Lets take a raun ot our model and see how it performs. We will set a indicator for the daily returns for SPY between 7.2% and 11%, which is rear but does happen in the mist of economic crisis. This is a perfect time to look that the 08 crash as well as the current COViD-19 epidemic

In [ ]:

Libraries

In [2]:
```
import pandas as pd
import numpy as np
from pandas_datareader import data as web
import matplotlib.pyplot as plt
import seaborn as sns
```

import data

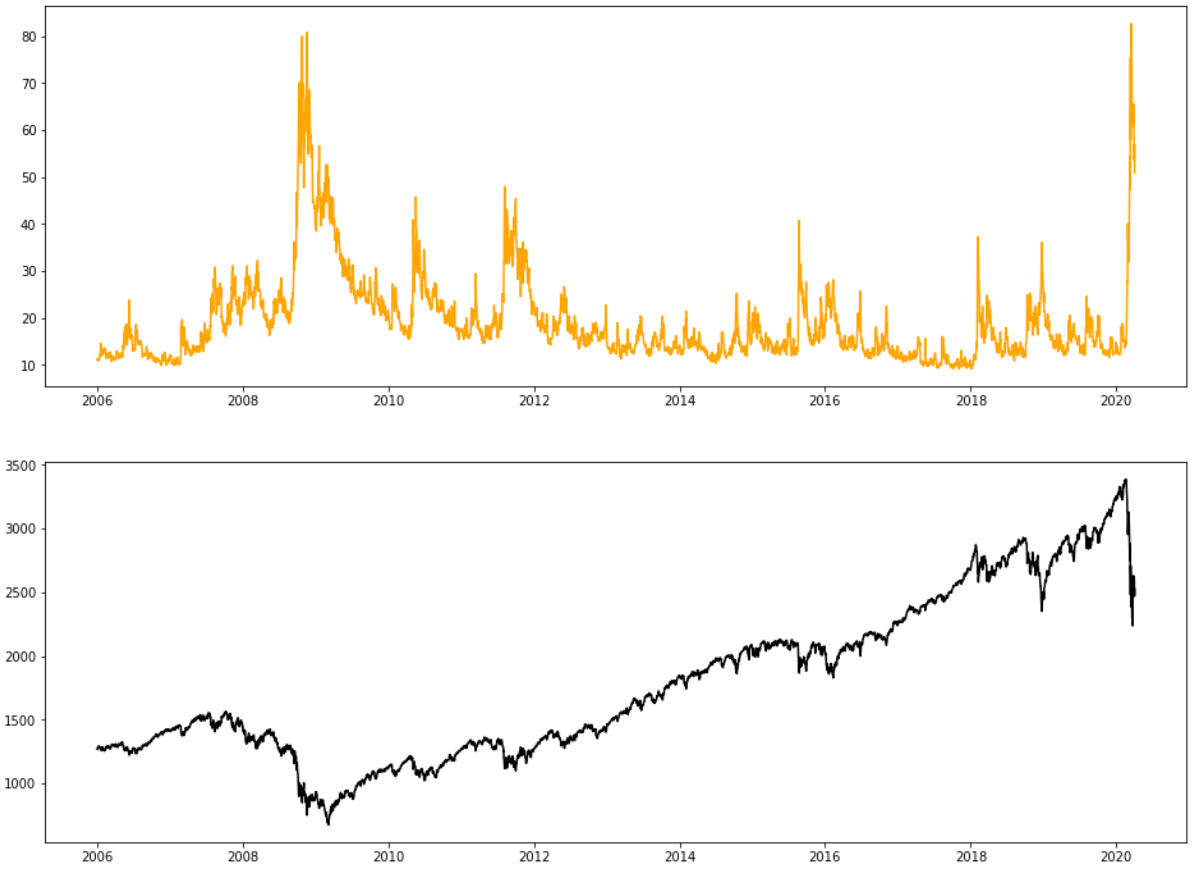
We will be looking at the adjustable close for both the S&P and VIX

In [4]:
```
tickers = ["^VIX", "^GSPC"]
data = pd.DataFrame()
for t in tickers:
    data[t] = web.DataReader(t, data_source="yahoo", start = "2006-1-1")
["Adj Close"]
```

plotting visual movement for both VIX and SPY .As expected the plots show an inverse correlation

In [15]:
```
fig, axes = plt.subplots(2,1,figsize = (16,12))
axes[0].plot(data["^VIX"], c = "orange")
axes[1].plot(data["^GSPC"], c = "black")
```

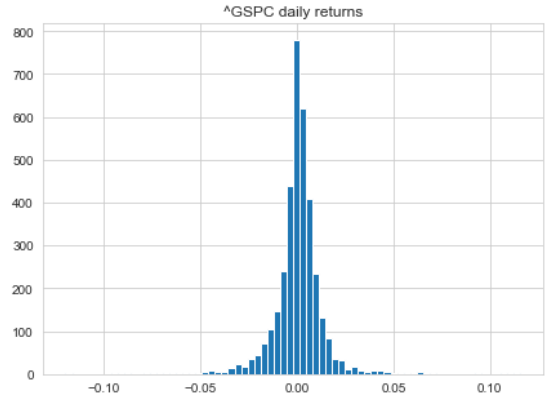
Out[15]:
```
[<matplotlib.lines.Line2D at 0x1286160b8>]
```

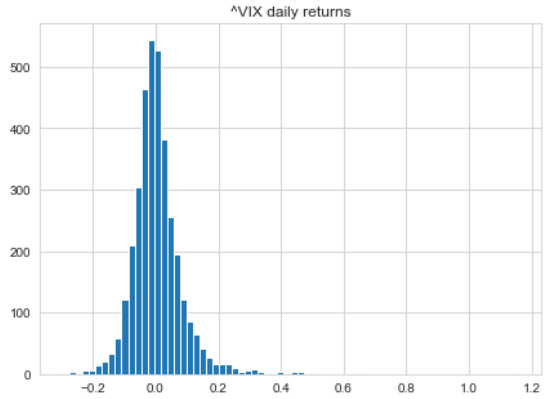


Tracking thre daily returns for each security. We will look at the volitility of the daily returns on a histogram below. what we see is most of the daily returns of SPY between -0.05, and 0.05, where VIX is between -0.2, and .2 with a few outlyers

In [16]:
```
for t in tickers:
    data[f"{t} daily returns"] = data[f"{t}"].pct_change()
```

In [23]:
```
sns.set_style("whitegrid")
data[["^VIX daily returns","^GSPC daily returns"]].hist(figsize = (16,5
), bins = 70);
```





The reason for this analysis is the test the theory that as the daily returns of SPY is between 7% and 11% we can see a sharp increase in VIX. We will test this below but first we will creat a hypithetical portfolio containing both SPY and VIX . We will weigh the portfolio 40% SPY and 60% VIX with a position of 150K in the portfolio. Our other assumption is that we are getting in the market on the first date of 1-3-2006

Normal Returns

In [25]:
```
for s in tickers:
    data[f"{s} normal returns"] = data[s]/data[s].iloc[0]
```

In [27]:
```
data.head()
```

Out[27]:

Date	^VIX	^GSPC	^VIX daily returns	^GSPC daily returns	^VIX normal returns	^GSPC normal returns
2006-01-03	11.14	1268.800049	NaN	NaN	1.000000	1.000000
2006-01-04	11.37	1273.459961	0.020646	0.003673	1.020646	1.003673
2006-01-05	11.31	1273.479980	-0.005277	0.000016	1.015260	1.003688
2006-01-06	11.00	1285.449951	-0.027409	0.009399	0.987433	1.013123
2006-01-09	11.13	1290.150024	0.011818	0.003656	0.999102	1.016827

Allocations

In [28]:
```
weights = [0.4, 0.6]
for s,w in zip(tickers, weights):
    data[f"{s} allocation"] = data[f"{s} normal returns"] * w
```

In [30]:
```
data.head()
```

Out[30]:

Date	^VIX	^GSPC	^VIX daily returns	^GSPC daily returns	^VIX normal returns	^GSPC normal returns	^VIX allocation	^GSPC allocation
2006-01-03	11.14	1268.800049	NaN	NaN	1.000000	1.000000	0.400000	0.600000
2006-01-04	11.37	1273.459961	0.020646	0.003673	1.020646	1.003673	0.408259	0.602204
2006-01-05	11.31	1273.479980	-0.005277	0.000016	1.015260	1.003688	0.406104	0.602213
2006-01-06	11.00	1285.449951	-0.027409	0.009399	0.987433	1.013123	0.394973	0.607874
2006-01-09	11.13	1290.150024	0.011818	0.003656	0.999102	1.016827	0.399641	0.610096

Position -> 150K

In [31]:
```
for x in tickers:
    data[f"{x} position"] = data[f"{x} allocation"] * 150000
```

In [33]:
```
data.head()
```

Out[33]:

Date	^VIX	^GSPC	^VIX daily returns	^GSPC daily returns	^VIX normal returns	^GSPC normal returns	^VIX allocation	^GSPC allocation	^VIX p
2006-01-03	11.14	1268.800049	NaN	NaN	1.000000	1.000000	0.400000	0.600000	60000.(
2006-01-04	11.37	1273.459961	0.020646	0.003673	1.020646	1.003673	0.408259	0.602204	61238.7
2006-01-05	11.31	1273.479980	-0.005277	0.000016	1.015260	1.003688	0.406104	0.602213	60915.(
2006-01-06	11.00	1285.449951	-0.027409	0.009399	0.987433	1.013123	0.394973	0.607874	59245.9
2006-01-09	11.13	1290.150024	0.011818	0.003656	0.999102	1.016827	0.399641	0.610096	59946.1

Lets take a raun ot our model and see how it performs. We will set a indicator for the daily returns for SPY and 7.2%, which is rear but does happen in the mist of economic crisis. THis is a perfect time to look that the 08 crash as well as the curren COViD-19 epidemic

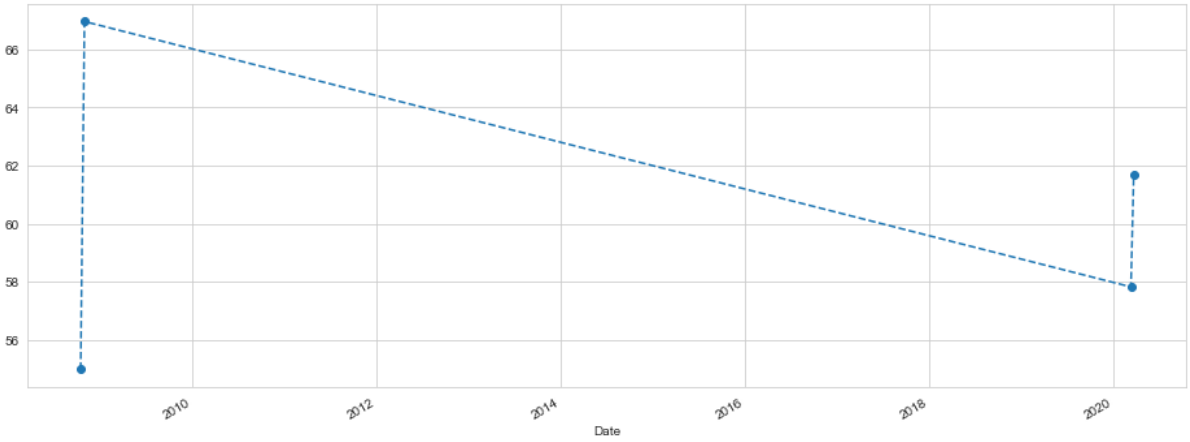
We can see there are 4 dates that this occurred and we just missed 2. in 2020

In [50]:
```
data[data["^GSPC daily returns"] * 100 > 7.2]["^VIX"]
```

Out[50]:
```
Date
2008-10-13    54.990002
2008-10-28    66.959999
2020-03-13    57.830002
2020-03-24    61.669998
Name: ^VIX, dtype: float64
```

In [57]:
```
data[data["^GSPC daily returns"] * 100 > 7.2]["^VIX"].plot(figsize = (16
,6), marker = "o", ls = "--")
```

Out[57]: <matplotlib.axes._subplots.AxesSubplot at 0x133390d30>

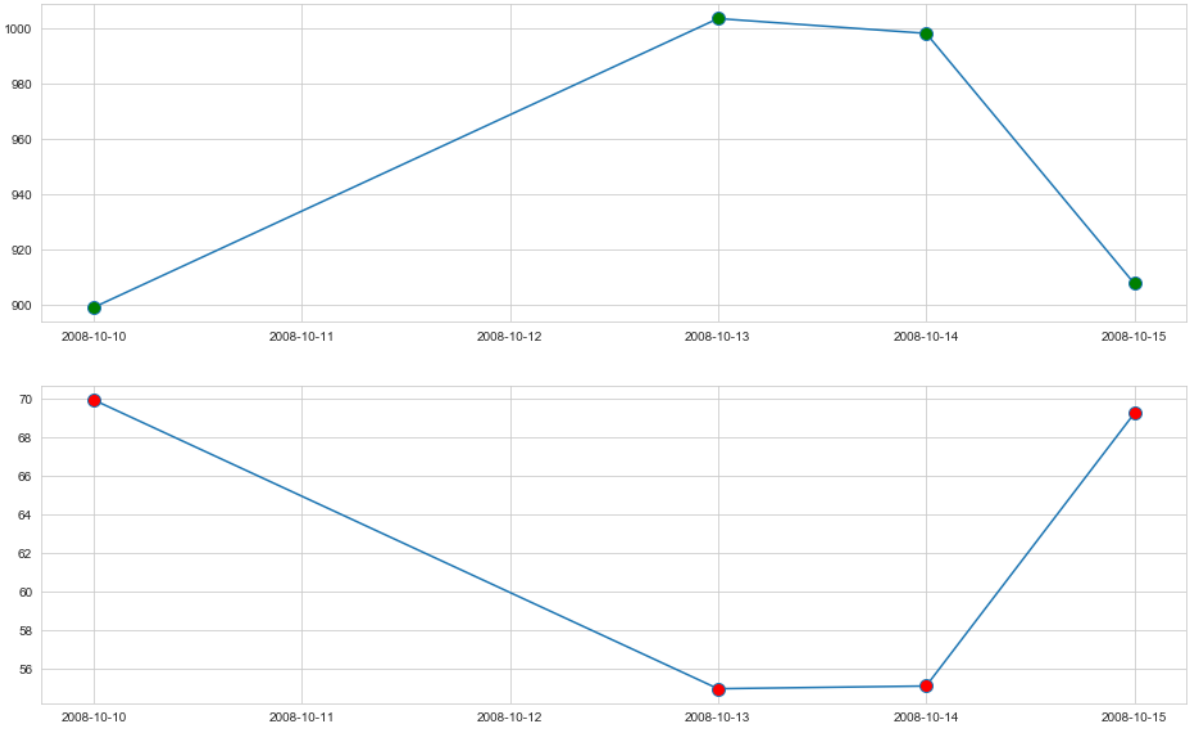


lets take a look at each date where SpY was 7.2 or above. To get a better look at this we will take a few days before and after the set date

2008-10-13

In [78]:
```
fig, axes = plt.subplots(2,1, figsize = (16,10))
axes[0].plot(data.loc["2008-10-10":"2008-10-15"]["^GSPC"], marker = "o",
mfc = "g", ms = 10)
axes[1].plot(data.loc["2008-10-10":"2008-10-15"]["^VIX"], marker = "o",
mfc = "r", ms = 10)
```

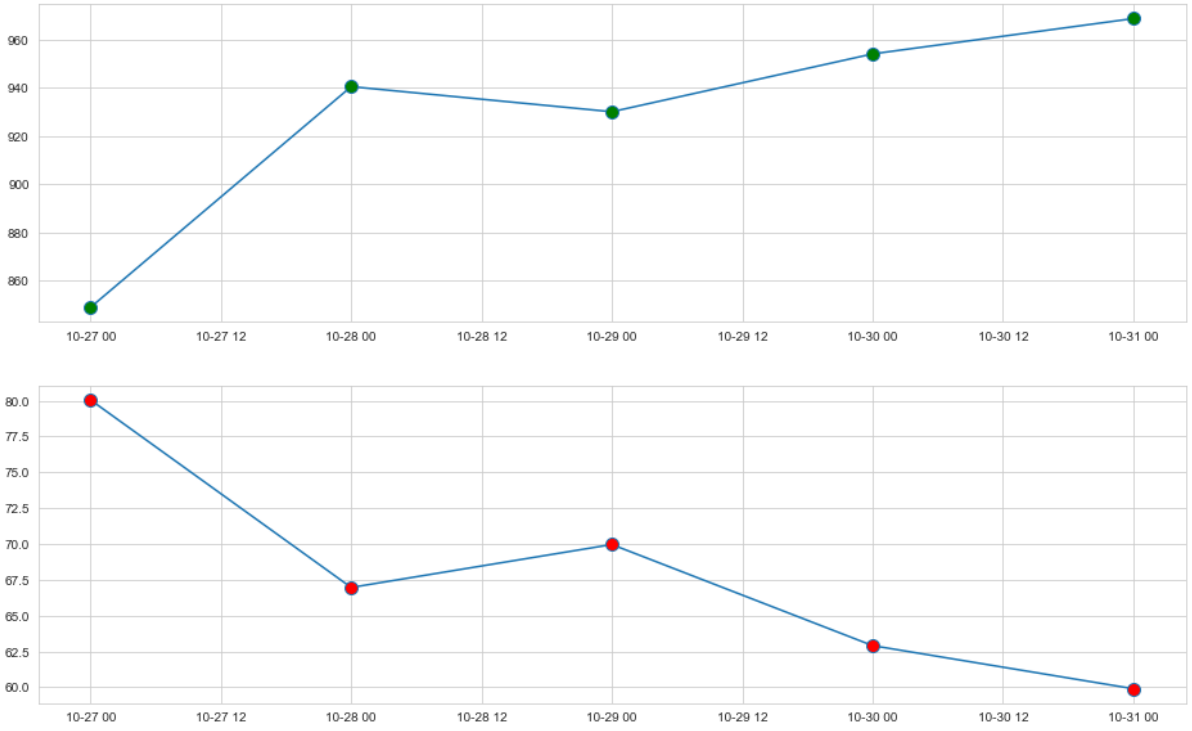
Out[78]:
```
[<matplotlib.lines.Line2D at 0x135f66b70>]
```



2008-10-28

In [83]:
```
fig, axes = plt.subplots(2,1, figsize = (16,10));
axes[0].plot(data.loc["2008-10-25":"2008-10-31"]["^GSPC"], marker = "o",
mfc = "g", ms = 10)
axes[1].plot(data.loc["2008-10-25":"2008-10-31"]["^VIX"], marker = "o",
mfc = "r", ms = 10)
```

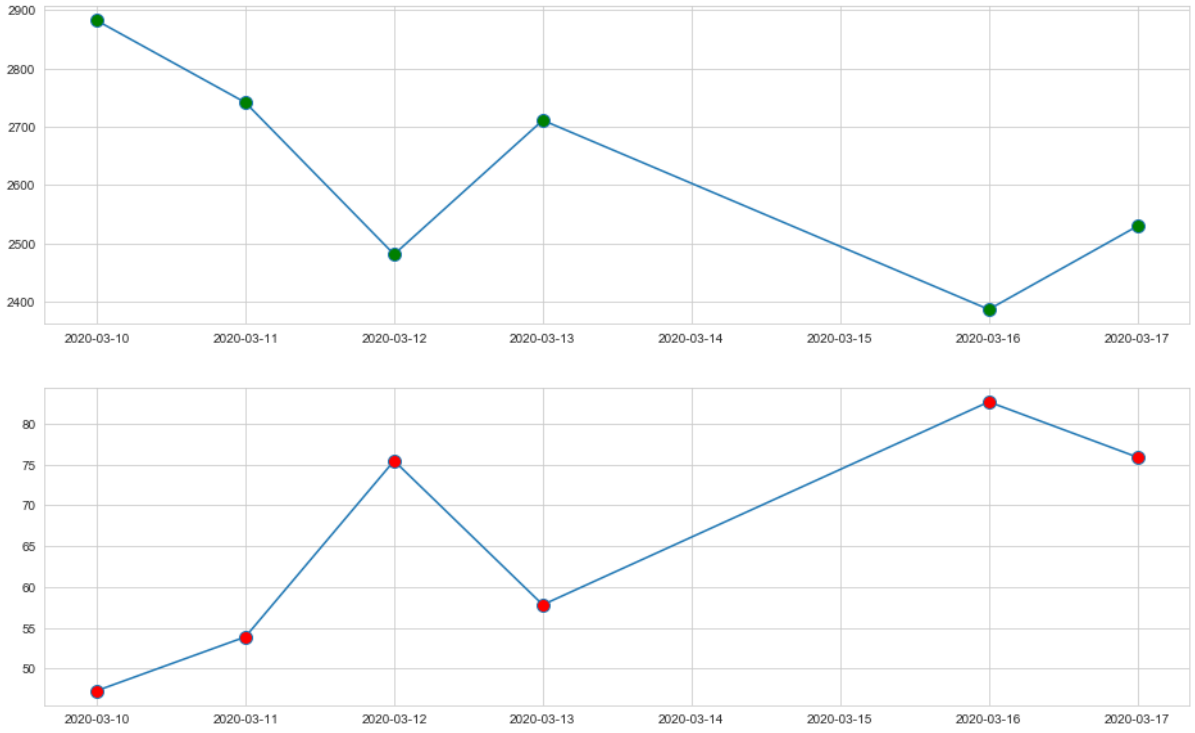
Out[83]:
```
[<matplotlib.lines.Line2D at 0x136762d30>]
```



2020-03-13

In [86]:
```
fig, axes = plt.subplots(2,1, figsize = (16,10));
axes[0].plot(data.loc["2020-03-10":"2020-03-17"]["^GSPC"], marker = "o",
mfc = "g", ms = 10)
axes[1].plot(data.loc["2020-03-10":"2020-03-17"]["^VIX"], marker = "o",
mfc = "r", ms = 10)
```

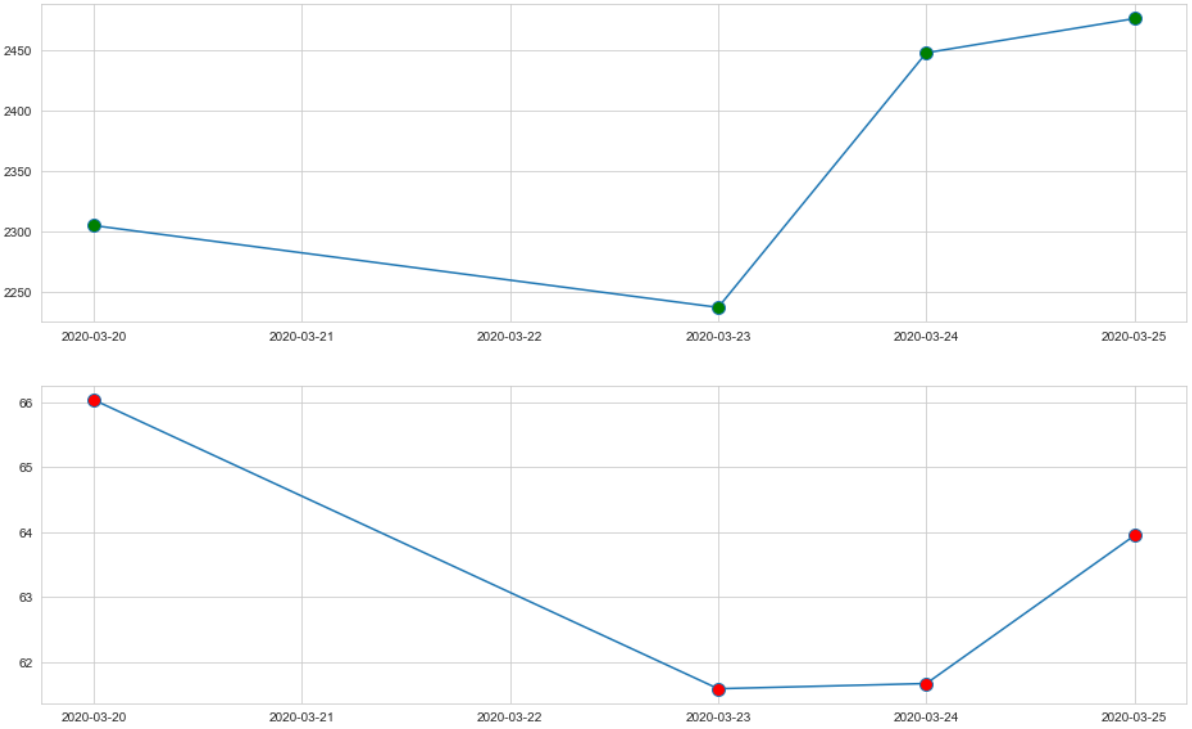
Out[86]:
```
[<matplotlib.lines.Line2D at 0x136da27f0>]
```



2020-03-24

In [89]:
```
fig, axes = plt.subplots(2,1, figsize = (16,10));
axes[0].plot(data.loc["2020-03-20":"2020-03-25"]["^GSPC"], marker = "o",
mfc = "g", ms = 10)
axes[1].plot(data.loc["2020-03-20":"2020-03-25"]["^VIX"], marker = "o",
mfc = "r", ms = 10)
```

Out[89]:
```
[<matplotlib.lines.Line2D at 0x1375d5d30>]
```



in summary ad SPY daily returns is in the range of 7.2 and 11 it is almost certain that VIX will have a significant gain. We cna see this clearly in 2020 on the days of 3/13 and 3 /24

In [ ]: