▾ Import Library

```python
import numpy as np
import pandas as pd
from pandas import DataFrame
import matplotlib.pyplot as plt
```

▾ **Overview of dataset using Pandas_Profiling**

```python
pip install pandas_profiling==2.7.1
```

```
Requirement already satisfied: pandas_profiling==2.7.1 in /usr/local/lib/python3.7/dist-packages (2.7.1)
Requirement already satisfied: matplotlib>=3.2.0 in /usr/local/lib/python3.7/dist-packages (from pandas_profiling==2.7.1) (3
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Requirement already satisfied: chardet<4,>=3.0.2 in /usr/local/lib/python3.7/dist-packages (from requests>=2.23.0->pandas_pro
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Requirement already satisfied: jupyter-core in /usr/local/lib/python3.7/dist-packages (from nbformat>=4.2.0->ipywidgets>=7.5
Requirement already satisfied: PyWavelets in /usr/local/lib/python3.7/dist-packages (from imagehash; extra == "type_image_pat
Requirement already satisfied: pyzmq>=13 in /usr/local/lib/python3.7/dist-packages (from jupyter-client->ipykernel>=4.5.1->ir
Requirement already satisfied: wcwidth in /usr/local/lib/python3.7/dist-packages (from prompt-toolkit<2.0.0,>=1.0.4->ipython>
Requirement already satisfied: ptyprocess>=0.5 in /usr/local/lib/python3.7/dist-packages (from pexpect; sys_platform != "win?
```

```
from pandas_profiling import ProfileReport

df=pd.read_csv('/content/top_Five.csv')
```

```
df=pd.read_csv("/content/top_five.csv")
df
```

	Name	Symbol	Date	High	Low	Open	Close	Volume	Marketcap
0	Bitcoin	BTC	01-01-2019 23:59	3850.913765	3707.231303	3746.713387	3843.519967	4.324201e+09	6.709863e+10
1	Bitcoin	BTC	02-01-2019 23:59	3947.981273	3817.409496	3849.216409	3943.409337	5.244857e+09	6.884986e+10
2	Bitcoin	BTC	03-01-2019 23:59	3935.685131	3826.222871	3931.048638	3836.741319	4.530215e+09	6.699492e+10
3	Bitcoin	BTC	04-01-2019 23:59	3865.934532	3783.853665	3832.039968	3857.717619	4.847965e+09	6.736833e+10
4	Bitcoin	BTC	05-01-2019 23:59	3904.903096	3836.900126	3851.973965	3845.194460	5.137610e+09	6.715757e+10
...	...	...	...	...	...	...	...	...	...
4585	Stellar	XLM	02-07-2021 23:59	0.273359	0.252874	0.269148	0.263427	3.487793e+08	6.118631e+09
4586	Stellar	XLM	03-07-2021 23:59	0.270331	0.259710	0.263304	0.264324	3.310069e+08	6.139464e+09
4587	Stellar	XLM	04-07-2021 23:59	0.272314	0.259118	0.264254	0.268128	3.376196e+08	6.227819e+09
4588	Stellar	XLM	05-07-2021 23:59	0.268272	0.252300	0.268272	0.254456	3.359242e+08	5.910264e+09
4589	Stellar	XLM	06-07-2021 23:59	0.267757	0.253547	0.253931	0.260190	3.604261e+08	6.049985e+09

4590 rows × 9 columns

```
profile =ProfileReport(df,title="Pandas Profiling Report")
```

```
profile.to_widgets()
```

```
/usr/local/lib/python3.7/dist-packages/pandas_profiling/profile_report.py:361: UserWarning: Ipywidgets is not yet fully support
  "Ipywidgets is not yet fully supported on Google Colab (https://github.com/googlecolab/colabtools/issues/60)."
```

Summarize dataset: 23/? [00:10<00:00, 1.34it/s, Completed]

Generate report structure: 100%   1/1 [00:04<00:00, 4.26s/it]

Render widgets: 100%   1/1 [00:24<00:00, 24.98s/it]

Number of variables	9	NUM	6
Number of observations	4590	CAT	3
Missing cells	0		
Missing cells (%)	0.0%		
Duplicate rows	0		
Duplicate rows (%)	0.0%		

```
profile.to_notebook_iframe()
```

Render HTML: 100%　　　　　　　　　　　　1/1 [00:01<00:00, 1.69s/it]

Overview

Overview	Reproduction	Warnings	**16**

Dataset statistics

Number of variables	9
Number of observations	4590
Missing cells	0
Missing cells (%)	0.0%
Duplicate rows	0
Duplicate rows (%)	0.0%
Total size in memory	1.1 MiB
Average record size in memory	244.4 B

Variable types

NUM	6
CAT	3

▾ Self Analysis of Dataset

```python
top_data=pd.read_csv('/content/top_Five.csv')
```

```
top_data['Date'] = pd.to_datetime(top_data['Date']).dt.strftime("%d-%m-%Y")
top_data['Date'] = pd.to_datetime(top_data['Date'])
top_data.set_index('Date', inplace=True)
top_data
```

Date	Name	Symbol	High	Low	Open	Close	Volume	Marketcap
2019-01-01	Bitcoin	BTC	3850.913765	3707.231303	3746.713387	3843.519967	4.324201e+09	6.709863e+10
2019-01-02	Bitcoin	BTC	3947.981273	3817.409496	3849.216409	3943.409337	5.244857e+09	6.884986e+10
2019-01-03	Bitcoin	BTC	3935.685131	3826.222871	3931.048638	3836.741319	4.530215e+09	6.699492e+10
2019-01-04	Bitcoin	BTC	3865.934532	3783.853665	3832.039968	3857.717619	4.847965e+09	6.736833e+10
2019-01-05	Bitcoin	BTC	3904.903096	3836.900126	3851.973965	3845.194460	5.137610e+09	6.715757e+10
...	...	...	...	...	...	...	...	...
2021-07-02	Stellar	XLM	0.273359	0.252874	0.269148	0.263427	3.487793e+08	6.118631e+09
2021-07-03	Stellar	XLM	0.270331	0.259710	0.263304	0.264324	3.310069e+08	6.139464e+09
2021-07-04	Stellar	XLM	0.272314	0.259118	0.264254	0.268128	3.376196e+08	6.227819e+09
2021-07-05	Stellar	XLM	0.268272	0.252300	0.268272	0.254456	3.359242e+08	5.910264e+09
2021-07-06	Stellar	XLM	0.267757	0.253547	0.253931	0.260190	3.604261e+08	6.049985e+09

4590 rows × 8 columns

```
top_data.shape
```

```
(4590, 8)
```

▾ Extracting the Bitcoin Data

```
bit_coin=top_data.loc[top_data['Name'].str.contains("Bitcoin", case=False)] #contains function is pattern match to string its regex m
```

```
bit_coin
```

Date	Name	Symbol	High	Low	Open	Close	Volume	Marketcap
2019-01-01	Bitcoin	BTC	3850.913765	3707.231303	3746.713387	3843.519967	4.324201e+09	6.709863e+10
2019-01-02	Bitcoin	BTC	3947.981273	3817.409496	3849.216409	3943.409337	5.244857e+09	6.884986e+10
2019-01-03	Bitcoin	BTC	3935.685131	3826.222871	3931.048638	3836.741319	4.530215e+09	6.699492e+10
2019-01-04	Bitcoin	BTC	3865.934532	3783.853665	3832.039968	3857.717619	4.847965e+09	6.736833e+10
2019-01-05	Bitcoin	BTC	3904.903096	3836.900126	3851.973965	3845.194460	5.137610e+09	6.715757e+10
...	...	...	...	...	...	...	...	...
2021-07-02	Bitcoin	BTC	33939.588700	32770.680780	33549.600180	33897.048590	3.872897e+10	6.354510e+11
2021-07-03	Bitcoin	BTC	34909.259900	33402.696540	33854.421360	34668.548400	2.438396e+10	6.499400e+11
2021-07-04	Bitcoin	BTC	35937.567150	34396.477460	34665.564870	35287.779770	2.492431e+10	6.615750e+11
2021-07-05	Bitcoin	BTC	35284.344430	33213.661030	35284.344430	33746.002460	2.672155e+10	6.326960e+11
2021-07-06	Bitcoin	BTC	35038.536360	33599.916170	33723.509660	34235.193450	2.650126e+10	6.418990e+11

918 rows × 8 columns

```
bit_coin.describe()
```

	High	Low	Open	Close	Volume	Marketcap
count	918.000000	918.000000	918.000000	918.000000	9.180000e+02	9.180000e+02
mean	17088.153689	16095.644686	16616.081669	16648.914879	3.211850e+10	3.073722e+11
std	16233.500556	15090.320247	15718.079585	15722.161741	2.218677e+10	2.952975e+11
min	3427.945610	3391.023752	3401.376433	3399.471644	4.324201e+09	5.957808e+10
25%	7931.194383	7527.582678	7695.299304	7721.138979	1.715998e+10	1.388070e+11

Extracting the Ethereum coin

```
Ethereum_coin = top_data.loc[top_data['Name'].str.contains("Ethereum", case=False)]


Ethereum_coin
```

Date	Name	Symbol	High	Low	Open	Close	Volume	Marketcap
2019-01-01	Ethereum	ETH	141.397504	132.650705	133.418145	140.819413	2.258710e+09	1.466532e+10
2019-01-02	Ethereum	ETH	156.929131	140.650960	141.519517	155.047677	3.328240e+09	1.615005e+10

Ethereum_coin.describe()

	High	Low	Open	Close	Volume	Marketcap
count	918.000000	918.000000	918.000000	918.000000	9.180000e+02	9.180000e+02
mean	640.582752	587.861999	615.613115	617.999074	1.539672e+10	7.034479e+10
std	845.528238	760.108065	806.228886	808.012409	1.198252e+10	9.397294e+10
min	106.058875	95.184301	104.645047	104.535299	2.212109e+09	1.095165e+10
25%	175.251211	167.007418	171.051290	171.493204	7.278407e+09	1.841330e+10
50%	239.138292	228.943087	233.295043	233.877789	1.129851e+10	2.586509e+10
75%	490.802900	465.799293	478.862737	480.141079	2.001583e+10	5.448255e+10
max	4362.350542	3785.848603	4174.635873	4168.701049	8.448291e+10	4.828820e+11

Extracting the XRP coin

```
XRP_coin=top_data.loc[top_data['Name'].str.contains("XRP", case=False)]
```

```
XRP_coin
```

	Name	Symbol	High	Low	Open	Close	Volume	Marketcap
Date								
2019-01-01	XRP	XRP	0.364771	0.350402	0.352512	0.364771	4.493476e+08	1.488050e+10
2019-01-02	XRP	XRP	0.378021	0.359574	0.365675	0.375243	5.432167e+08	1.530769e+10
2019-01-03	XRP	XRP	0.374505	0.357675	0.374505	0.360224	4.388738e+08	1.469501e+10
2019-01-04	XRP	XRP	0.364642	0.352785	0.359753	0.356747	4.506339e+08	1.455320e+10
2019-01-05	XRP	XRP	0.361069	0.353987	0.356347	0.355275	4.520902e+08	1.449313e+10
...	...	...	...	...	...	...	...	...
2021-07-02	XRP	XRP	0.667287	0.634726	0.659890	0.656763	2.061607e+09	3.030759e+10
2021-07-03	XRP	XRP	0.683677	0.644653	0.655639	0.672888	1.872820e+09	3.105172e+10
2021-07-04	XRP	XRP	0.707783	0.665802	0.673218	0.694945	1.885242e+09	3.206960e+10
2021-07-05	XRP	XRP	0.695653	0.648492	0.695653	0.654300	2.076373e+09	3.019395e+10

```
XRP_coin.describe()
```

	High	Low	Open	Close	Volume	Marketcap

Find Cardano coin

```
Cardano_coin=top_data.loc[top_data['Name'].str.contains("Cardano", case=False)]
```

	0.140911	0.115093	0.140324	0.139635	3.449603e+08	6.118533e+09

```
Cardano_coin
```

Date	Name	Symbol	High	Low	Open	Close	Volume	Marketcap
2019-01-01	Cardano	ADA	0.042547	0.040308	0.040984	0.042547	1.496290e+07	1.103114e+09
2019-01-02	Cardano	ADA	0.045563	0.041982	0.042568	0.045258	2.415153e+07	1.173420e+09
2019-01-03	Cardano	ADA	0.045259	0.042535	0.045106	0.042682	2.112696e+07	1.106609e+09
2019-01-04	Cardano	ADA	0.044092	0.042477	0.042629	0.043812	1.602403e+07	1.135912e+09
2019-01-05	Cardano	ADA	0.045570	0.043350	0.043659	0.044701	2.510096e+07	1.158976e+09
...	...	...	...	...	...	...	...	...
2021-07-02	Cardano	ADA	1.394397	1.286607	1.332942	1.394397	2.159410e+09	4.454587e+10
2021-07-03	Cardano	ADA	1.441714	1.359664	1.394152	1.406836	2.028094e+09	4.494324e+10
2021-07-04	Cardano	ADA	1.493717	1.382153	1.404008	1.458184	1.806362e+09	4.658364e+10
2021-07-05	Cardano	ADA	1.461221	1.379284	1.461221	1.404898	1.759461e+09	4.488134e+10
2021-07-06	Cardano	ADA	1.456887	1.393282	1.404712	1.418053	1.477700e+09	4.530158e+10

918 rows × 8 columns

```
Cardano_coin.describe()
```

	High	Low	Open	Close	Volume	Marketcap
count	918.000000	918.000000	918.000000	918.000000	9.180000e+02	9.180000e+02
mean	0.301699	0.269860	0.286079	0.287651	1.265571e+09	8.891907e+09
std	0.505720	0.446315	0.477287	0.478910	2.491791e+09	1.538745e+10
min	0.025993	0.019130	0.023954	0.023961	1.101152e+07	6.212325e+08
25%	0.046178	0.043575	0.044956	0.044981	6.454646e+07	1.166232e+09
50%	0.082322	0.076880	0.079374	0.079485	1.679510e+08	2.061911e+09
75%	0.147571	0.137910	0.142533	0.142937	8.745900e+08	3.824914e+09
max	2.461766	2.013285	2.300190	2.309113	1.914198e+10	7.377224e+10

▾ Find Stellar coin

```
Stellar_coin=top_data.loc[top_data['Name'].str.contains("Stellar", case=False)]
```

```
Stellar_coin
```

Date	Name	Symbol	High	Low	Open	Close	Volume	Marketcap
2019-01-01	Stellar	XLM	0.118505	0.112223	0.112932	0.115930	9.163009e+07	2.221378e+09
2019-01-02	Stellar	XLM	0.119368	0.114197	0.116054	0.119331	1.069496e+08	2.286719e+09
2019-01-03	Stellar	XLM	0.118976	0.113571	0.118946	0.113825	9.019234e+07	2.181194e+09
2019-01-04	Stellar	XLM	0.117095	0.112709	0.113778	0.115361	8.056446e+07	2.210639e+09
2019-01-05	Stellar	XLM	0.116614	0.113536	0.115128	0.114046	8.846399e+07	2.185438e+09

```
Stellar_coin.describe()
```

	High	Low	Open	Close	Volume	Marketcap
count	918.000000	918.000000	918.000000	918.000000	9.180000e+02	9.180000e+02
mean	0.158388	0.143050	0.150556	0.150727	6.377296e+08	3.249021e+09
std	0.154461	0.133290	0.143430	0.143492	9.214212e+08	3.349920e+09
min	0.037372	0.028492	0.033476	0.033441	5.515062e+07	6.774927e+08
25%	0.070392	0.066635	0.068438	0.068427	1.838170e+08	1.378297e+09
50%	0.088453	0.083525	0.086073	0.086135	3.356122e+08	1.727437e+09
75%	0.139042	0.127718	0.133230	0.133532	6.198823e+08	2.639646e+09
max	0.796471	0.663512	0.733122	0.729996	1.040858e+10	1.685469e+10

▾ Dependence of High, Low, Open and Close on each other

```
fig, ax1 = plt.subplots(5, figsize=(20,17))
title =["Bitcoin: Features Inter-Dependence Graph","Ethereum: Features Inter-Dependence Graph",
        "XRP: Features Inter-Dependence Graph","Cardano: Features Inter-Dependence Graph","Stellar:Features Inter-Dependence Graph"]
```

```
bit_coin[["High","Low","Open","Close"]].plot(ax=ax1[0])
Ethereum_coin[["High","Low","Open","Close"]].plot(ax=ax1[1])
XRP_coin[["High","Low","Open","Close"]].plot(ax=ax1[2])
Cardano_coin[["High","Low","Open","Close"]].plot(ax=ax1[3])
Stellar_coin[["High","Low","Open","Close"]].plot(ax=ax1[4])
for i in range(5):
  ax1[i].set_title(title[i], pad=-20, fontsize=20)
plt.show()
```

Bitcoin: Features Inter-Dependence Graph

Ethereum: Features Inter-Dependence Graph

XRP: Features Inter-Dependence Graph
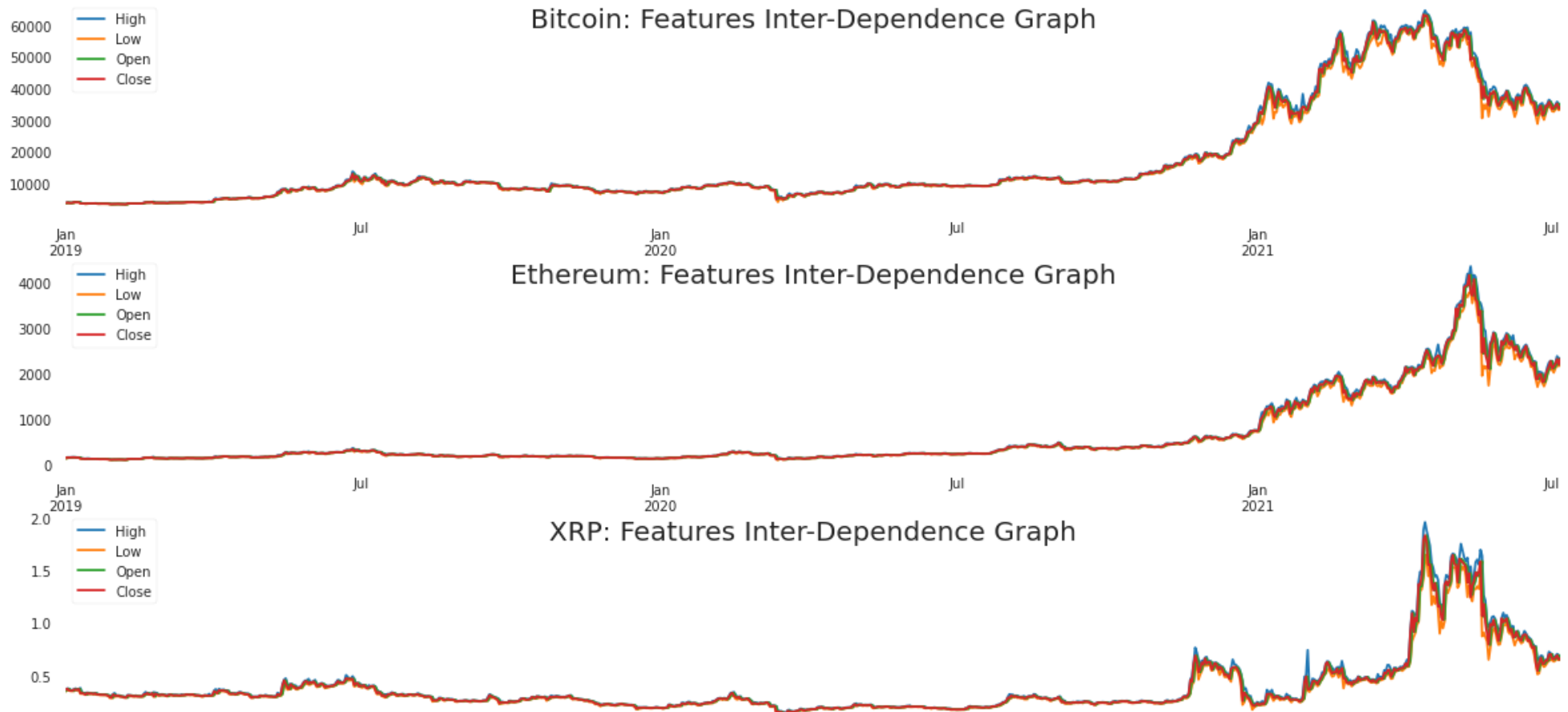
▾ Maximum returns

```
plt.figure(figsize=(12,10))
plt.plot(bit_coin['Close']*100/bit_coin['Close'].iloc[0])
plt.plot(Ethereum_coin['Close']*100/Ethereum_coin['Close'].iloc[0] )
plt.plot(XRP_coin['Close']*100/XRP_coin['Close'].iloc[0] )
plt.plot(Cardano_coin['Close']*100/Cardano_coin['Close'].iloc[0] )
plt.plot(Stellar_coin['Close']*100/Stellar_coin['Close'].iloc[0] )
plt.legend(['Bitcoin','Ethereum','XRP','Cardano','Stellar'], loc='best')
plt.title("Maximum returns")
plt.xlabel("Dates")
```

```
plt.ylabel("Increase %")
plt.show()
```

Maximum returns
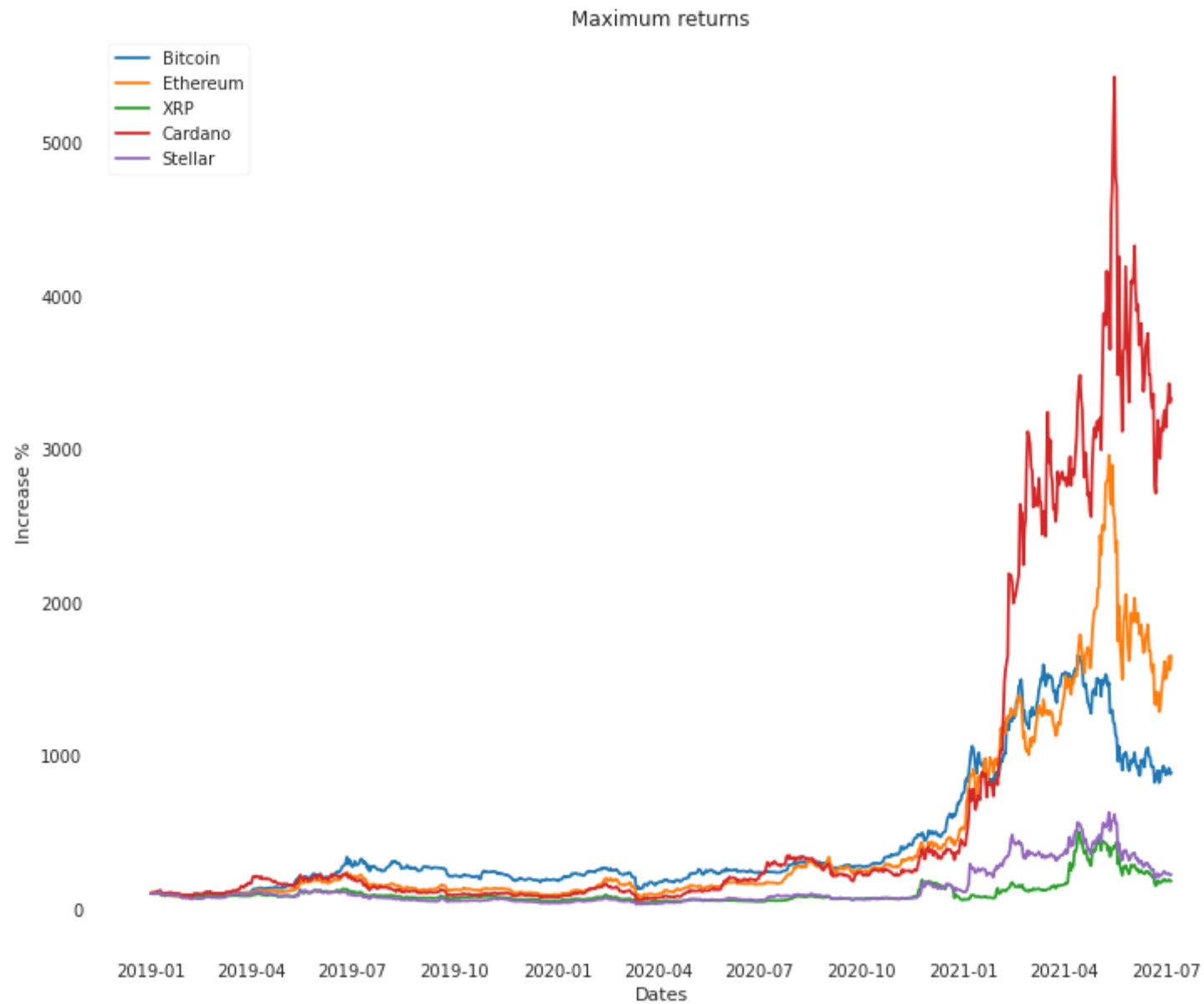
▾ Charts to Depict the Inter-Dependence among Currencies

```
#scaling the data
from sklearn.preprocessing import MinMaxScaler
scaler=MinMaxScaler()
coindf1=pd.DataFrame({'BTC':bit_coin["High"],'ETH':Ethereum_coin["High"], 'XRP':XRP_coin["High"],'ADA':Cardano_coin["High"],'XLM':Ste
coindf1.plot(figsize=(10,7)) # Data won't be presented very well as they are having different scales
plt.show()
df1= pd.DataFrame(scaler.fit_transform(coindf1), columns=["BTC","ETH","XRP","ADA","LMX"], index=bit_coin.index) # Scaling the data
print(df1)
```

```
df1[700:].plot(figsize=(12,10))
plt.title("Graph to show the effect of spike or dip in price of a crypto on other crypto", size=20)
plt.xlabel('Date', size=15, labelpad=10)
plt.ylabel('Price (Scaled)',size=15,labelpad=10)
plt.show()
```

Graph to show the effect of spike or dip in price of a crypto on other crypto
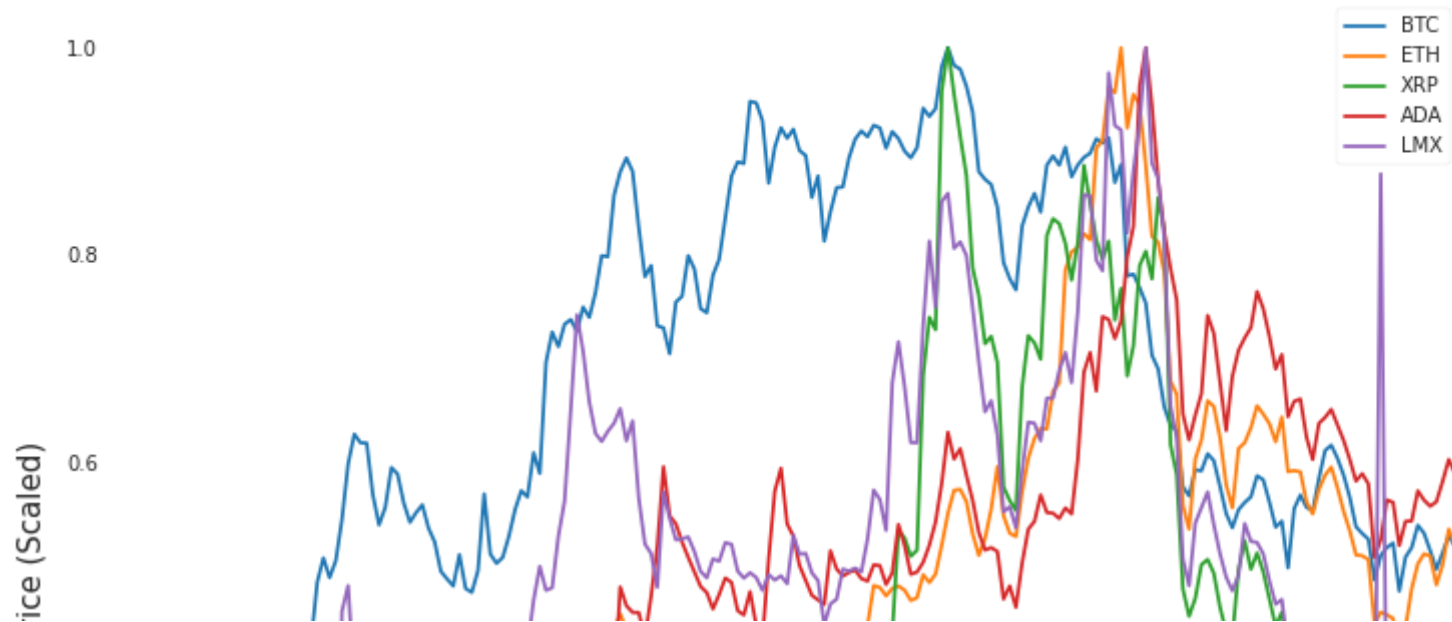

```python
df2 = pd.DataFrame(coindf1.pct_change(), index=bit_coin.index)
df2.dropna(inplace=True)
df2[700:].plot(figsize=(12,10))
plt.title("Graph to show the effect of spike in price of a crypto on other crypto (in terms of return)", size=20)
plt.xlabel('Date', size=15, labelpad=10)
plt.ylabel('Return(%)',size=15,labelpad=10)
plt.ylim(-.75,.75)
plt.show()
```

Graph to show the effect of spike in price of a crypto on other crypto (in terms of return)
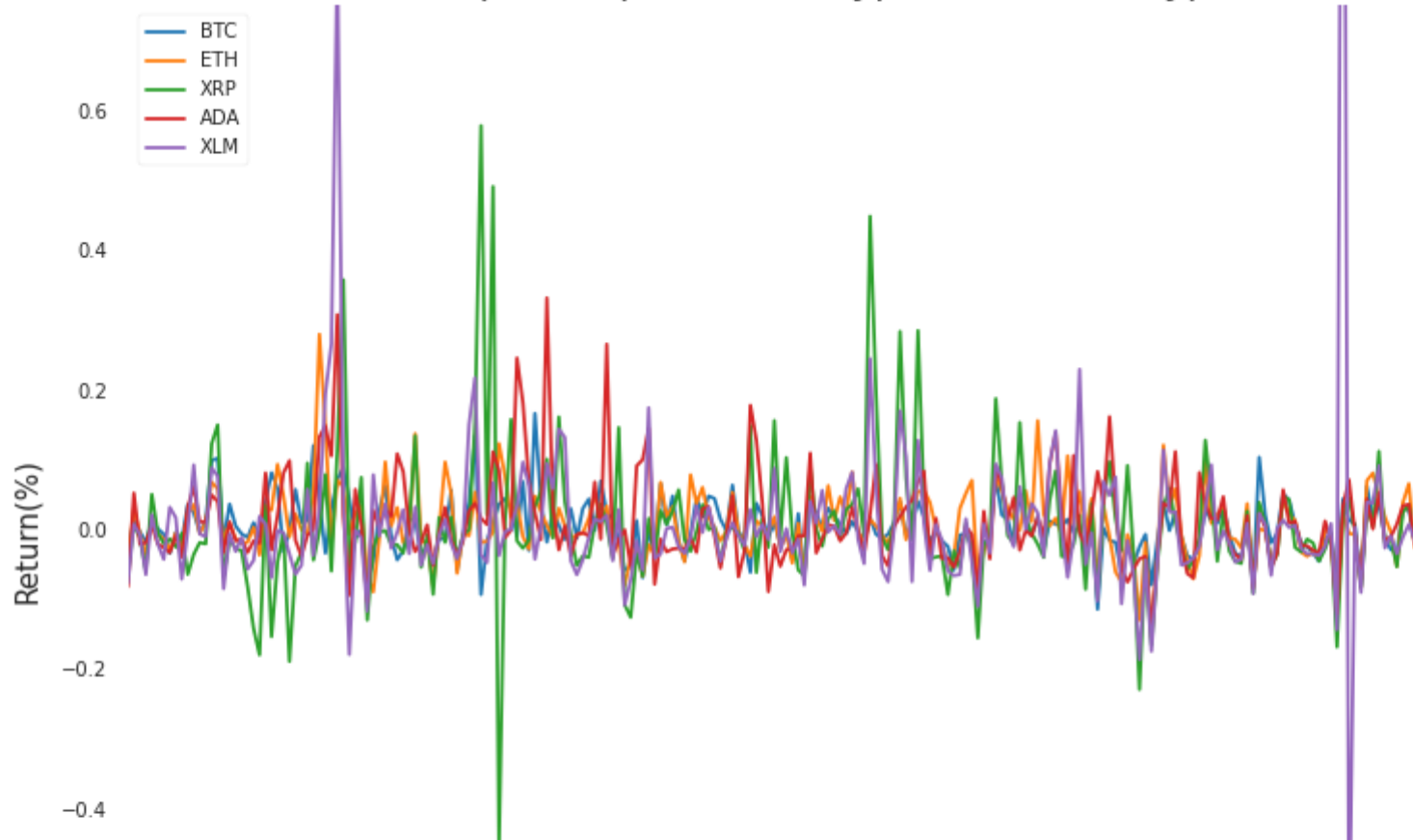
▾ Correlation Among the features of each currency

```
import seaborn as sb
fig,ax1 = plt.subplots(3,2,figsize=(20,15))
plt.suptitle("Features Correlation", size=20)
sb.heatmap(bit_coin.corr(), annot=True,ax=ax1[0][0])
ax1[0][0].set_title("Bitcoin", size=15)
sb.heatmap(Ethereum_coin.corr(), annot=True,ax=ax1[0][1])
ax1[0][1].set_title("Ethereum", size=15)
sb.heatmap(XRP_coin.corr(), annot=True,ax=ax1[1][0])
```

```python
ax1[1][0].set_title("XRP", size=15)
sb.heatmap(Cardano_coin.corr(), annot=True,ax=ax1[1][1])
ax1[1][1].set_title("Cardano", size=15)
sb.heatmap(Stellar_coin.corr(), annot=True,ax=ax1[2][0])
ax1[2][0].set_title("Stellar", size=15)
ax1[2][1].axis('off')
plt.show()
```
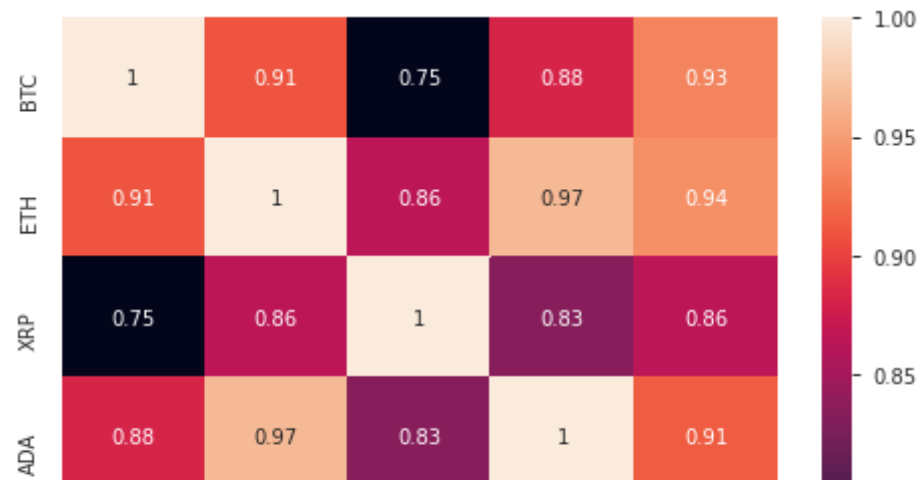
Features Correlation
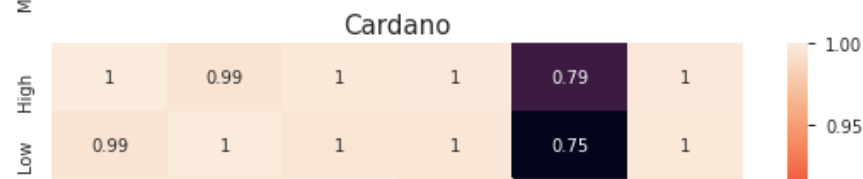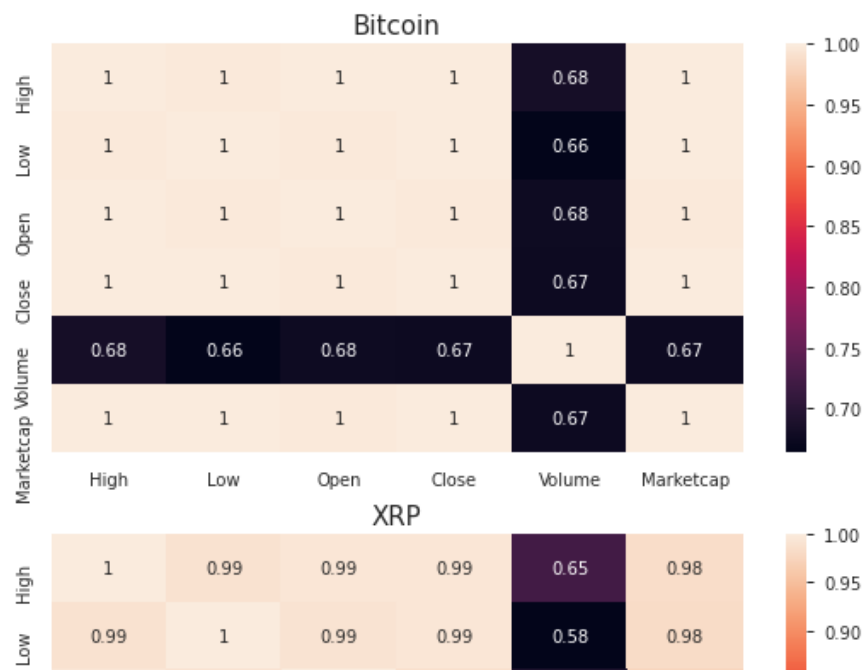
▾ Correlation Between The Cryptocurrencies


```
tc = df1.corr()
print(tc)
sb.heatmap(tc, annot=True)
plt.show()
```

```
           BTC        ETH        XRP        ADA        LMX
BTC   1.000000   0.909816   0.747702   0.882129   0.934965
ETH   0.909816   1.000000   0.864532   0.966578   0.941679
XRP   0.747702   0.864532   1.000000   0.833899   0.863999
ADA   0.882129   0.966578   0.833899   1.000000   0.913495
LMX   0.934965   0.941679   0.863999   0.913495   1.000000
```



```
sb.pairplot(df1)
plt.show()
```

▾ Volatility of Crypto

```
yeardf = pd.DataFrame({'BTC':bit coin["High"],'ETH':Ethereum coin["High"], 'XRP':XRP coin["High"],'ADA':Cardano coin["High"],'XLM':St
```

```
df2=yeardf.pct_change()# for calculating the percentage change (return)
df2.dropna(inplace=True)
fig, ax1 = plt.subplots(5, figsize=(15,10))
df2['BTC'].plot(ax =ax1[0], ylim=[-1,1], fontsize=12, color='r', legend=True)
df2['ETH'].plot(ax =ax1[1], ylim=[-1,1], fontsize=12, color='b', legend=True)
df2['XRP'].plot(ax =ax1[2], ylim=[-1,1], fontsize=12, color='g', legend=True)
df2['ADA'].plot(ax =ax1[3], ylim=[-1,1], fontsize=12, color='m', legend=True)
df2['XLM'].plot(ax =ax1[4], ylim=[-1,1], fontsize=12, color='y', legend=True)
for i in range(5):
  ax1[i].set_xlabel("Date", size=15)
  ax1[i].set_ylabel("Return(%)", size=15)
plt.show()
```

```
#showing the summary of return
df2.boxplot()
plt.title("Return Summary")
plt.show()
df2.boxplot( showfliers=False)
plt.title("Return Summary excluding outliers")
plt.show()
```
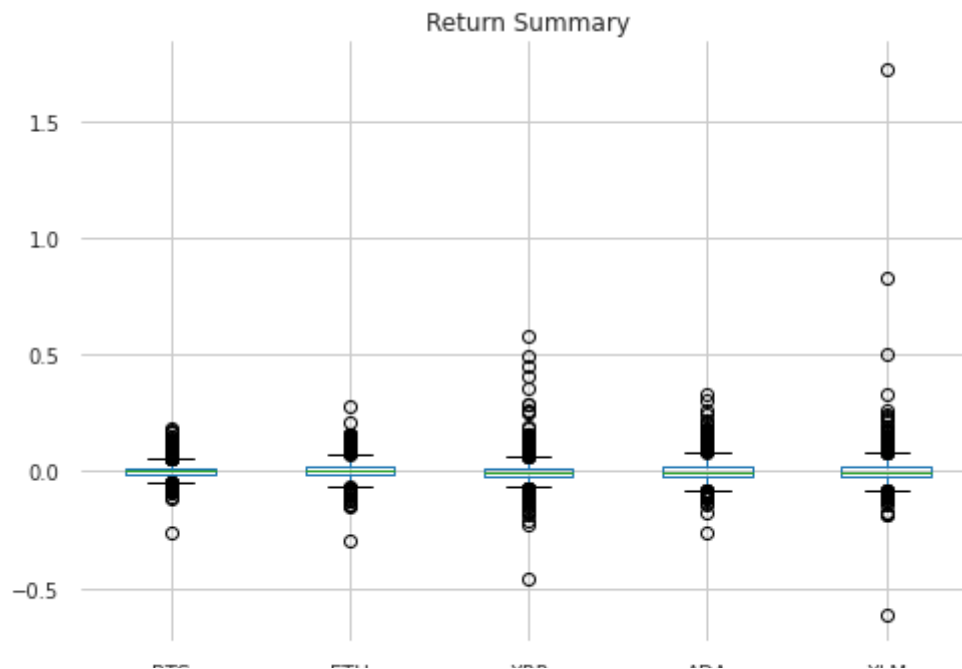
Return Distribution

```python
fig, ax = plt.subplots(3,2, figsize=(15,10))
title=[["Bitcoin","Ethereum"],["XRP", "Cardano"],["Stellar",""]]
ax[0][0].hist(df2['BTC'],bins=100,color='r', range=(-0.15,0.15))
ax[0][1].hist(df2['ETH'],bins=100, color='g',range=(-0.15,0.15))
ax[1][0].hist(df2['XRP'],bins=100,color='b',range=(-0.15,0.15))
ax[1][1].hist(df2['ADA'],bins=100, color='m',range=(-0.15,0.15))
ax[2][0].hist(df2['XLM'],bins=100,color='y',range=(-0.15,0.15))
plt.legend(loc='best')
for i in range(3):
  for j in range(2):
    ax[i][j].set_title(title[i][j], size=20)
    ax[i][j].set_xlabel('return (%)', size=15, labelpad=10)
    ax[i][j].set_ylabel('count (Days)',size=15,labelpad=10)
ax[2][1].axis('off')
plt.suptitle("Return Distribution", size=25)
```

```
      plt.show()
```

```
No handles with labels found to put in legend.
```

Return Distribution

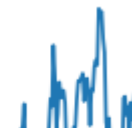## ▾ Loking at the plot of Market Capital vs Date to know which currency is leading

```
df = pd.DataFrame({'BTC':bit_coin["Marketcap"],'ETH':Ethereum_coin["Marketcap"],'XRP':XRP_coin["Marketcap"],'ADA':Cardano_coin["Marke
df.plot(figsize=(12,10), ylabel='Market Capital(10^12)')
```
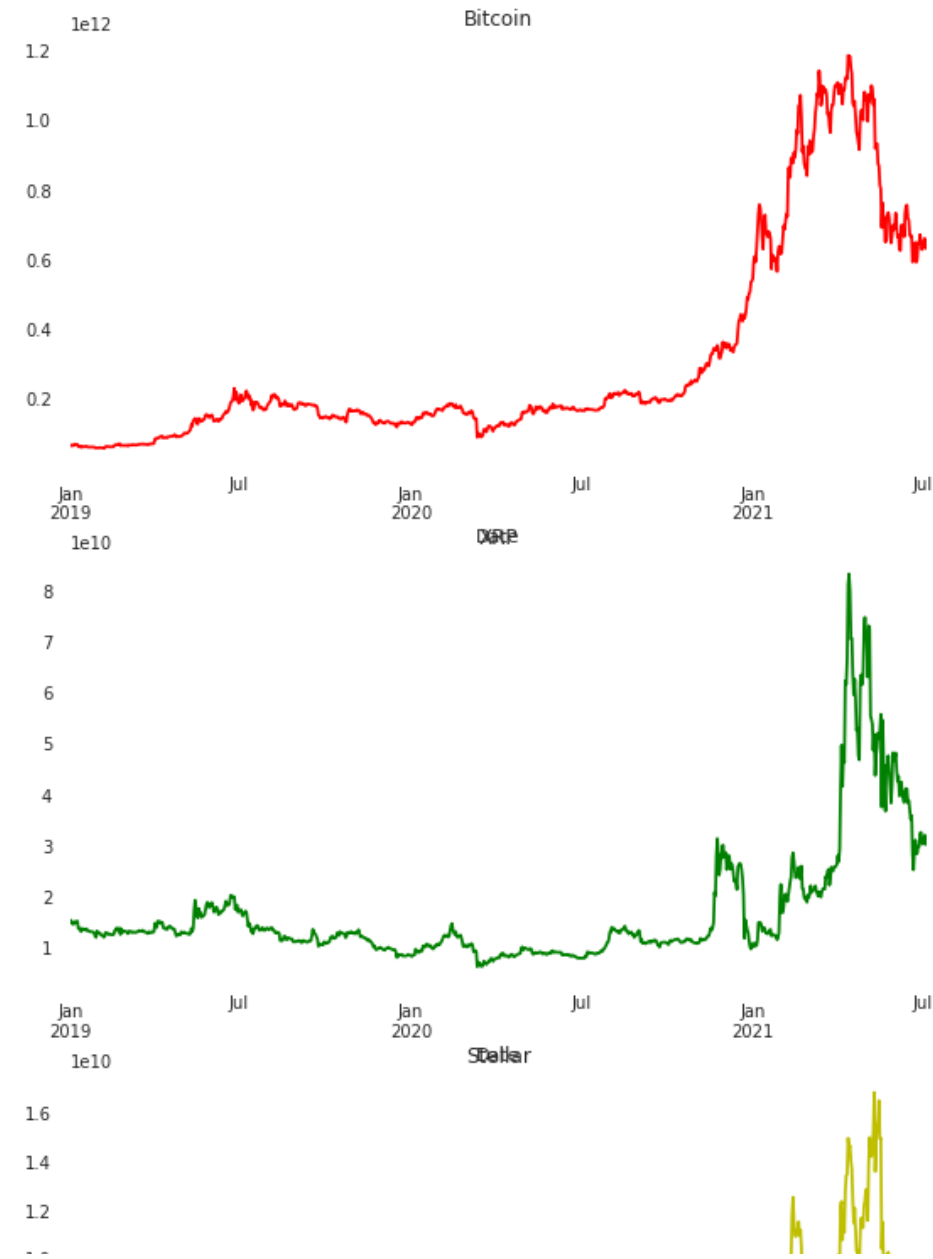
```
<matplotlib.axes._subplots.AxesSubplot at 0x7fd909287110>
```



```python
fig,ax = plt.subplots(3,2,figsize=(20,16))
df['BTC'].plot(ax=ax[0][0], color='r')
ax[0][0].set_title('Bitcoin')
df['ETH'].plot(ax=ax[0][1], color='b')
ax[0][1].set_title('Ethereum')
df['XRP'].plot(ax=ax[1][0], color='g')
ax[1][0].set_title('XRP')
df['ADA'].plot(ax=ax[1][1], color='m')
ax[1][1].set_title('Cardano')
df['XLM'].plot(ax=ax[2][0], color='y')
ax[2][0].set_title('Stellar')
ax[2][1].axis('off')
```
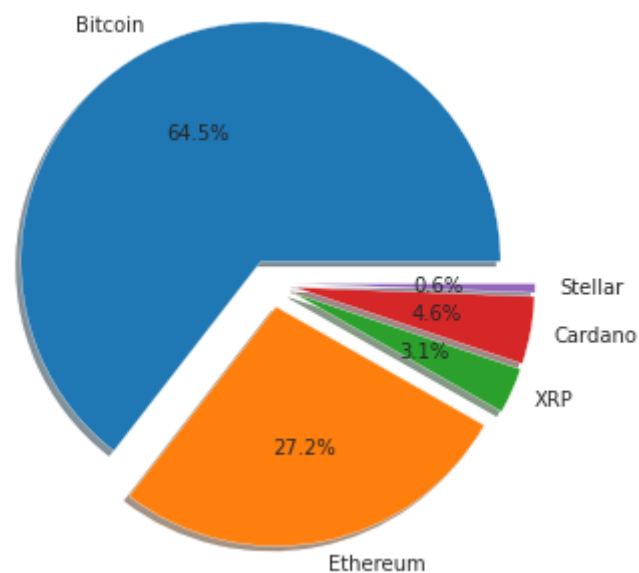
(0.0, 1.0, 0.0, 1.0)


```
plt.pie(df.iloc[-1], explode=(0.1, 0.1, 0.1, 0.1,0.1), autopct = '%1.1f%%', shadow = True,labels=['Bitcoin', 'Ethereum', 'XRP', 'Card
plt.show()
```

Cryptocurrency Volume

```
df = pd.DataFrame({'BTC':bit_coin["Volume"],'ETH':Ethereum_coin["Volume"], 'XRP':XRP_coin["Volume"],'ADA':Cardano_coin["Volume"],'XLM
df.plot(figsize=(10,10), ylabel="Number of units(1o^11)")
```
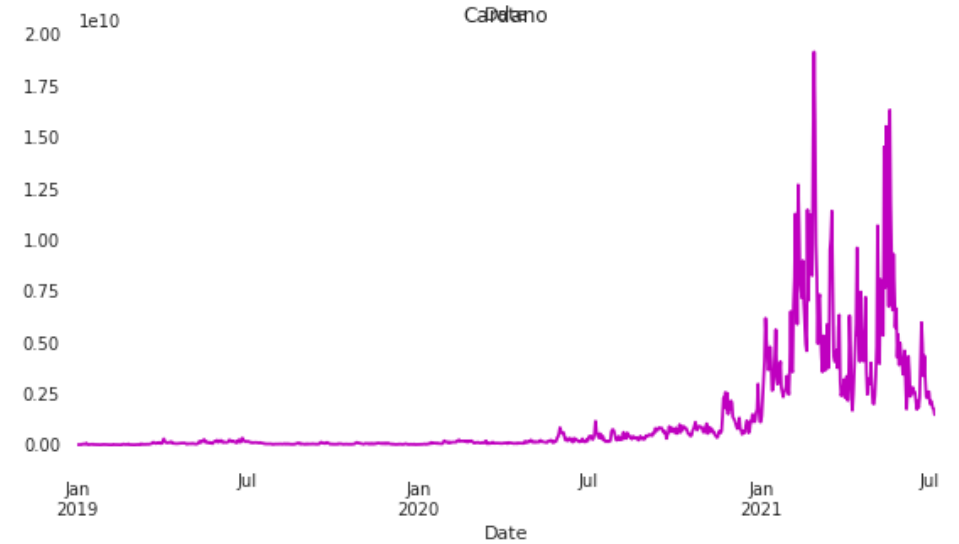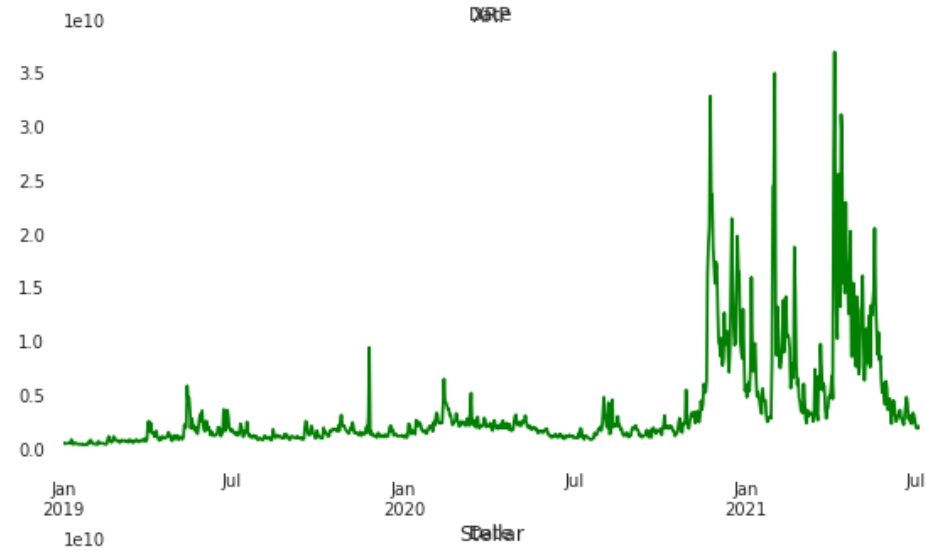
```
<matplotlib.axes._subplots.AxesSubplot at 0x7fd9095a9910>
```
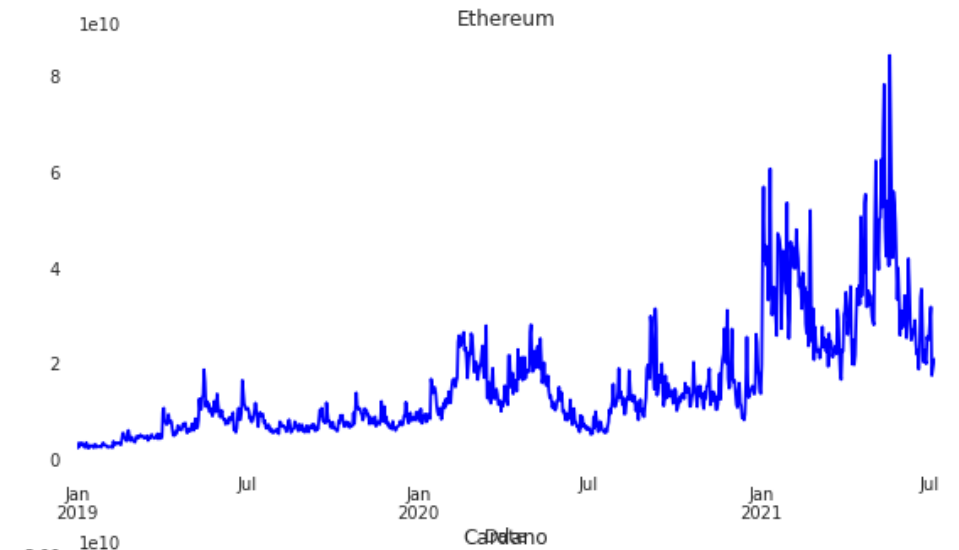


```
fig,ax = plt.subplots(3,2,figsize=(20,16))
df['BTC'].plot(ax=ax[0][0], color='r')
ax[0][0].set_title('Bitcoin')
df['ETH'].plot(ax=ax[0][1], color='b')
ax[0][1].set_title('Ethereum')
df['XRP'].plot(ax=ax[1][0], color='g')
ax[1][0].set_title('XRP')
df['ADA'].plot(ax=ax[1][1], color='m')
ax[1][1].set_title('Cardano')
df['XLM'].plot(ax=ax[2][0], color='y')
ax[2][0].set_title('Stellar')
ax[2][1].axis('off')
```
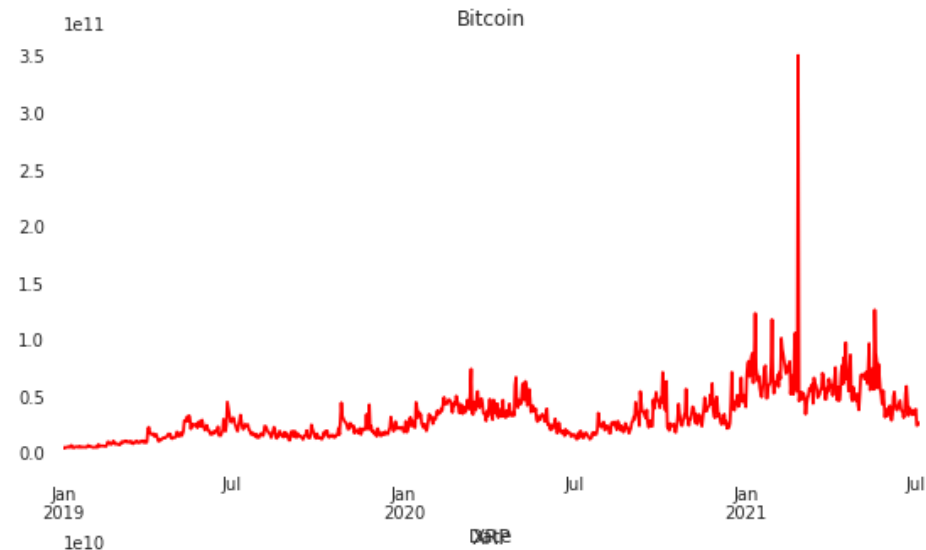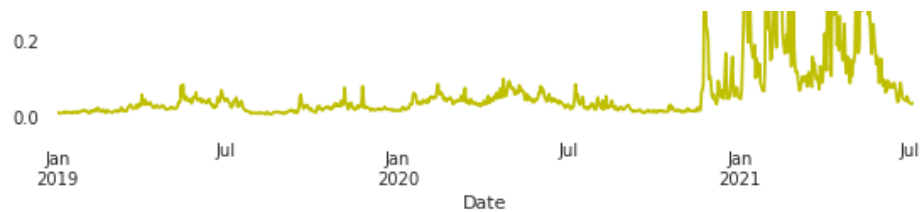
(0.0, 1.0, 0.0, 1.0)

ETS Plot

```
from statsmodels.tsa.seasonal import seasonal_decompose
df = pd.DataFrame({'BTC':bit_coin["Close"],'ETH':Ethereum_coin["Close"], 'XRP':XRP_coin["Close"],'ADA':Cardano_coin["Close"],'XLM':St
c=['r','b','g','y','m']
title = ['Bitcoin','Ethereum','XRP','Cardano','Stellar']
for i in range(5):
  print(' '*25+title[i])
  s=seasonal_decompose(df.iloc[:,i])
  s.plot()
  plt.show()
```

Bitcoin

Ethereum

XRP

Cardano

Stellar

XLM
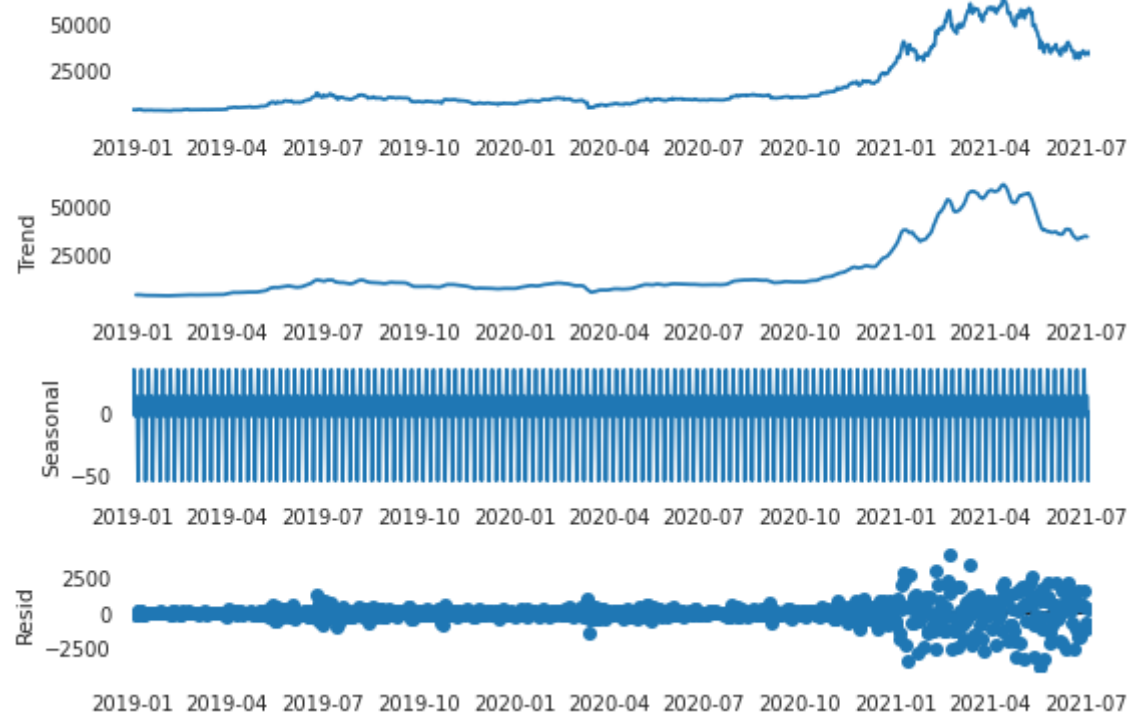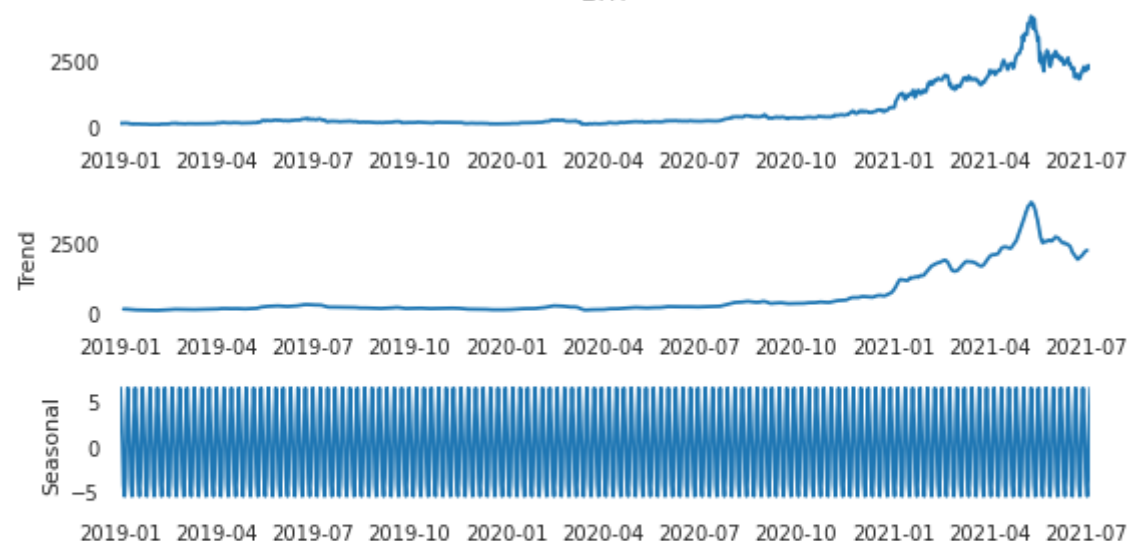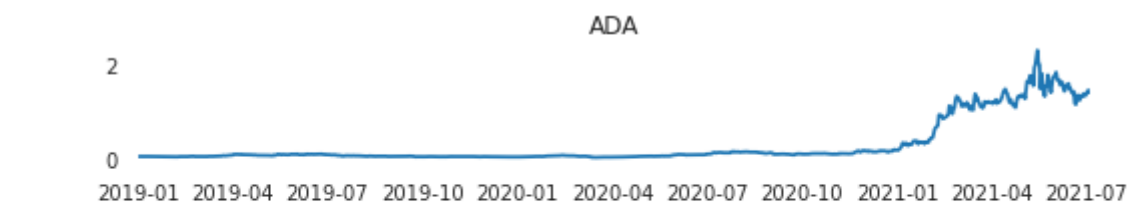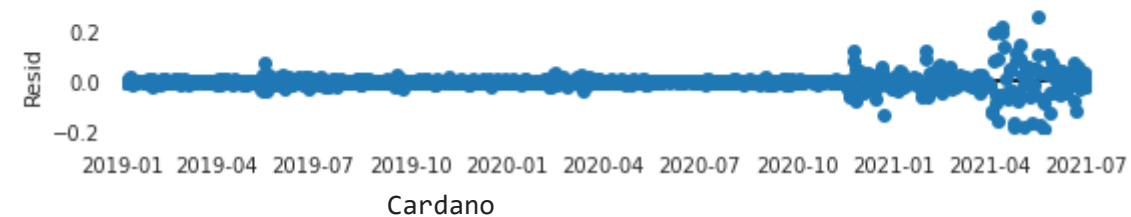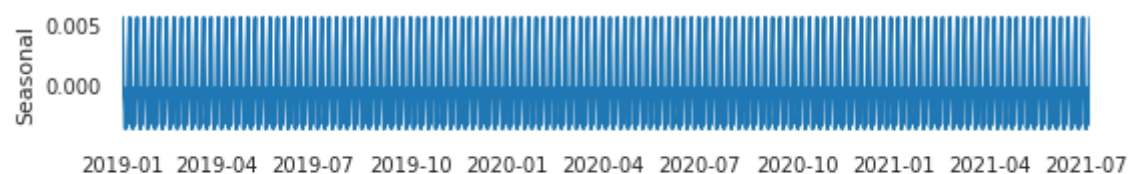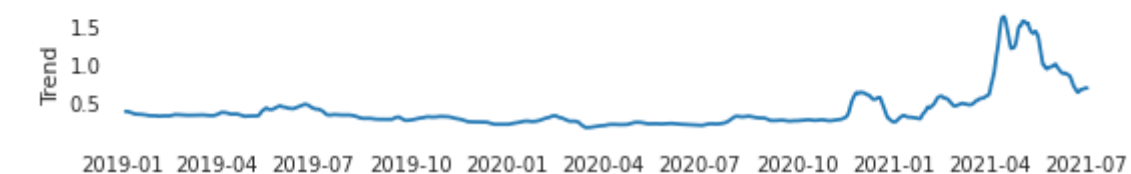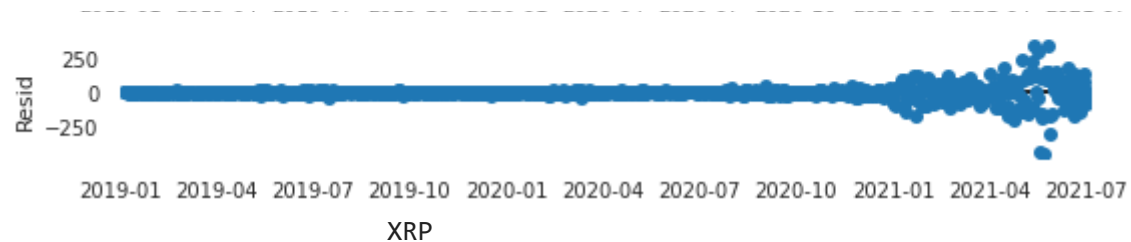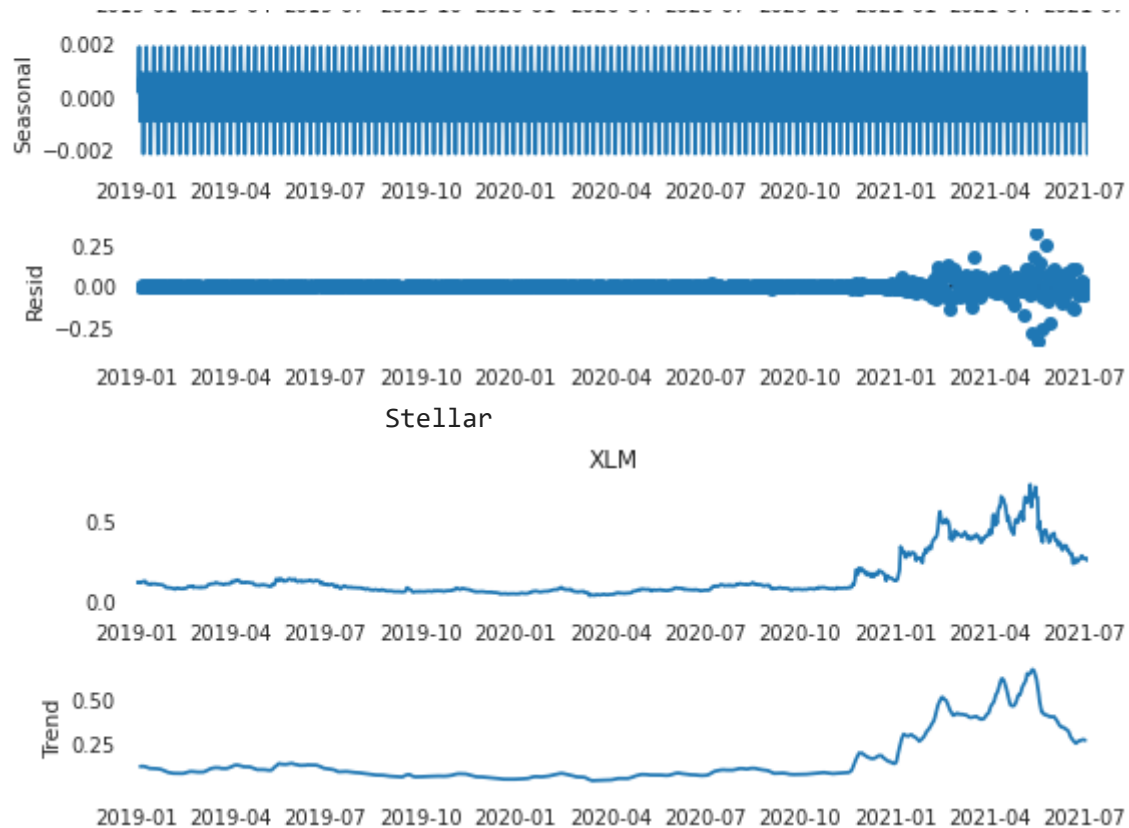
Maximum Highest value and Minimum Highest value of bit coin Accroding to closing


```
bit_max=bit_coin[bit_coin['Close']==max(bit_coin.Close)]
```



```
bit_max
```

Date	Name	Symbol	High	Low	Open	Close	Volume	Marketcap
2021-04-13	Bitcoin	BTC	63742.28334	59869.95629	59890.01779	63503.45793	6.998345e+10	1.186360e+12

```
bit_min=bit_coin[bit_coin['Close']==min(bit_coin.Close)]
```

```
bit_min
```

Date	Name	Symbol	High	Low	Open	Close	Volume	Marketcap
2019-02-07	Bitcoin	BTC	3427.94561	3394.218608	3414.929539	3399.471644	5.004963e+09	5.957808e+10

```
plt.plot(bit_max['High'],'o-',bit_min['High'],'-o')
plt.legend(loc='best')
plt.title('min value bitcoin')
plt.legend(['max High','min high'])
plt.show()
```

```
No handles with labels found to put in legend.
```

▾ Maximum Highest value and Minimum Highest value of Ethereum Accroding to closing

```
Ethereum_max=Ethereum_coin[Ethereum_coin['Close']==max(Ethereum_coin.Close)]
```

```
Ethereum_max
```

Date	Name	Symbol	High	Low	Open	Close	Volume	Marketcap
2021-05-11	Ethereum	ETH	4178.208815	3783.889474	3948.271909	4168.701049	5.267974e+10	4.828820e+11

```
Ethereum_min=Ethereum_coin[Ethereum_coin['Close']==min(Ethereum_coin.Close)]
```

```
Ethereum_min
```

Date	Name	Symbol	High	Low	Open	Close	Volume	Marketcap
2019-02-07	Ethereum	ETH	106.058875	104.409134	104.835777	104.535299	2.326765e+09	1.095165e+10

```
plt.plot(Ethereum_max['High'],'o-',Ethereum_min['High'],'-o')
plt.legend(loc='best')
plt.title('Ethereum min value')
plt.legend(['Max High','Min High'])
plt.show()
```

No handles with labels found to put in legend.

Ethereum min value

Maximum Highest value and Minimum Highest value of XRP Accroding to Closing

```
XRP_max=XRP_coin[XRP_coin['Close']==max(XRP_coin.Close)]
```

```
XRP_max
```

Date	Name	Symbol	High	Low	Open	Close	Volume	Marketcap
2021-04-14	XRP	XRP	1.964997	1.579077	1.794248	1.839236	2.902583e+10	8.350871e+10

```
XRP_min=XRP_coin[XRP_coin['Close']==min(XRP_coin.Close)]
```

```
XRP_min
```

	Name	Symbol	High	Low	Open	Close	Volume	Marketcap
Date								
2020-03-12	XRP	XRP	0.209124	0.139635	0.208205	0.139635	3.547958e+09	6.118533e+09

```
plt.plot(XRP_max['High'],'o-',XRP_min['High'],'-o')
plt.legend(loc='best')
plt.title('XRP min Value')
plt.legend(['Max High','Min High'])
plt.show()
```

    No handles with labels found to put in legend.
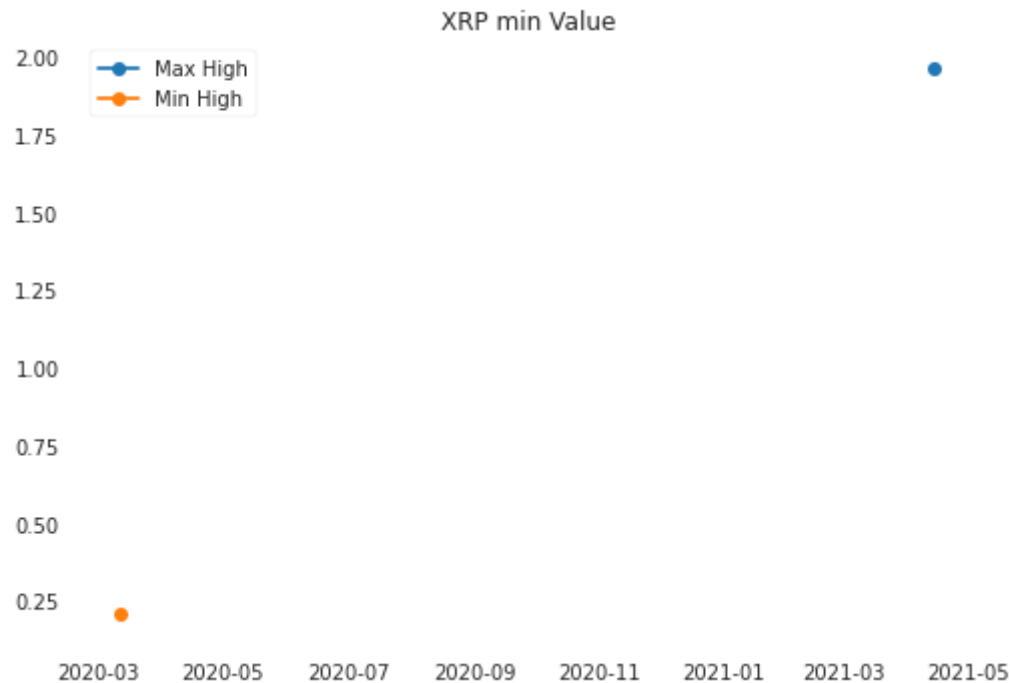
▾ Maximum Highest value and Minimum Highest value of Cardano Accroding to Closing

```
Cardano_max=Cardano_coin[Cardano_coin['Close']==max(Cardano_coin.Close)]
```

```
Cardano_max
```

Date	Name	Symbol	High	Low	Open	Close	Volume	Marketcap
2021-05-16	Cardano	ADA	2.461766	2.013285	2.171434	2.309113	1.252415e+10	7.377224e+10

```
Cardano_min=Cardano_coin[Cardano_coin['Close']==min(Cardano_coin.Close)]
```

```
Cardano_min
```

Date	Name	Symbol	High	Low	Open	Close	Volume	Marketcap
2020-03-12	Cardano	ADA	0.039701	0.023961	0.039627	0.023961	179944369.8	621232514.3

```
plt.plot(Cardano_max['High'],'o-',Cardano_min['High'],'-o')
plt.legend(loc='best')
plt.title('min pric')
plt.legend(['Max High','Min High'])
plt.show()
```

```
No handles with labels found to put in legend.
```
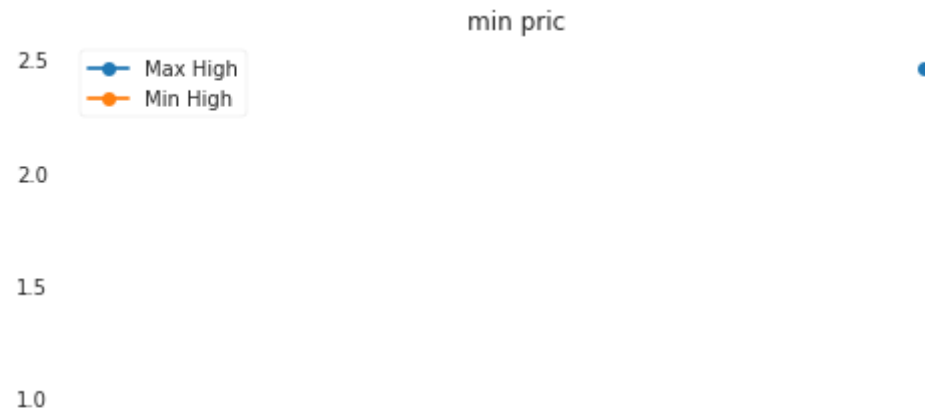

Maximum Highest value and Minimum Highest value of Stellar Accroding to Closing

```
Stellar_max=Stellar_coin[Stellar_coin['Close']==max(Stellar_coin.Close)]
```

```
Stellar_max
```

Date	Name	Symbol	High	Low	Open	Close	Volume	Marketcap
2021-05-11	Stellar	XLM	0.73951	0.620578	0.657429	0.729996	4.500603e+09	1.685469e+10

```
Stellar_min=Stellar_coin[Stellar_coin['Close']==min(Stellar_coin.Close)]
```

```
Stellar_min
```

	Name	Symbol	High	Low	Open	Close	Volume	Marketcap

```
plt.plot(Stellar_max['High'],'o-',Stellar_min['High'],'-o')
plt.legend(loc='best')
plt.title('Min high and low price')

plt.legend(['Max High','Min High'])
plt.show()
```

No handles with labels found to put in legend.
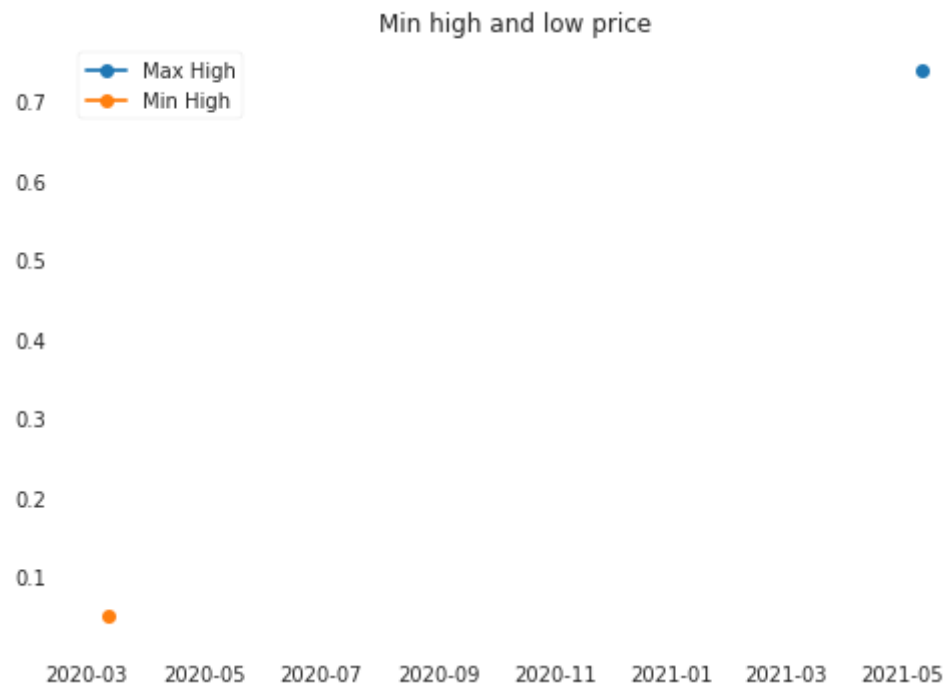
KNN Model

```
X= np.array(bit_coin['Close']).reshape(-1,1) #one columns 2d
print(X.tolist())
```

[[3843.519967], [3943.4093369999996], [3836.7413189999997], [3857.7176189999996], [3845.19446], [4076.632685], [4025.248287], [4

```
%matplotlib inline
import matplotlib.pyplot as plt

plt.plot(X)
```

[<matplotlib.lines.Line2D at 0x7fd9120f43d0>]


```
dist_sq = np.sum((X[:,np.newaxis,:] - X[np.newaxis,:,:]) ** 2, axis=-1)
dist_sq
```

```
array([[0.00000000e+00, 9.97788624e+03, 4.59500687e+01, ...,
        9.88741475e+08, 8.94158459e+08, 9.23653817e+08],
       [9.97788624e+03, 0.00000000e+00, 1.13780661e+04, ...,
        9.82469558e+08, 8.88194557e+08, 9.17592185e+08],
       [4.59500687e+01, 1.13780661e+04, 0.00000000e+00, ...,
        9.89167820e+08, 8.94563902e+08, 9.24065892e+08],
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```

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        1.10793796e+06, 2.39307825e+05, 0.00000000e+00]])
```

```python
# for each pair of points, compute differences in their coordinates
differences = X[:, np.newaxis, :] - X[np.newaxis, :, :]
```

```python
differences.shape
```

```
(918, 918, 1)
```

```python
#import sys
K = 2
nearest_partition = np.argpartition(dist_sq, K + 1, axis=1)
```

```python
#np.set_printoptions(threshold=sys.maxsize) see full data near by
```

```python
#nearest partion matrix in index shape according
plt.plot(nearest_partition)
```

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