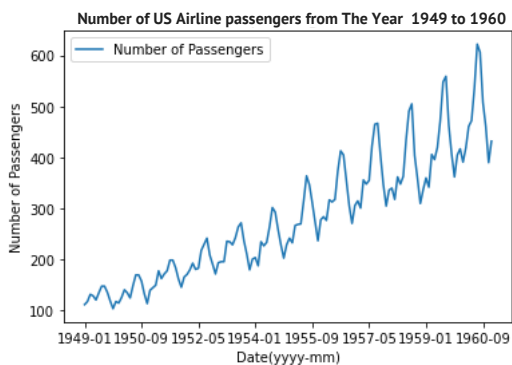


```
In [1]: #Name: Harsh Arora
#Roll Number:AE-1218
#Course: BSC.(HONS.) COMPUTER SCIENCE
```

```
In [2]: import pandas as pd
import matplotlib.pyplot as plt
from statsmodels.tsa.seasonal import seasonal_decompose as sm
```

```
In [3]: Passenger_Data= pd.read_csv(r"C:\Users\MSI\Downloads\AirPassengers.csv")
Passenger_Data.columns['Date(yyyy-mm)','Number of The Passengers']
Passenger_Data.plot(x='Date(yyyy-mm)', y='Number of The Passengers',title= 'Number of US Airline passengers from The Year 1949 to 1960')
plt.ylabel('Number of The Passengers')
```

```
Out[3]: Text(0, 0.5, 'Number of The Passengers')
```

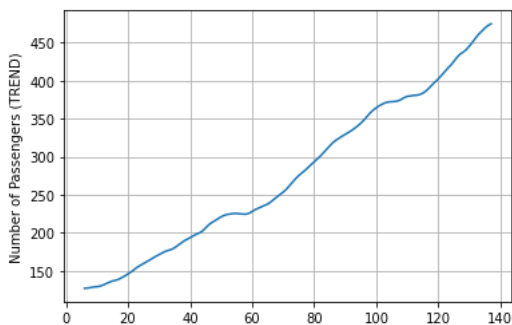


```
In [5]: #3. Data Representation of ETS Decomposition-MULTIPLICATIVE MODEL EXTRACTING 'TREND' COMPONENT
```

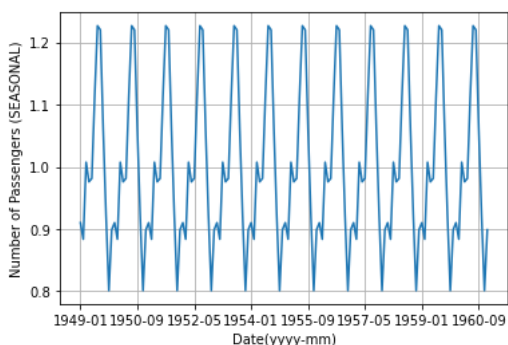
```
Passenger_Data= pd.read_csv(r"C:\Users\MSI\Downloads\AirPassengers.csv")
Passenger_Data.columns['Date(yyyy-mm)','Number of The Passengers']

# Multiplicative Decomposition of The DATA

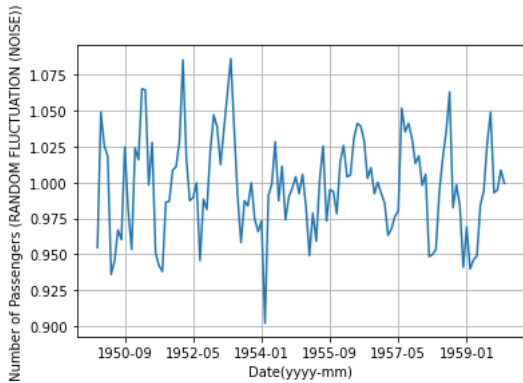
multiplicative_decomposition =sm(PassengerData['Number of Passengers'],model='multiplicative', period=12)
multiplicative_decomposition.trend.plot() # TREND component of the plot indicates GROWING OR DECAYING TREND
plt.ylabel('Number of The Passengers (TREND)')
plt.grid()
```



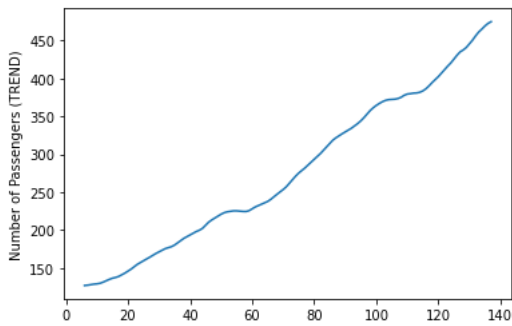
```
In [8]: #EXTRACTING 'SEASONAL' COMPONENT- MULTIPLICATIVE MODEL
Passenger_Data= pd.read_csv(r"C:\Users\MSI\Downloads\AirPassengers.csv")
Passenger_Data.columns['Date(yyyy-mm)','Number of The Passengers']
Passenger_Data.set_index('Date(yyyy-mm)',inplace= True )
#Graph of Multiplicative Decomposition
multiplicative_decomposition =sm(PassengerData['Number of The Passengers'],model='multiplicative', period=12)
multiplicative_decomposition.seasonal.plot()
plt.ylabel('Number of The Passengers (SEASONAL)')
plt.grid()
```



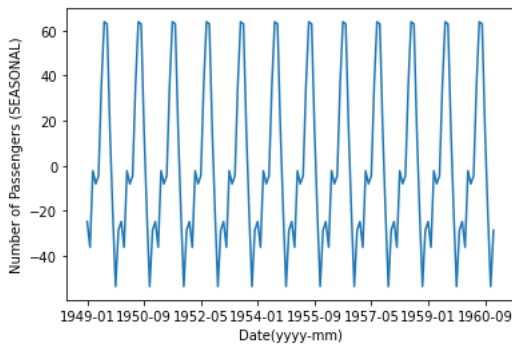
```
In [9]: #EXTRACTING The 'RESIDUAL' COMPONENT- MULTIPLICATIVE MODEL
Passenger_Data= pd.read_csv(r"C:\Users\MSI\Downloads\AirPassengers.csv")
Passenger_Data.columns['Date(yyyy-mm)', 'Number of The Passengers']
Passenger_Data.set_index('Date(yyyy-mm)', inplace=True)
# Graph of Multiplicative Decomposition
multiplicative_decomposition = sm(PassengerData['Number of Passengers'], model='multiplicative', period=24)
multiplicative_decomposition.resid.plot()
plt.ylabel('Number of Passengers (RANDOM FLUCTUATION (NOISE))')
plt.grid()
```



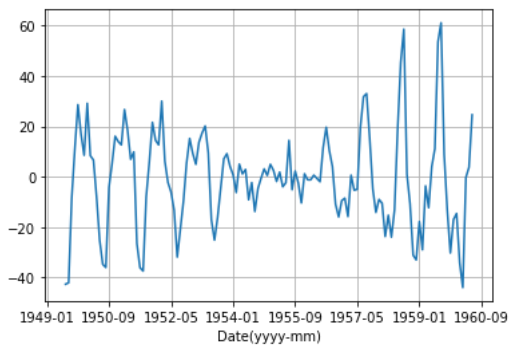
```
In [10]: #EXTRACTING 'TREND' COMPONENT- ADDITIVE MODEL
Passenger_Data= pd.read_csv(r"C:\Users\MSI\Downloads\AirPassengers.csv")
Passenger_Data.columns['Date(yyyy-mm)', 'Number of Passengers']
# Graph of Additive Decomposition
Additive_decomposition = sm(PassengerData['Number of Passengers'], model='additive', period=12)
Additive_decomposition.trend.plot()
plt.ylabel('Number of ThePassengers (TREND)')
plt.show()
```



```
In [12]: #EXTRACTING 'SEASONAL' COMPONENT- ADDITIVE MODEL
PassengerData = pd.read_csv(r"C:\Users\MSI\Downloads\AirPassengers.csv")
PassengerData.columns['Date(yyyy-mm)', 'Number of Passengers']
PassengerData.set_index('Date(yyyy-mm)', inplace=True)
# Additive Decomposition
Additive_decomposition = sm(PassengerData['Number of Passengers'], model='additive', period=12)
Additive_decomposition.seasonal.plot()
plt.ylabel('Number of Passengers (SEASONAL)')
plt.show()
```



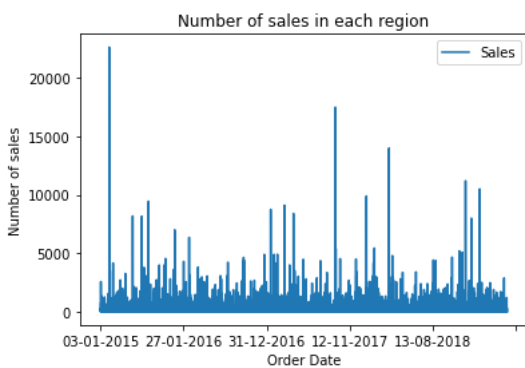
```
In [13]: #EXTRACTING 'RESIDUAL' COMPONENT- ADDITIVE MODEL
PassengerData = pd.read_csv(r"C:\Users\MSI\Downloads\AirPassengers.csv")
PassengerData.columns=['Date(yyyy-mm)', 'Number of Passengers']
PassengerData.set_index('Date(yyyy-mm)', inplace=True)
# Additive Decomposition
Additive_decomposition = sm(PassengerData['Number of Passengers'], model='additive', period=12)
Additive_decomposition.resid.plot()
plt.grid()
plt.show()
```



```
In [15]: #DataSet Number 2
```

```
In [17]: sales_Data= pd.read_csv(r"C:\Users\MSI\Downloads\SuperStore-SalesDataSet.csv")
salesData.plot(x='Order Date', y='Sales', title='Number of sales in each region')
plt.ylabel('Number of sales')
```

```
Out[17]: Text(0, 0.5, 'Number of sales')
```

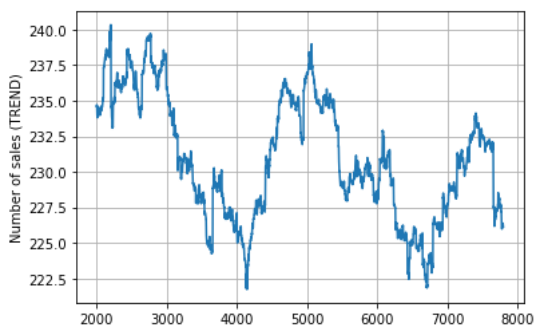


```
In [18]: #3. ETS Decomposition-MULTIPLICATIVE MODEL EXTRACTING 'TREND' COMPONENT

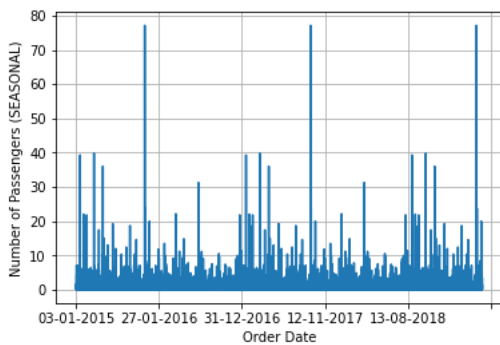
salesData = pd.read_csv(r"C:\Users\MSI\Downloads\SuperStore-SalesDataSet.csv")

# Graph of Multiplicative Decomposition

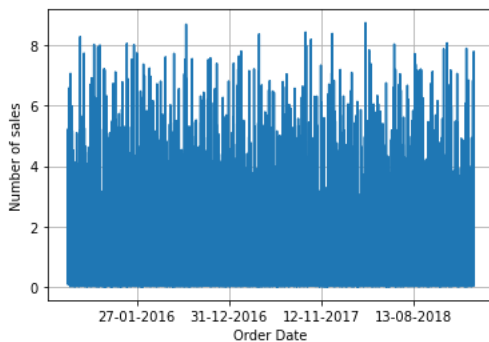
multiplicative_decomposition = sm(salesData['Sales'], model='multiplicative', period=4000)
multiplicative_decomposition.trend.plot() # TREND component of the plot indicates GROWING OR DECAYING TREND
plt.ylabel('Number of sales (TREND)')
plt.grid()
```



```
In [19]: #EXTRACTING 'SEASONAL' COMPONENT- MULTIPLICATIVE MODEL
salesData = pd.read_csv(r"C:\Users\MSI\Downloads\SuperStore-SalesDataSet.csv")
salesData.set_index('Order Date',inplace=True)
# Graph of Multiplicative Decomposition
multiplicative_decomposition = sm(salesData['Sales'],model='multiplicative', period=4000)
multiplicative_decomposition.seasonal.plot()
plt.ylabel('Number of Passengers (SEASONAL)')
plt.grid()
```

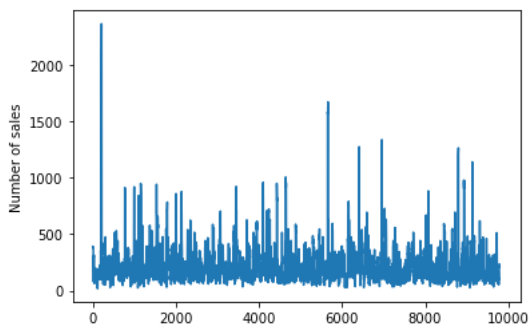


```
In [20]: #EXTRACTING 'RESIDUAL' COMPONENT- MULTIPLICATIVE MODEL
salesData = pd.read_csv(r"C:\Users\MSI\Downloads\SuperStore-SalesDataSet.csv")
salesData.set_index('Order Date',inplace=True)
# Graph OF Multiplicative Decomposition
multiplicative_decomposition = sm(salesData['Sales'], model='multiplicative', period=1000)
multiplicative_decomposition.resid.plot()
plt.ylabel('Number of sales')
plt.grid()
```

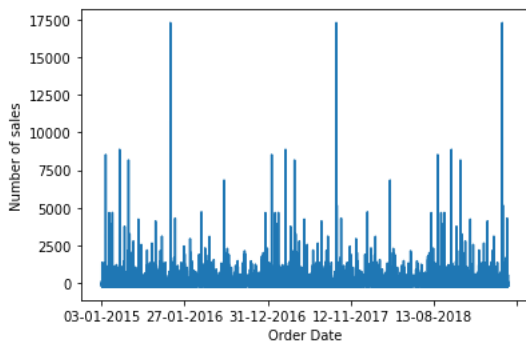


```
In [22]: #EXTRACTING 'TREND' COMPONENT- ADDITIVE MODEL
salesData = pd.read_csv(r"C:\Users\MSI\Downloads\SuperStore-SalesDataSet.csv")

# Graph of Additive Decomposition
Additive_decomposition = sm(salesData['Sales'],model='additive', period=12)
Additive_decomposition.trend.plot()
plt.ylabel('Number of sales')
plt.show()
```



```
In [24]: #EXTRACTING 'SEASONAL' COMPONENT- ADDITIVE MODEL
sales_Data= pd.read_csv(r"C:\Users\MSI\Downloads\SuperStore-SalesDataSet.csv")
salesData.set_index('Order Date',inplace=True)
# Additive Decomposition
Additive_decomposition = sm(salesData['Sales'],model='additive', period=4000)
Additive_decomposition.seasonal.plot()
plt.ylabel('Number of sales')
plt.show()
```



```
In [25]: #EXTRACTING 'RESIDUAL' COMPONENT- ADDITIVE MODEL
sales_Data= pd.read_csv(r"C:\Users\MSI\Downloads\SuperStore-SalesDataSet.csv")
salesData.set_index('Order Date',inplace=True)
# Additive Decomposition
Additive_decomposition = sm(salesData['Sales'], model='additive', period=1000)
Additive_decomposition.resid.plot()
plt.grid()
plt.show()
```

