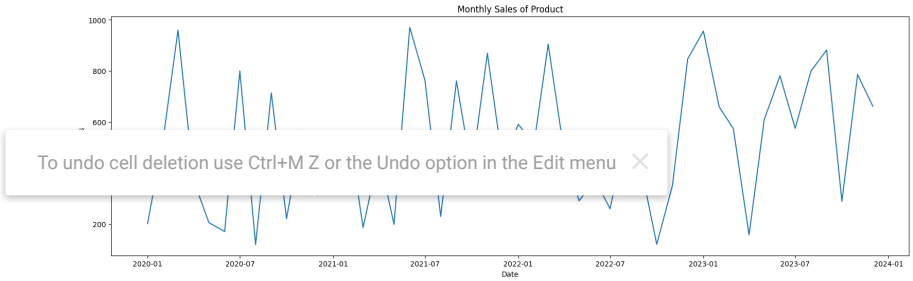
```
import numpy as np
import pandas as pd

# Generating synthetic data
np.random.seed(42)
date_rng = pd.date_range(start='2020-01-01', end='2023-12-01', freq=
sales = np.random.randint(100, 1000, len(date_rng))

# Create a DataFrame to store the data
data = pd.DataFrame({'Date': date_rng, 'Sales': sales})
data.set_index('Date', inplace=True)


import matplotlib.pyplot as plt

# Plotting the data
plt.figure(figsize=(20, 6))
plt.plot(data.index, data['Sales'])
plt.xlabel('Date')
plt.ylabel('Sales')
plt.title('Monthly Sales of Product')
plt.show()
```




```
from statsmodels.tsa.stattools import adfuller

# Function to check stationarity using Augmented Dickey-Fuller test
def check_stationarity(timeseries):
    result = adfuller(timeseries)
    print('ADF Statistic:', result[0])
```

```
    print('p-value:', result[1])
    print('Critical Values:')
    for key, value in result[4].items():
        print(f'{key}: {value}')

# Check stationarity
check_stationarity(data['Sales'])
```

```
ADF Statistic: -7.273363146601268
p-value: 1.5672947773193926e-10
Critical Values:
1%: -3.5778480370438146
5%: -2.925338105429433
10%: -2.6007735310095064
```

```
# Differencing to make the data stationary
data['Sales_diff'] = data['Sales'] - data['Sales'].shift(1)
data.dropna(inplace=True)

# Check stationarity of differenced data
check_stationarity(data['Sales_diff'])
```

```
ADF Statistic: -6.831590844278446
p-value: 1.8876381786502522e-09
Critical Values:
1%: -3.5925042342183704
5%: -2.931549768951162
10%: -2.60406594375338
```

```
data['Sales_diff']
```

```
Date
2020-02-01    333.0
```

To undo cell deletion use Ctrl+M Z or the Undo option in the Edit menu

```
2020-06-01    -35.0
2020-07-01    629.0
2020-08-01   -680.0
2020-09-01    594.0
2020-10-01   -493.0
2020-11-01    345.0
2020-12-01   -252.0
2021-01-01    116.0
2021-02-01    128.0
2021-03-01   -371.0
2021-04-01    285.0
2021-05-01   -273.0
2021-06-01    772.0
2021-07-01   -208.0
2021-08-01   -533.0
2021-09-01    531.0
2021-10-01   -353.0
2021-11-01    461.0
2021-12-01   -426.0
2022-01-01    148.0
2022-02-01    -78.0
2022-03-01    392.0
2022-04-01   -420.0
2022-05-01   -194.0
2022-06-01     85.0
2022-07-01   -116.0
2022-08-01    299.0
2022-09-01   -146.0
2022-10-01   -292.0
2022-11-01    231.0
2022-12-01    495.0
2023-01-01    109.0
2023-02-01   -296.0
2023-03-01    -86.0
2023-04-01   -416.0
```

```
2023-05-01    452.0
2023-06-01    171.0
2023-07-01   -206.0
2023-08-01    224.0
2023-09-01     83.0
2023-10-01   -593.0
2023-11-01    497.0
2023-12-01   -124.0
Name: Sales_diff, dtype: float64
```

```
from statsmodels.tsa.arima.model import ARIMA

# Create and train the ARIMA model
order = (1, 1, 1)  # (p, d, q) order
model = ARIMA(data['Sales'], order=order)
results = model.fit()
```

```
/usr/local/lib/python3.10/dist-packages/statsmodels/tsa/base/tsa_model.py:471: ValueWarning: No frequency information was provided,
  self._init_dates(dates, freq)
/usr/local/lib/python3.10/dist-packages/statsmodels/tsa/base/tsa_model.py:471: ValueWarning: No frequency information was provided,
  self._init_dates(dates, freq)
/usr/local/lib/python3.10/dist-packages/statsmodels/tsa/base/tsa_model.py:471: ValueWarning: No frequency information was provided,
  self._init_dates(dates, freq)
```

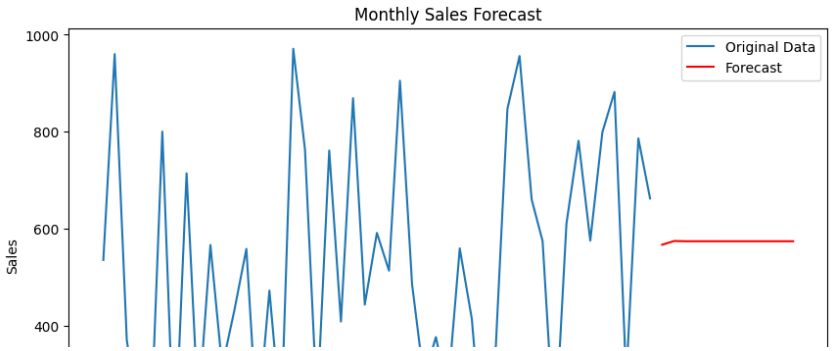
```
# Forecast future sales
forecast_steps = 12
forecast = results.forecast(steps=forecast_steps)

# Create date range for future forecast
forecast_date_rng = pd.date_range(start='2024-01-01', periods=foreca

# Create a DataFrame to store the forecast
forecast_data = pd.DataFrame({'Date': forecast_date_rng, 'Forecast':
```

To undo cell deletion use Ctrl+M Z or the Undo option in the Edit menu

```
e forecast
plt.figure(figsize=(10, 6))
plt.plot(data.index, data['Sales'], label='Original Data')
plt.plot(forecast_data['Date'], forecast_data['Forecast'], label='Fo
plt.xlabel('Date')
plt.ylabel('Sales')
plt.title('Monthly Sales Forecast')
plt.legend()
plt.show()
```



forecast_data

	Date	Forecast
2024-01-01	2024-01-01	566.555112
2024-02-01	2024-02-01	574.274654
2024-03-01	2024-03-01	573.650301
2024-04-01	2024-04-01	573.700798
2024-05-01	2024-05-01	573.696714
2024-06-01	2024-06-01	573.697044
2024-07-01	2024-07-01	573.697018
2024-08-01	2024-08-01	573.697020
2024-09-01	2024-09-01	573.697019
2024-10-01	2024-10-01	573.697020
2024-11-01	2024-11-01	573.697020
2024-12-01	2024-12-01	573.697020

***Follow Sachin M on LinkedIn & GitHub for Open Source bublic resource ***

To undo cell deletion use Ctrl+M Z or the Undo option in the Edit menu

Colab paid products - Cancel contracts here

✓ 0s completed at 4:18 PM