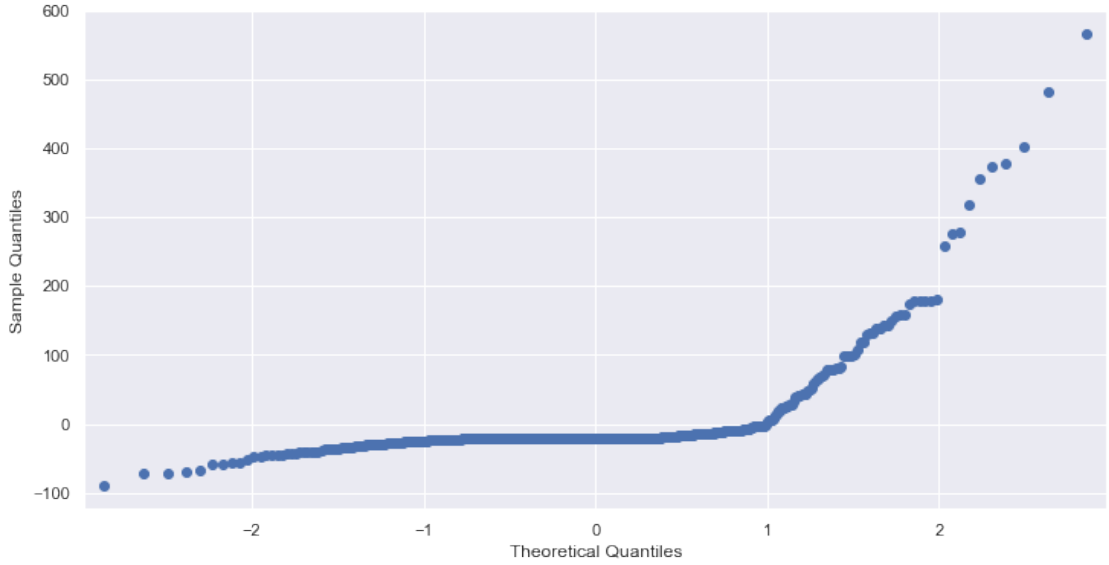
```
error
```

4

```
In [8]: fig, ax = plt.subplots(figsize=(12, 6))
        ax.plot(model1.resid);
```



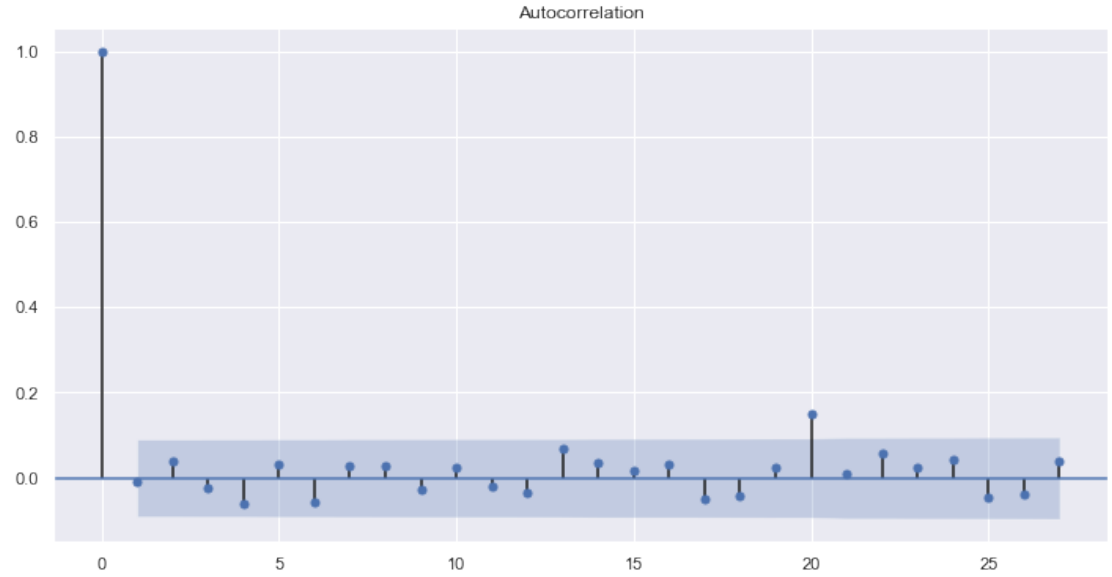
In [9]:
```
fig, ax = plt.subplots(figsize=(12, 6))
sm.qqplot(model1.resid, ax=ax);
```



In [10]:
```
print(stats.shapiro(model1.resid)[1]) # p-value of the Shapiro-Wilk test for normalit
```

```
7.260349022357701e-35
```

In [11]:
```
fig, ax = plt.subplots(figsize=(12, 6))
tsaplt.plot_acf(model1.resid, lags=27, ax=ax);
```



5

In [12]:
```
fig, ax = plt.subplots(figsize=(12, 6))
ax.plot((model1.resid - model1.resid.mean()) / model1.resid.std(), 'o');
```