MA653-COMPUTATIONAL FINANCIAL MODELLING

LAB ASSIGNMENT-2 REPORT

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Q_1.

Stock Chosen:-

1.ONGC (Oil and Natural Gas Sector)

2.TATA Motors (Automotive Sector)

3.Infosys (IT Sector)

All these 3 Stock are from the different sectors for analyzing how each sector is performing over the year period of 5 years i.e., (25-May-2017 To 25-May-2012). Below are data representations of all three stocks.

1.TATA Motors.

```
In [73]: TATA
```

Out[73]:

Date	Price	Open	High	Low	Volume
25-May-22	417.00	428.45	429.00	413.45	13540006
24-May-22	425.75	423.90	427.50	416.00	14525617
23-May-22	421.45	421.65	431.15	419.55	16345308
20-May-22	418.00	410.00	421.40	410.00	23504236
19-May-22	398.65	400.00	406.80	396.20	17706724
...	...	...	...	...	...
31-May-17	476.15	482.30	483.00	474.80	5393856
30-May-17	481.30	482.70	487.00	480.00	3101380
29-May-17	481.50	482.50	485.00	471.80	4253044
26-May-17	481.10	474.10	488.25	473.50	7692869
25-May-17	476.00	470.00	479.00	464.70	15108872

1239 rows × 5 columns

2.ONGC

```
In [64]: ONGC
```

Out[64]:

Date	Price	Open	High	Low	Volume
25-May-22	152.60	152.90	153.25	147.60	19366472
24-May-22	150.65	157.40	157.75	150.15	19141394
23-May-22	155.10	161.75	164.20	154.65	18029557
20-May-22	161.90	161.65	163.80	160.10	7235654
19-May-22	160.00	158.55	162.05	157.80	8932407
...	...	...	...	...	...
31-May-17	177.00	178.55	178.55	175.25	10715866
30-May-17	178.65	175.10	179.35	173.10	6532975
29-May-17	175.75	174.50	177.30	171.20	6629243
26-May-17	175.75	174.70	177.50	174.30	6460263
25-May-17	174.15	174.80	175.65	173.50	8230189

1239 rows × 5 columns

3.Infosys

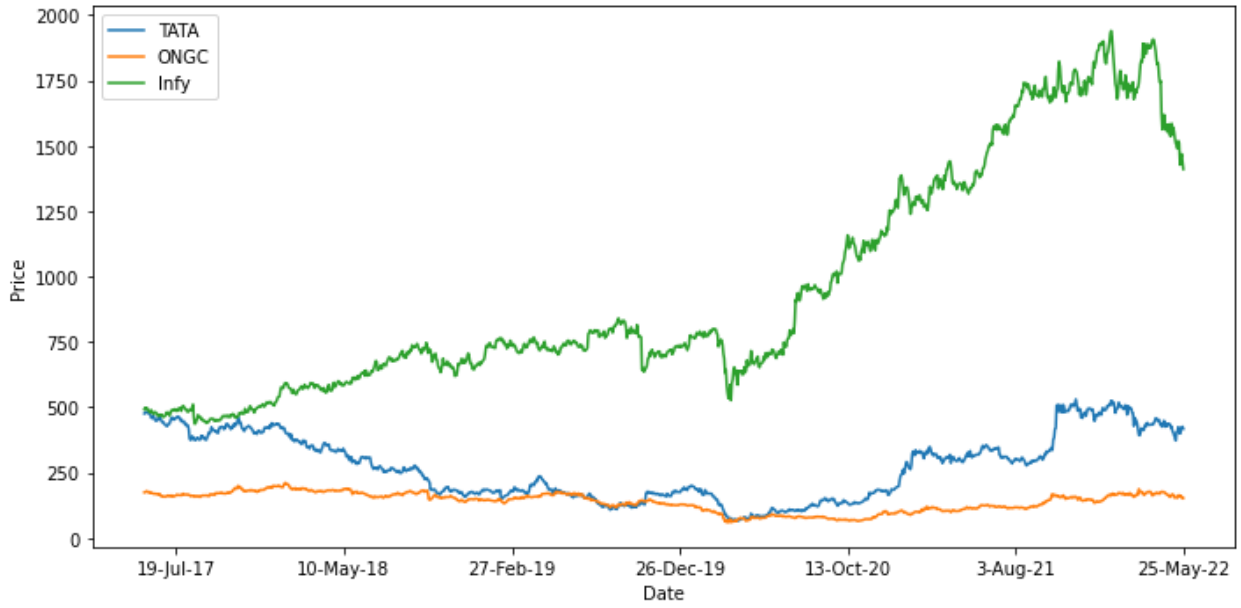
```
In [74]: Infy
```

Out[74]:

Date	Price	Open	High	Low	Volume
25-May-22	1410.45	1435.00	1442.50	1399.25	9630092
24-May-22	1441.00	1468.60	1469.55	1435.25	5693167
23-May-22	1468.40	1455.10	1488.00	1450.05	5887569
20-May-22	1455.15	1453.00	1466.75	1446.70	10488908
19-May-22	1427.15	1481.00	1484.70	1417.65	16561140
...	...	...	...	...	...
31-May-17	488.53	496.78	496.78	487.43	3881950
30-May-17	498.10	491.00	500.00	489.33	1858455
29-May-17	492.58	495.45	498.35	487.85	3154217
26-May-17	497.85	493.50	500.00	490.30	2494002
25-May-17	491.65	480.50	493.30	480.50	5219257

1239 rows × 5 columns

- **Price vs. Year Graph of All three Stocks**.



- **Plotting Daily Return stock of each Stock**

Given dataset doesn't have the Daily Return so we have to Calculate the Daily Return of each Stock by using the following Formula.

$$r_i = \frac{p_t - p_{t-1}}{p_{t-1}}$$

p_t= Today`s Price of Stock.

p_{t-1}= Yesterday`s Price of Stock.

r_i = Return on day.

1. Daily Return Calculated Data Set Representation.
   a. TATA Motors

```
In [81]: TATA
```

Out[81]:

Date	Price	Open	High	Low	Volume	Daily_Return
25-May-22	417.00	428.45	429.00	413.45	13540006	-0.020552
24-May-22	425.75	423.90	427.50	416.00	14525617	0.010203
23-May-22	421.45	421.65	431.15	419.55	16345308	0.008254
20-May-22	418.00	410.00	421.40	410.00	23504236	0.048539
19-May-22	398.65	400.00	406.80	396.20	17706724	-0.039745
...	...	...	...	...	...	...
1-Jun-17	476.65	476.95	479.70	473.55	3001232	0.001050
31-May-17	476.15	482.30	483.00	474.80	5393856	-0.010700
30-May-17	481.30	482.70	487.00	480.00	3101380	-0.000415
29-May-17	481.50	482.50	485.00	471.80	4253044	0.000831
26-May-17	481.10	474.10	488.25	473.50	7692869	0.010714

1238 rows × 6 columns

   b. Infosys

```
In [83]: Infy
```

Out[83]:

Date	Price	Open	High	Low	Volume	Daily_Return
25-May-22	1410.45	1435.00	1442.50	1399.25	9630092	-0.021201
24-May-22	1441.00	1468.60	1469.55	1435.25	5693167	-0.018660
23-May-22	1468.40	1455.10	1488.00	1450.05	5887569	0.009106
20-May-22	1455.15	1453.00	1466.75	1446.70	10488908	0.019620
19-May-22	1427.15	1481.00	1484.70	1417.65	16561140	-0.054367
...	...	...	...	...	...	...
1-Jun-17	485.70	484.65	489.85	479.28	2754303	-0.005793
31-May-17	488.53	496.78	496.78	487.43	3881950	-0.019213
30-May-17	498.10	491.00	500.00	489.33	1858455	0.011206
29-May-17	492.58	495.45	498.35	487.85	3154217	-0.010586
26-May-17	497.85	493.50	500.00	490.30	2494002	0.012611

1238 rows × 6 columns

c. ONGC

```
In [82]: ONGC
```

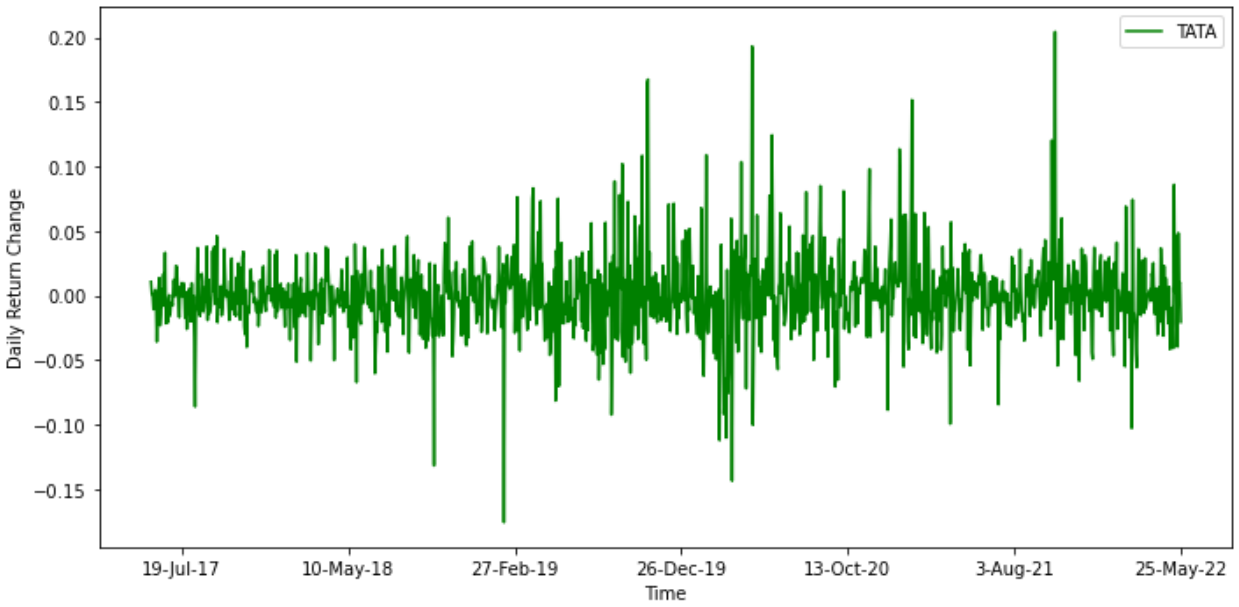
Out[82]:

Date	Price	Open	High	Low	Volume	Daily_Return
25-May-22	152.60	152.90	153.25	147.60	19366472	0.012944
24-May-22	150.65	157.40	157.75	150.15	19141394	-0.028691
23-May-22	155.10	161.75	164.20	154.65	18029557	-0.042001
20-May-22	161.90	161.65	163.80	160.10	7235654	0.011875
19-May-22	160.00	158.55	162.05	157.80	8932407	-0.019608
...	...	...	...	...	...	...
1-Jun-17	174.00	176.90	176.90	172.60	8676208	-0.016949
31-May-17	177.00	178.55	178.55	175.25	10715866	-0.009236
30-May-17	178.65	175.10	179.35	173.10	6532975	0.016501
29-May-17	175.75	174.50	177.30	171.20	6629243	0.000000
26-May-17	175.75	174.70	177.50	174.30	6460263	0.009187

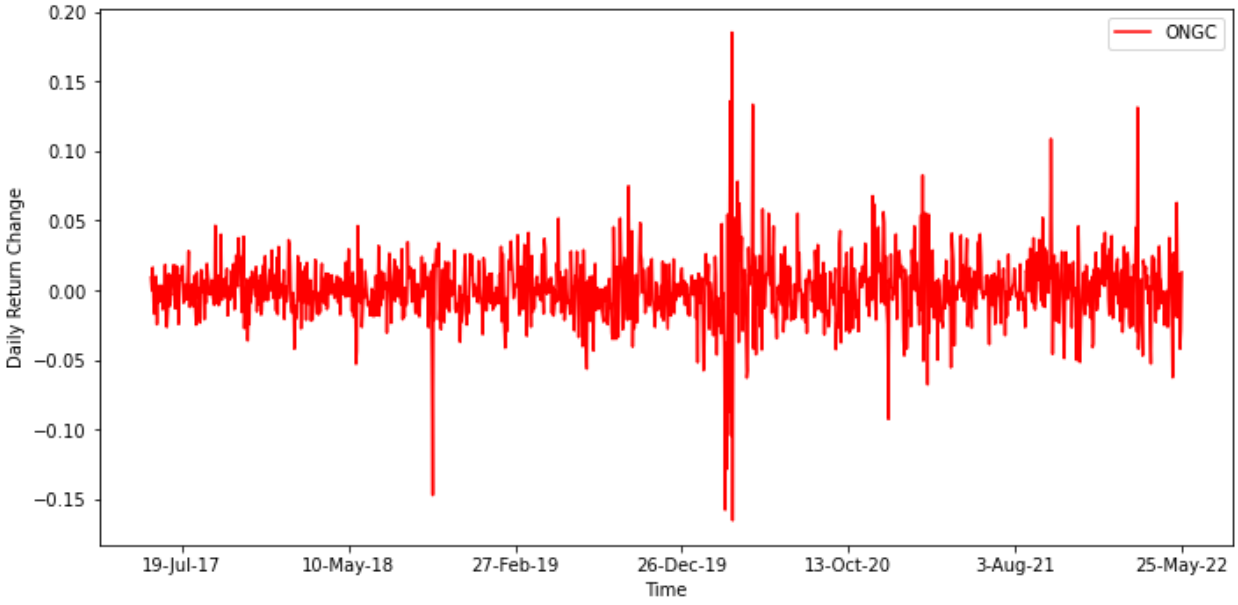
1238 rows × 6 columns

- **Daily Return plot**

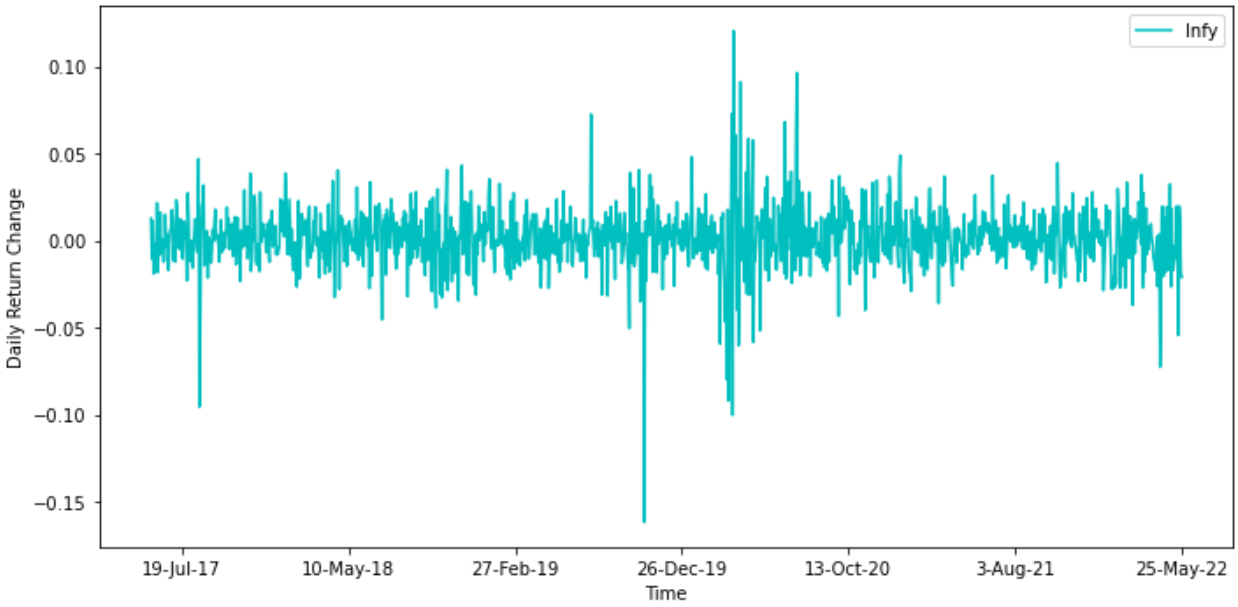
1.TATA Motors



2. ONGC



3. Infosys



Q_1_a:-

Code Snippet for Random weight generation for 3 Stocks:-

Weight Calculation

i.e W1+W2+W3=1 and W1,W2,W3 >=0

```
#Produces n random weights that sum to 1
def rand_weights(n):
    rand = abs(np.random.rand(n))
    return rand / sum(rand)
```

```
'Checking Is Constrained is Followed Or Not'
np.sum(rand_weights(3)) #Sum is 0
```

```
23]: 1.0
```

Code Snippet for Calculating Risk and Return:-

```
#Returns the mean and standard deviation of returns for a random portfolio
def random_portfolio(returns):
    p = np.asmatrix(np.mean(returns, axis=1))
    w = np.asmatrix(rand_weights(returns.shape[0]))
    C = np.asmatrix(np.cov(returns))

    mu = w * p.T #Return of portfolio
    sigma = (w * C * w.T) #Risk of Portfolio

    return mu, sigma
```

- **Risk vs. Return Plot 3 Stocks.**