In [ ]:
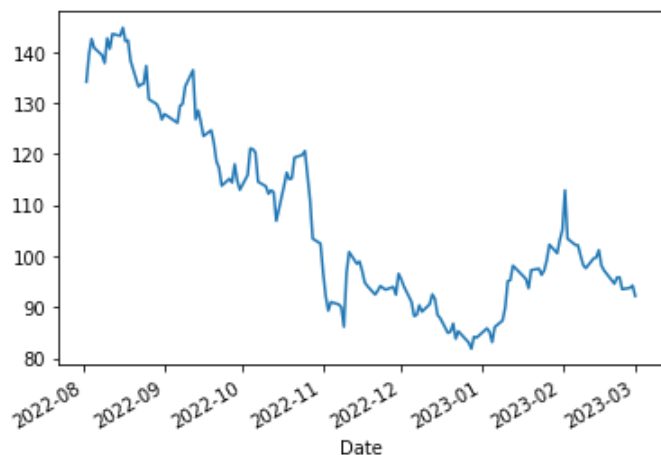```python
!pip install yfinance
```

In [ ]: 
```python
import numpy as np
import pandas as pd
import yfinance as yfin
```

In [ ]:
```python
df = yfin.download('AMZN', start='2022-08-02', end='2023-03-02')
```

```
[**********************100%***********************]  1 of 1 completed
```

In [ ]:
```python
df["Adj Close"].plot()
```

Out[ ]: `<AxesSubplot:xlabel='Date'>`

In [ ]:
```python
df.head(3)
```

Out[ ]:

	Open	High	Low	Close	Adj Close	Volume
Date						
2022-08-02	134.720001	137.440002	134.089996	134.160004	134.160004	61922400
2022-08-03	136.210007	140.490005	136.050003	139.520004	139.520004	71827800
2022-08-04	140.580002	143.559998	139.550003	142.570007	142.570007	70585000

In [ ]:
```python
# log price return = ln(P(t)) - ln(P(t-1))
# series P(t-1)
d = df['Adj Close']
d.shift(1)
```

Out[ ]:
```
Date
2022-08-02          NaN
2022-08-03    134.160004
2022-08-04    139.520004
2022-08-05    142.570007
2022-08-08    140.800003
                 ...
2023-02-23     95.790001
2023-02-24     95.820000
2023-02-27     93.500000
2023-02-28     93.760002
2023-03-01     94.230003
Name: Adj Close, Length: 146, dtype: float64
```

```python
In [ ]:  # log price return
         r = np.log(d) - np.log(d.shift(1))
         r.head(3)
```

```
Out[ ]:  Date
         2022-08-02         NaN
         2022-08-03    0.039175
         2022-08-04    0.021625
         Name: Adj Close, dtype: float64
```

```python
In [ ]:  r.drop('2022-08-02', inplace=True)
```

```python
In [ ]:  # simple moving average of 3 days
         r_sma = r.rolling(window=3)
```

```python
In [ ]:  sma_mean = r_sma.mean() # series of mean of 3 days
```

```python
In [ ]:  sma_std = r_sma.std(ddof=1)
```

```python
In [ ]:  # ewma with lamba = 0.94
         # input = alpha = 1-lamba
         # adjust: True = weighted sum, False = recursive formula
         r_ewm = r.ewm(alpha=0.06, adjust=True)
```

```python
In [ ]:  ewm_mean = r_ewm.mean() # series of EWMA of log returns
         ewm_std = r_ewm.std()
```

```python
In [ ]:  sma_std.head(5), sma_mean.head(5)
```

```
Out[ ]:  (Date
          2022-08-03         NaN
          2022-08-04         NaN
          2022-08-05    0.026273
          2022-08-08    0.018999
          2022-08-09    0.001290
          Name: Adj Close, dtype: float64, Date
          2022-08-03         NaN
          2022-08-04         NaN
          2022-08-05    0.016102
          2022-08-08   -0.000263
          2022-08-09   -0.011271
          Name: Adj Close, dtype: float64)
```

```python
In [ ]:  # ewm correlation
         r_ewm.cov(other=r), r_ewm.var()
```

```
Out[ ]:  (Date
         2022-08-03         NaN
         2022-08-04    0.000154
         2022-08-05    0.000699
         2022-08-08    0.000617
         2022-08-09    0.000532
                          ...
         2023-02-23    0.000736
         2023-02-24    0.000724
         2023-02-27    0.000682
         2023-02-28    0.000644
         2023-03-01    0.000630
         Name: Adj Close, Length: 145, dtype: float64, Date
         2022-08-03         NaN
         2022-08-04    0.000154
         2022-08-05    0.000699
         2022-08-08    0.000617
         2022-08-09    0.000532
                          ...
         2023-02-23    0.000736
         2023-02-24    0.000724
         2023-02-27    0.000682
         2023-02-28    0.000644
         2023-03-01    0.000630
         Name: Adj Close, Length: 145, dtype: float64)
```