Build a linear regression model for the dataset 'electric_motor.csv'. Comment on the results

In [11]:
```
import numpy as np
import pandas as pd
import seaborn as sns
import random as rnd
import matplotlib.pyplot as plt
from sklearn import preprocessing, svm
from sklearn.model_selection import train_test_split
from sklearn.linear_model import LinearRegression
from sklearn.preprocessing import StandardScaler
from sklearn.metrics import mean_squared_error
```

In [12]:
```
df = pd.read_csv('electric_motor.csv')
```

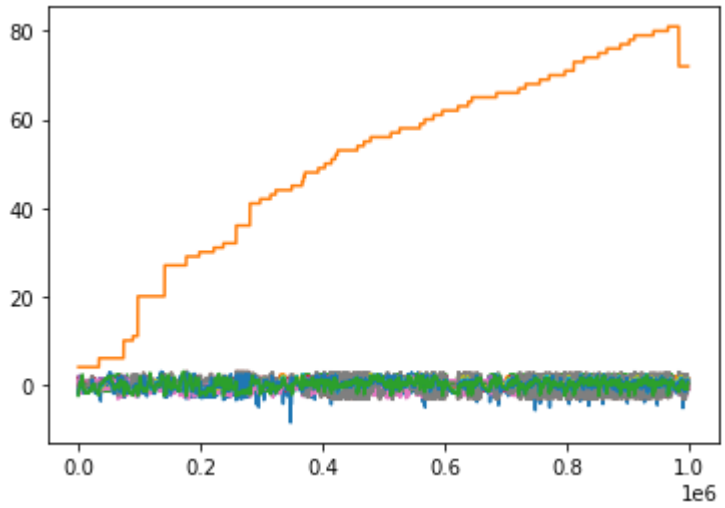
In [13]:
```
df.head()
```

Out[13]:

	ambient	coolant	u_d	u_q	motor_speed	torque	i_d	i_q	
0	-0.752143	-1.118446	0.327935	-1.297858	-1.222428	-0.250182	1.029572	-0.245860	-2.522
1	-0.771263	-1.117021	0.329665	-1.297686	-1.222429	-0.249133	1.029509	-0.245832	-2.522
2	-0.782892	-1.116681	0.332771	-1.301822	-1.222428	-0.249431	1.029448	-0.245818	-2.522
3	-0.780935	-1.116764	0.333700	-1.301852	-1.222430	-0.248636	1.032845	-0.246955	-2.521
4	-0.774043	-1.116775	0.335206	-1.303118	-1.222429	-0.248701	1.031807	-0.246610	-2.521

In [14]:
```
x=df.drop(['pm'],axis=1)
y=df['pm']
plt.plot(x)
plt.plot(y)
```

Out[14]:
```
[<matplotlib.lines.Line2D at 0x1c2bd08e5b0>]
```



In [25]:
```
features = list(set(df.columns)-set(['motor_speed','torque']))
target = list(['motor_speed','torque'])
print(features)
print(target)
['stator_winding', 'coolant', 'i_d', 'stator_tooth', 'profile_id',
'u_q', 'pm', 'i_q', 'stator_yoke', 'ambient', 'u_d']
['motor_speed', 'torque']
x = df.loc[:,features]
y = df.loc[:,target].astype(float)
X_train,X_test,y_train,y_test=train_test_split(x,y,test_size=0.3,random_state=
base_pre = np.mean(y_test)
print(base_pre)
```

```
['u_d', 'i_d', 'u_q', 'i_q', 'stator_tooth', 'pm', 'profile_id', 'stator_wind
ing', 'ambient', 'coolant', 'stator_yoke']
['motor_speed', 'torque']
motor_speed   -0.004353
torque        -0.002432
dtype: float64

C:\Users\91830\anaconda3\lib\site-packages\numpy\core\fromnumeric.py:3438: Fu
tureWarning: In a future version, DataFrame.mean(axis=None) will return a sca
lar mean over the entire DataFrame. To retain the old behavior, use 'frame.me
an(axis=0)' or just 'frame.mean()'
  return mean(axis=axis, dtype=dtype, out=out, **kwargs)
```

In [26]:
```
base_pred=np.repeat(base_pre,len(y_test))
print(base_pred)
```

```
motor_speed   -0.004353
motor_speed   -0.004353
motor_speed   -0.004353
motor_speed   -0.004353
motor_speed   -0.004353
                 ...
torque        -0.002432
torque        -0.002432
torque        -0.002432
torque        -0.002432
torque        -0.002432
Length: 598842, dtype: float64
```

In [28]:
```
scaler_x = StandardScaler()
scaler_y = StandardScaler()
scaler_x.fit(X_train)
scaler_y.fit(y_train)
StandardScaler()

StandardScaler()
```

Out[28]:
```
StandardScaler()
```

In [29]:
```
X_train = scaler_x.transform(X_train)
X_test = scaler_x.transform(X_test)
y_train = scaler_y.transform(y_train)
lgr = LinearRegression()
x = lgr.fit(X_train,y_train)
x.coef_
```

Out[29]:
```
array([[-1.40928576e-01, -6.49349286e-01,  5.44484775e-01,
        -1.82485257e-01,  2.35671433e+00,  1.05744816e-01,
        -6.58846943e-03, -1.19271009e+00, -4.74054145e-02,
         4.15341210e-01, -1.64771362e+00],
       [-6.90117641e-02, -2.07371914e-02, -1.40309814e-02,
         9.33570254e-01, -1.40551227e-01, -9.81994903e-04,
         6.29896607e-03,  9.16799465e-02, -3.37402447e-03,
        -5.32939335e-03,  6.09187751e-02]])
```

In [20]:
```
x = lgr.fit(X_train,y_train)
x.coef_
```

Out[20]:
```
array([[-1.40928576e-01, -6.49349286e-01,  5.44484775e-01,
        -1.82485257e-01,  2.35671433e+00,  1.05744816e-01,
        -6.58846943e-03, -1.19271009e+00, -4.74054145e-02,
         4.15341210e-01, -1.64771362e+00],
       [-6.90117641e-02, -2.07371914e-02, -1.40309814e-02,
         9.33570254e-01, -1.40551227e-01, -9.81994903e-04,
         6.29896607e-03,  9.16799465e-02, -3.37402447e-03,
        -5.32939335e-03,  6.09187751e-02]])
```

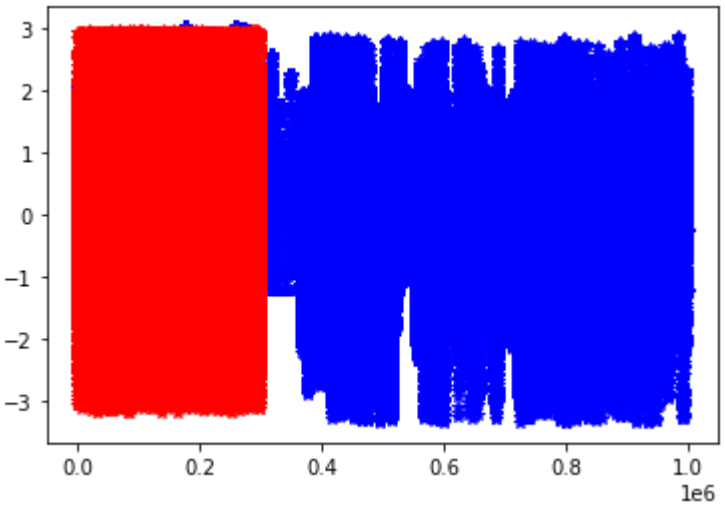
In [21]:
```
pred_lgr=lgr.predict(X_test)
y_predicted = scaler_y.inverse_transform(pred_lgr)
print(y_predicted)
```

```
[[-1.28894016 -0.26057314]
 [-0.33144692  0.44213959]
 [ 0.19480701 -1.64476966]
 ...
 [-1.35051682 -0.25777813]
 [-0.75026849 -0.6144407 ]
 [-1.20097625 -0.25455705]]
```

In [22]:
```
mean_squared_error = (mean_squared_error(y_test,y_predicted))**0.5
print(mean_squared_error)
0.1956759451110211
plt.plot(y_test,'b*')
plt.plot(y_predicted,'r*')
```

```
0.19576637587840987
```

Out[22]:
```
[<matplotlib.lines.Line2D at 0x1c280b23d60>,
 <matplotlib.lines.Line2D at 0x1c280b23ca0>]
```



In [ ]:

In [ ]:

In [ ]:

In [ ]:

In [ ]: