

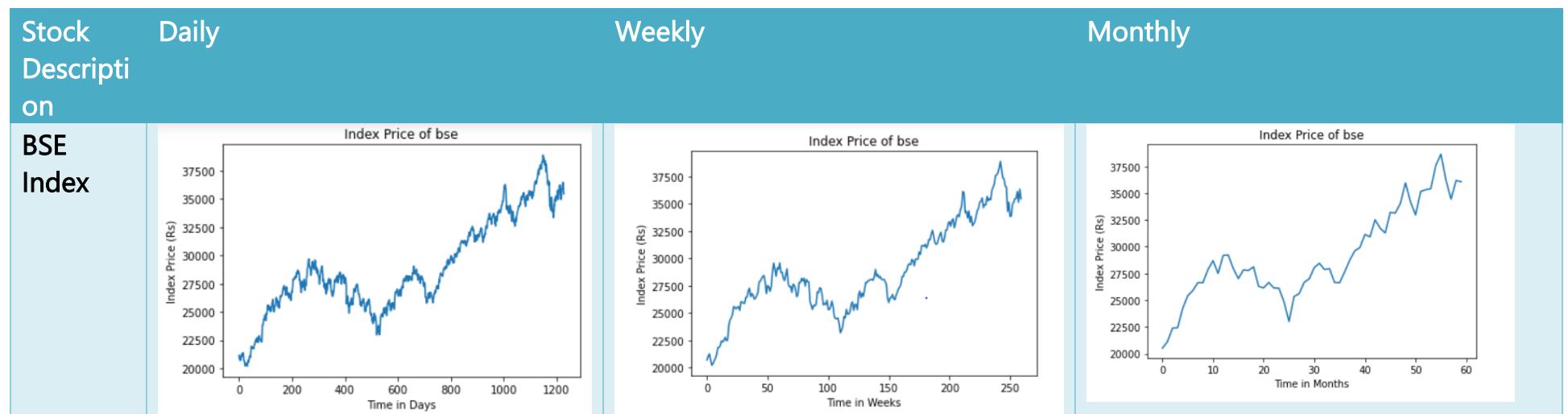
Name: Udayarao Sai Sandeep

Roll Number: 180123063

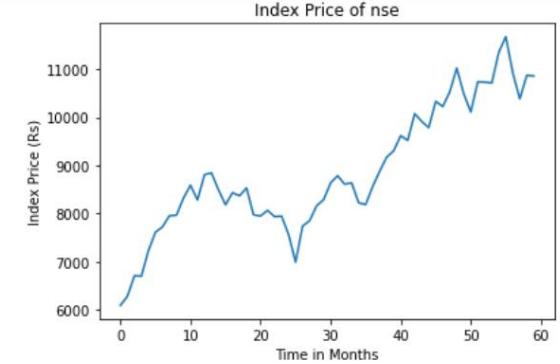
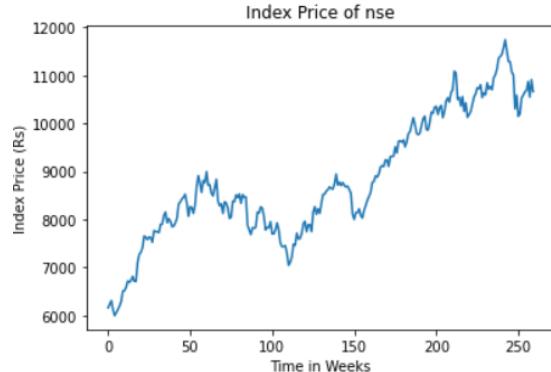
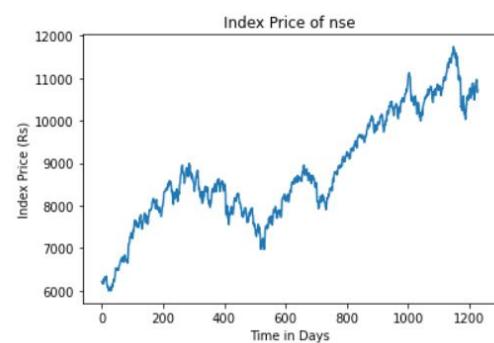
Dept.: Mathematics and Computing

Q1.

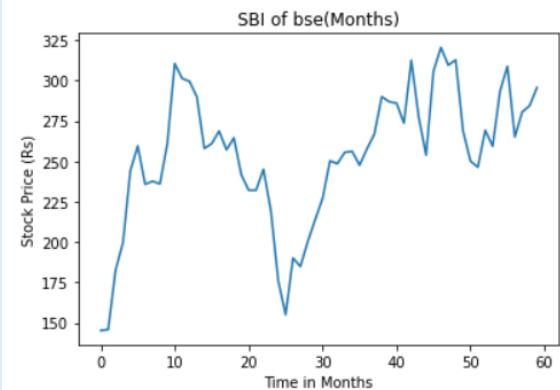
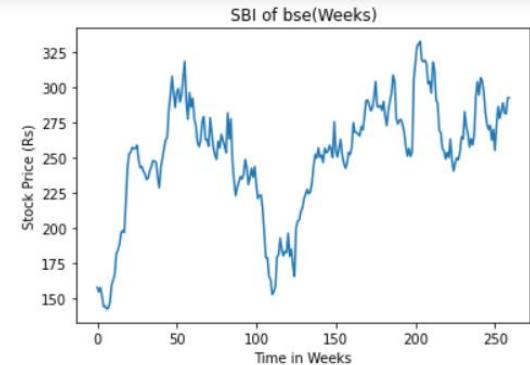
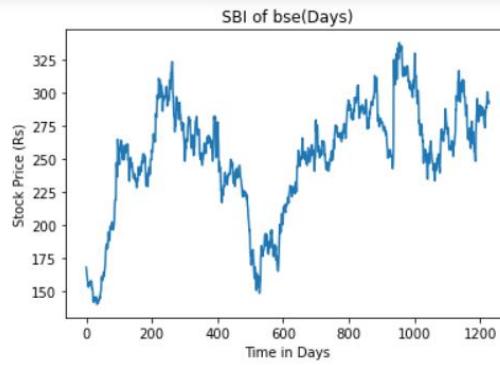
Similar to the previous assignment, company stock prices (10 from Sensex-BSE and 10 from Nifty-NSE) ranging from Jan 1, 2014 to Dec 31, 2018 was collected. (daily, weekly and monthly closing prices). Also, Nifty index values and Sensex index values (for the same range) was collected (from Yahoo Finance). Then, the Stock Price vs Time was plotted out.



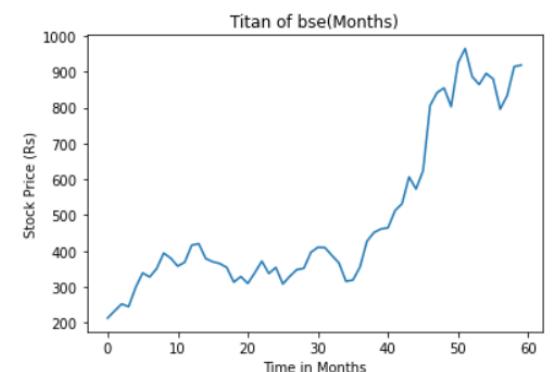
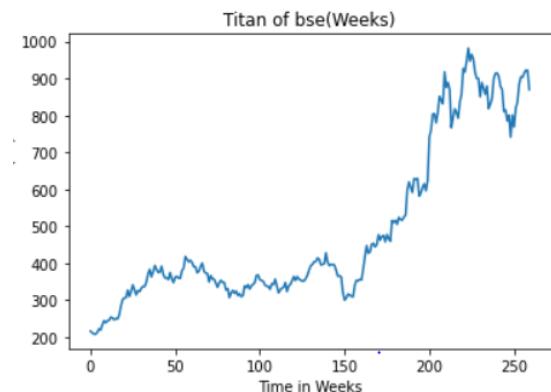
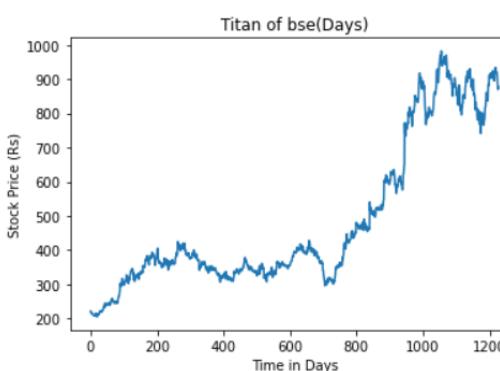
NSE Index



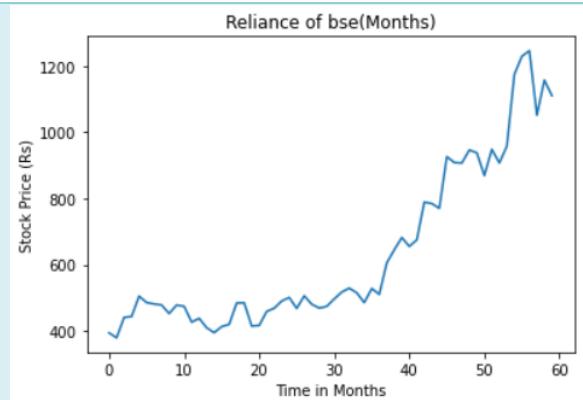
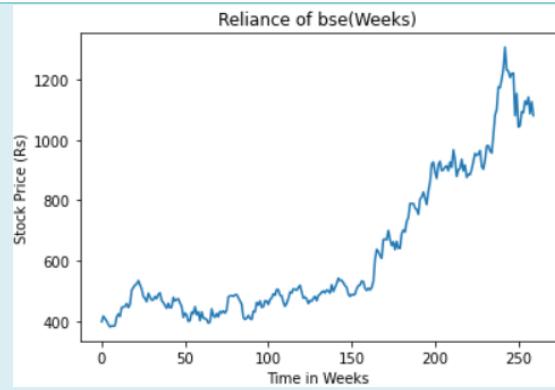
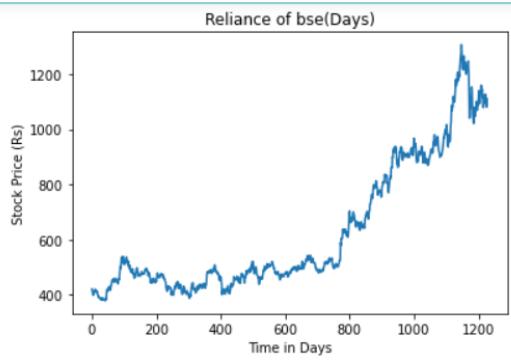
SBI



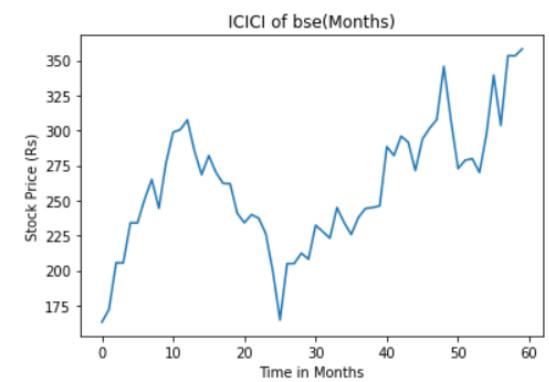
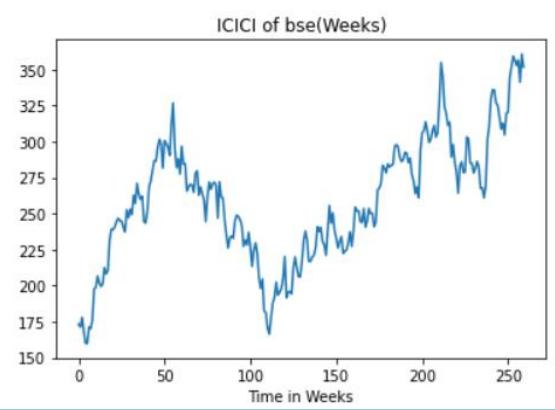
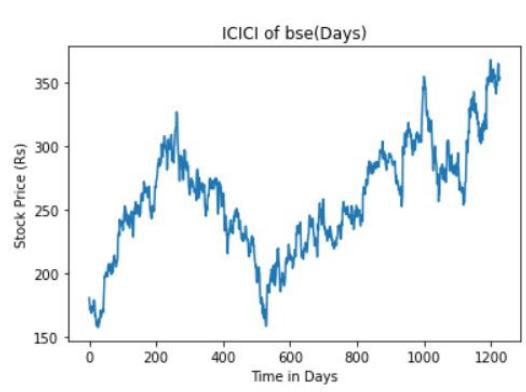
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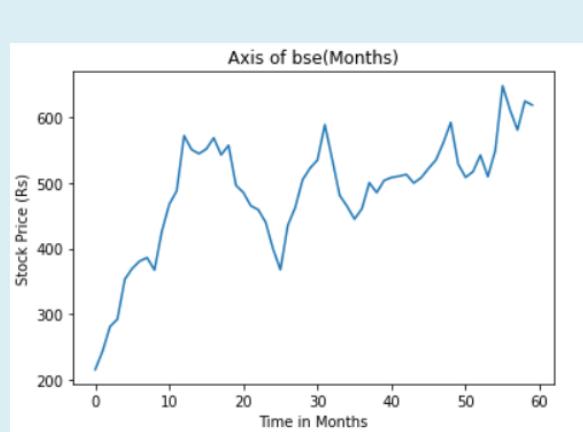
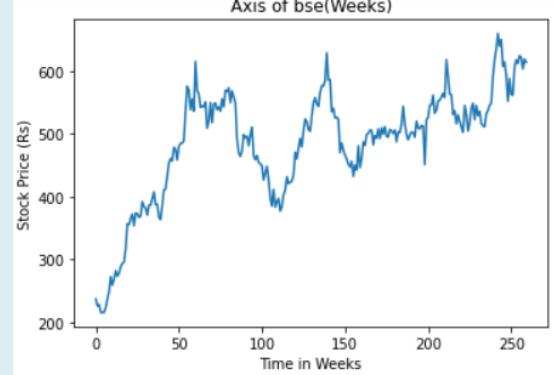
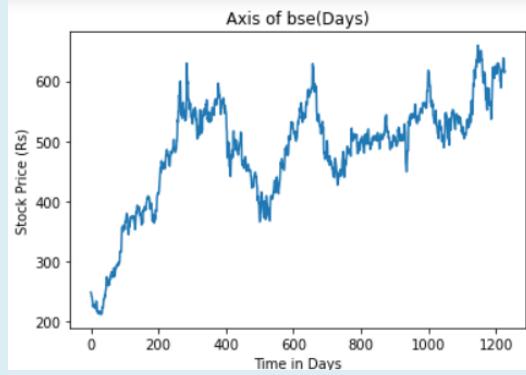
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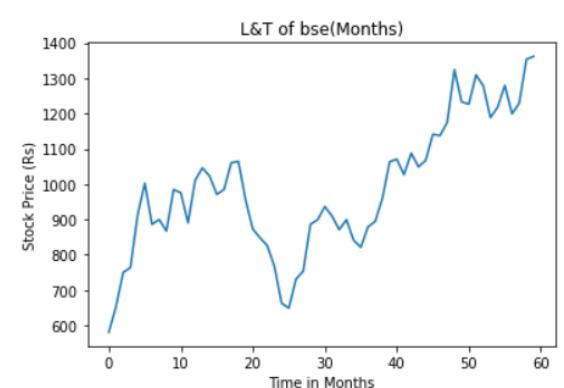
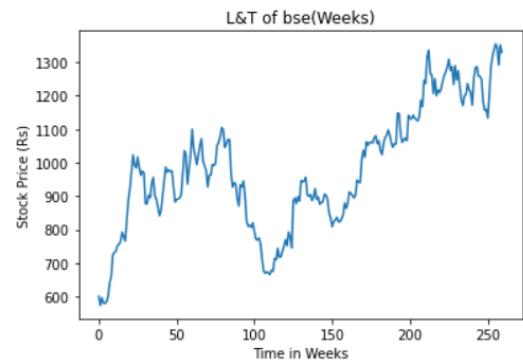
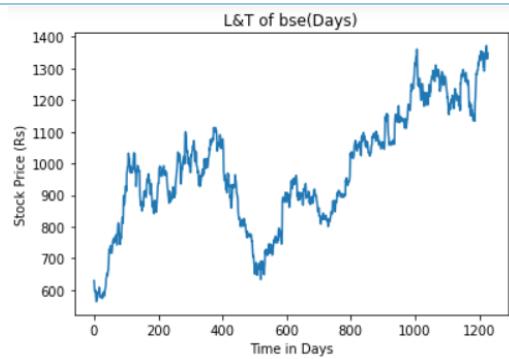
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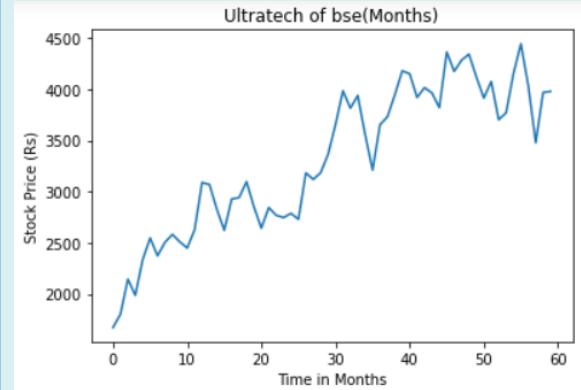
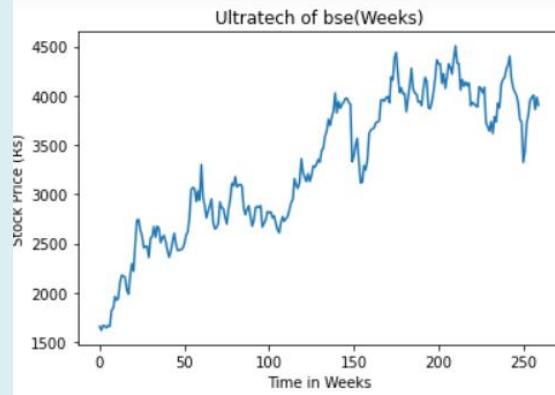
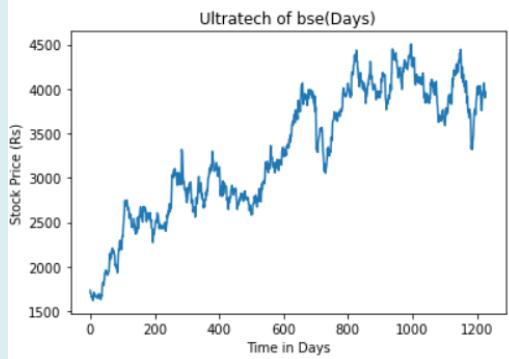
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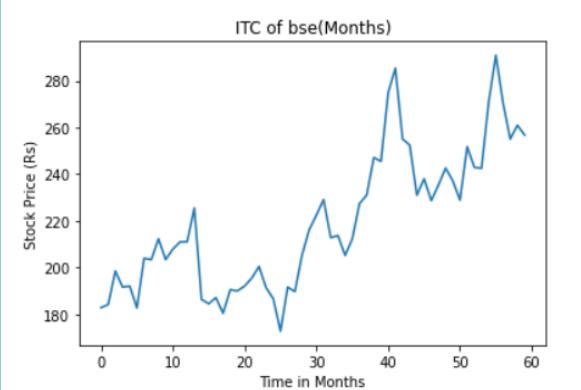
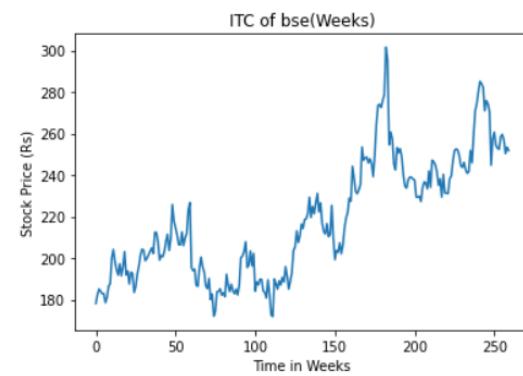
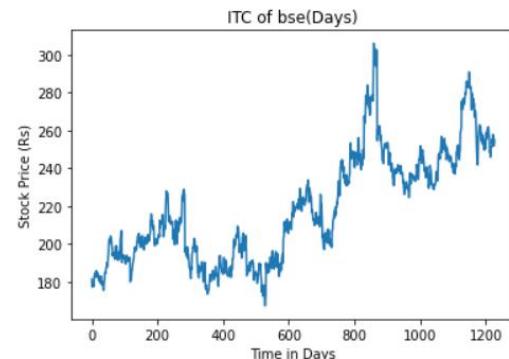
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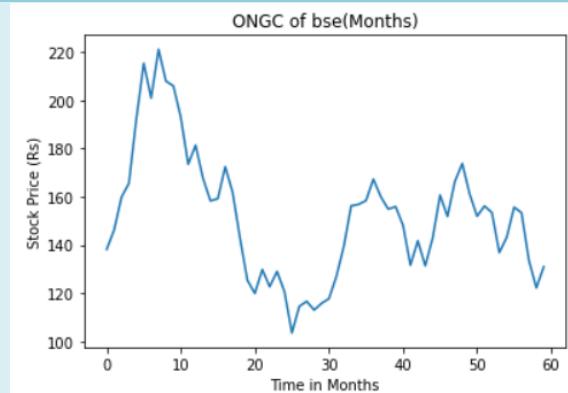
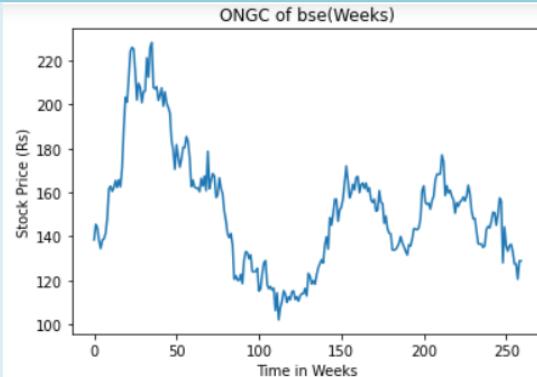
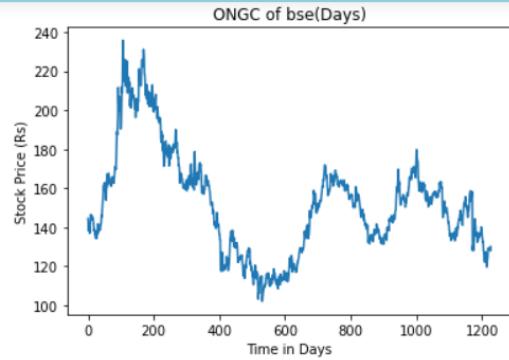
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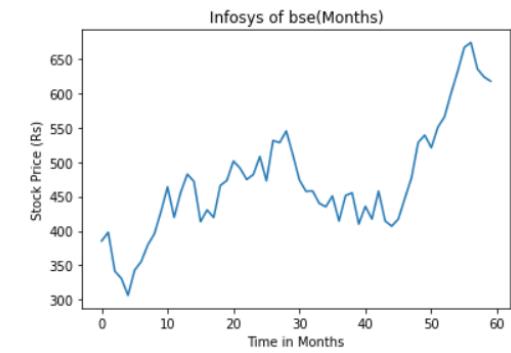
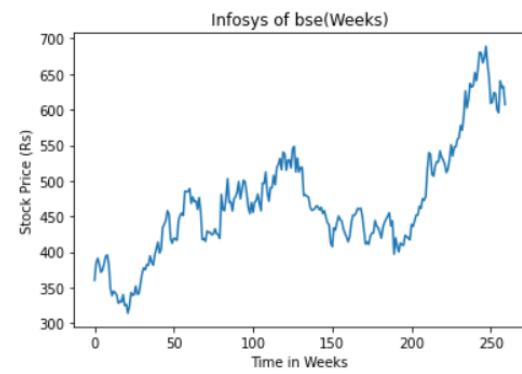
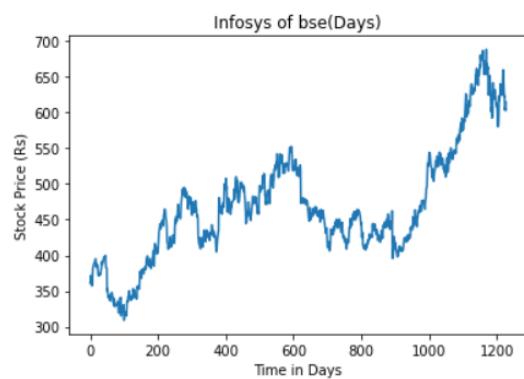
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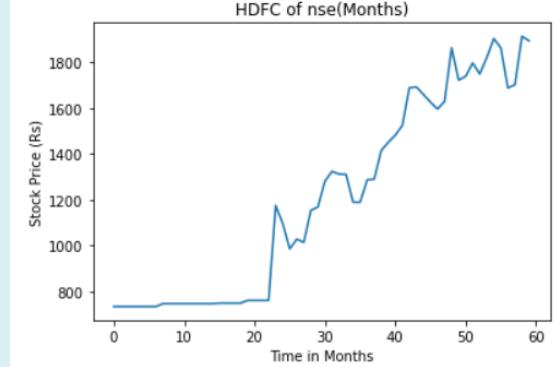
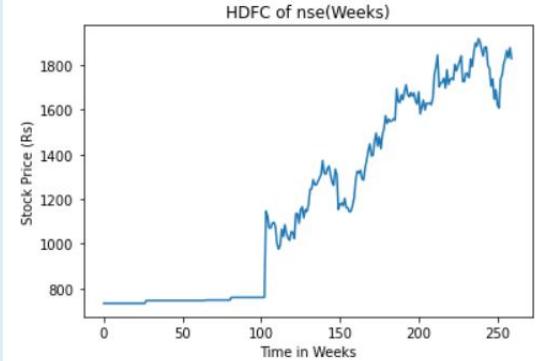
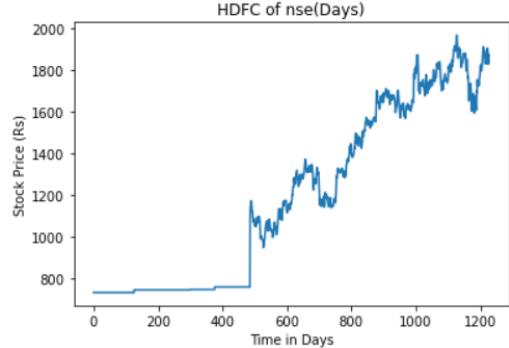
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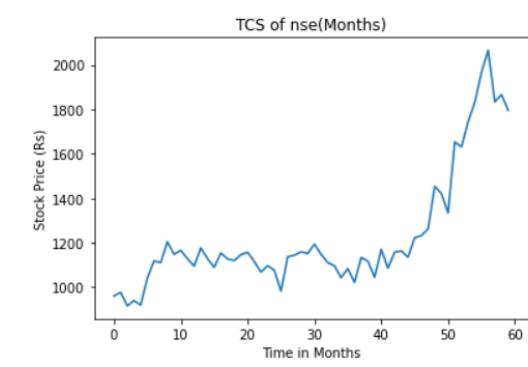
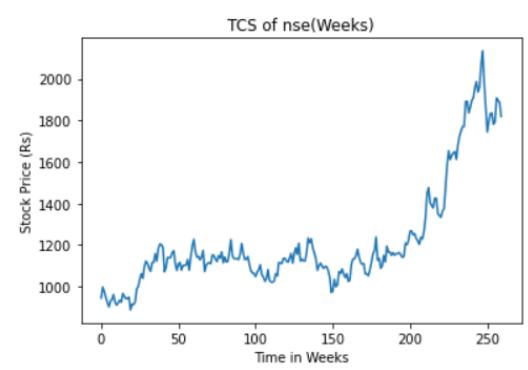
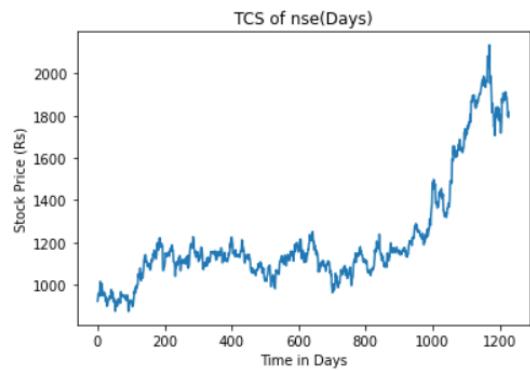
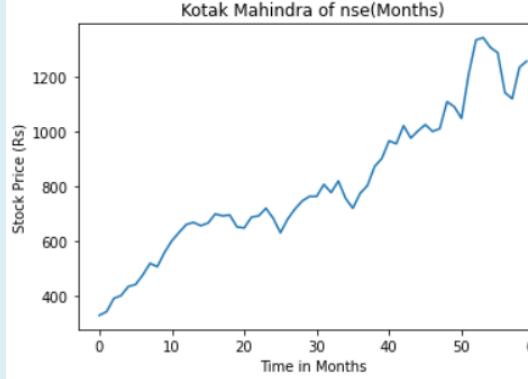
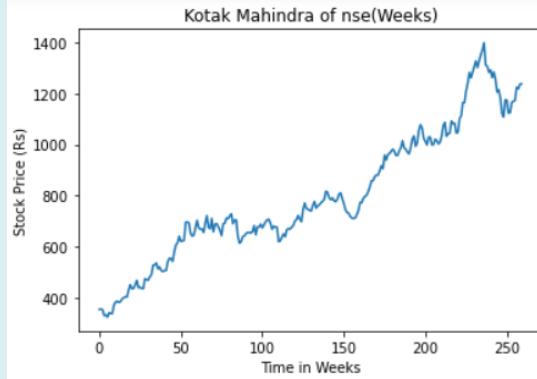
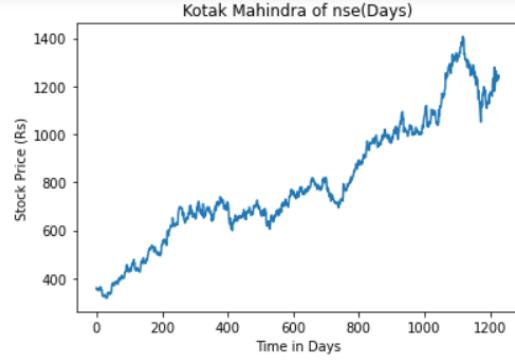
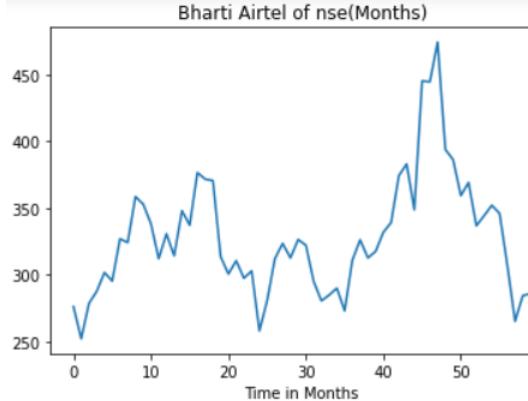
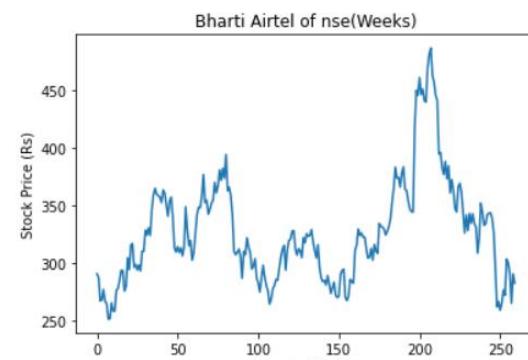
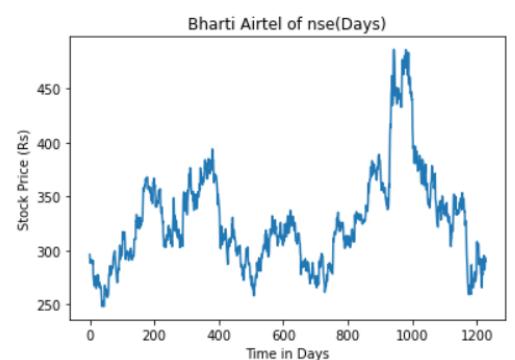


Infosys

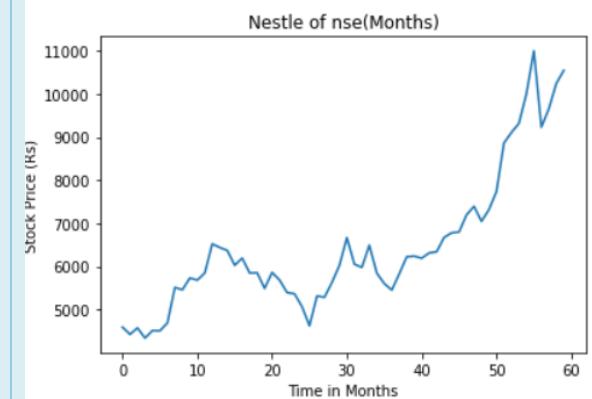
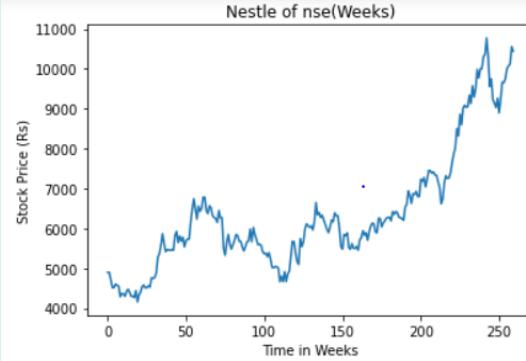
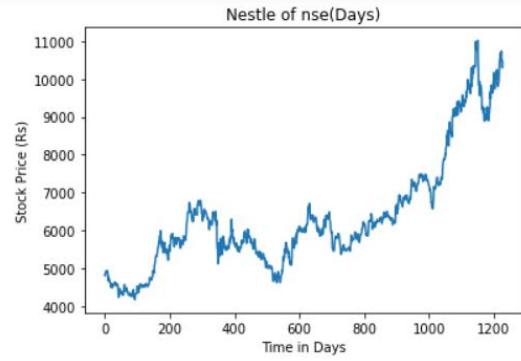


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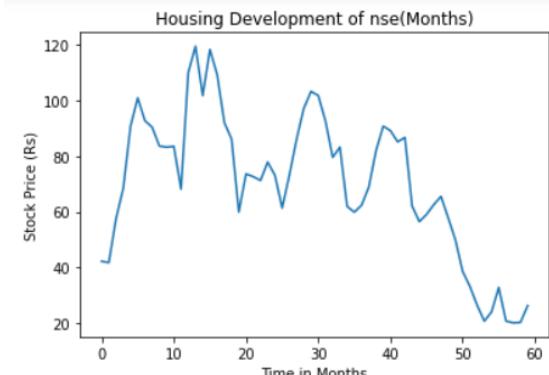
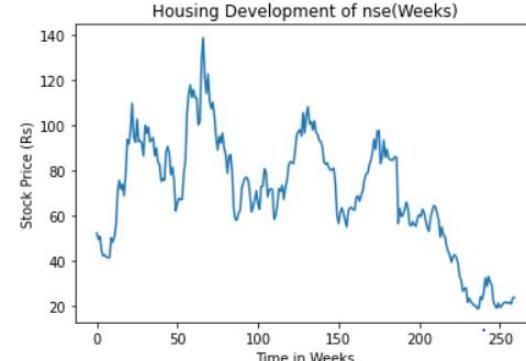
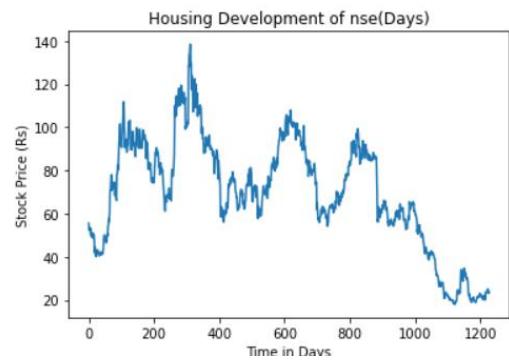


TCS**Kotak****Airtel**

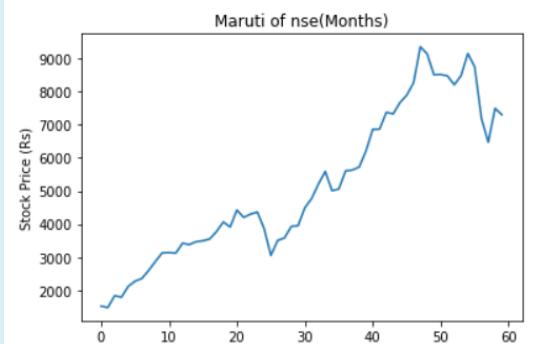
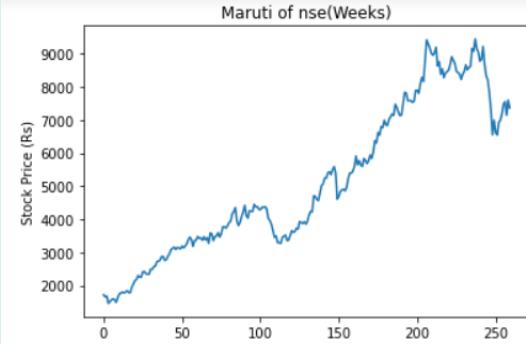
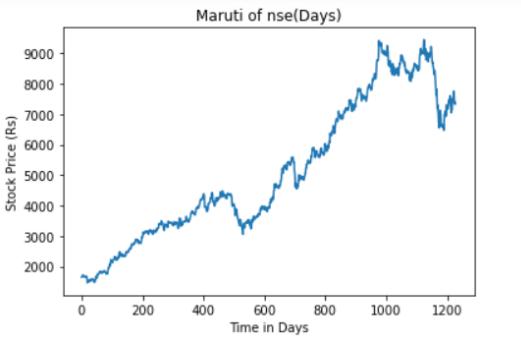
Nestle

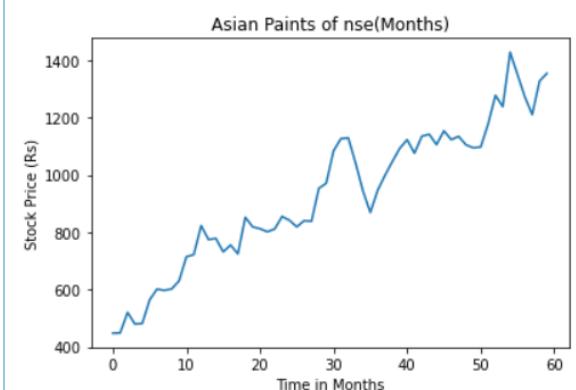
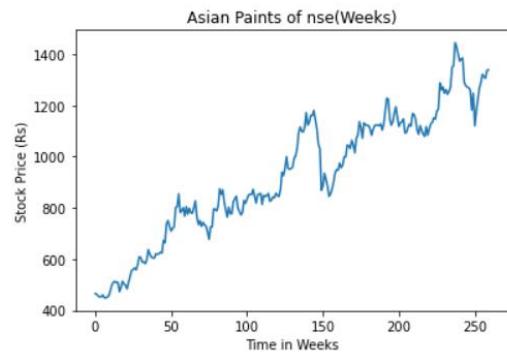
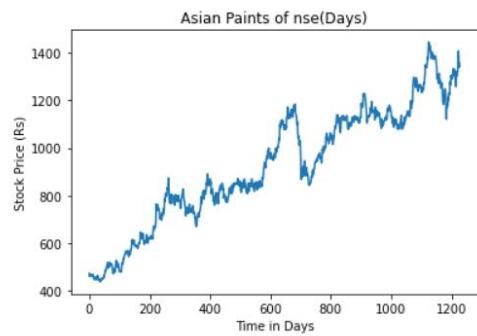
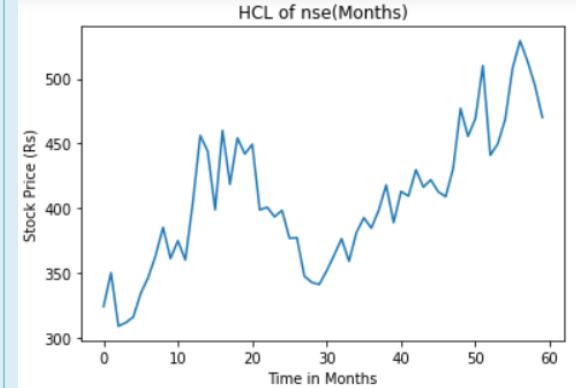
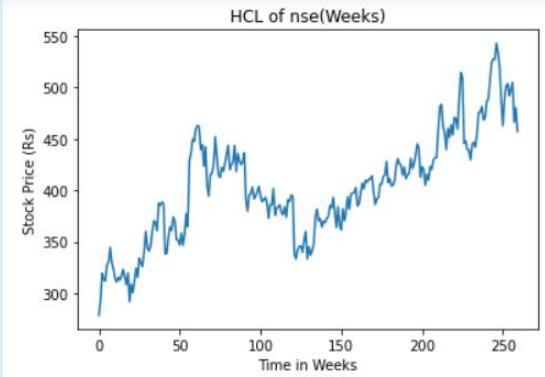
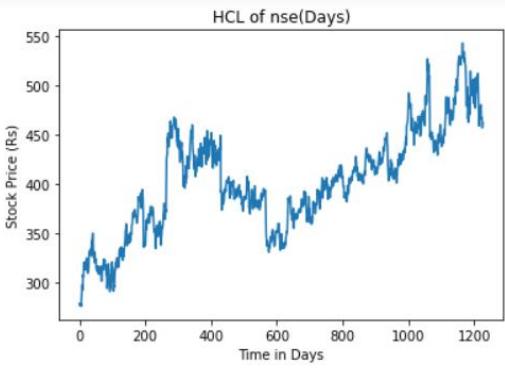
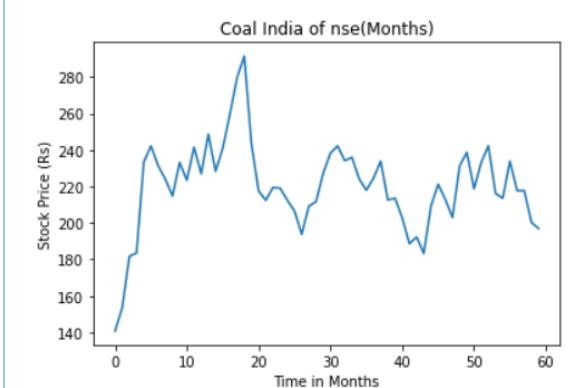
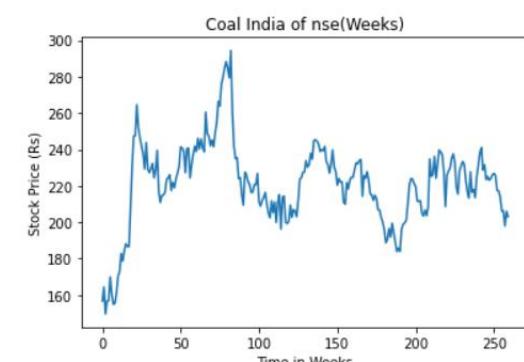
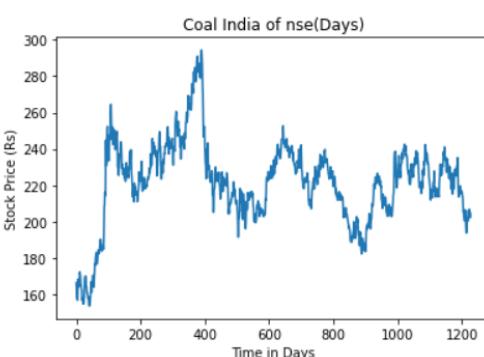


Housing



Maruti

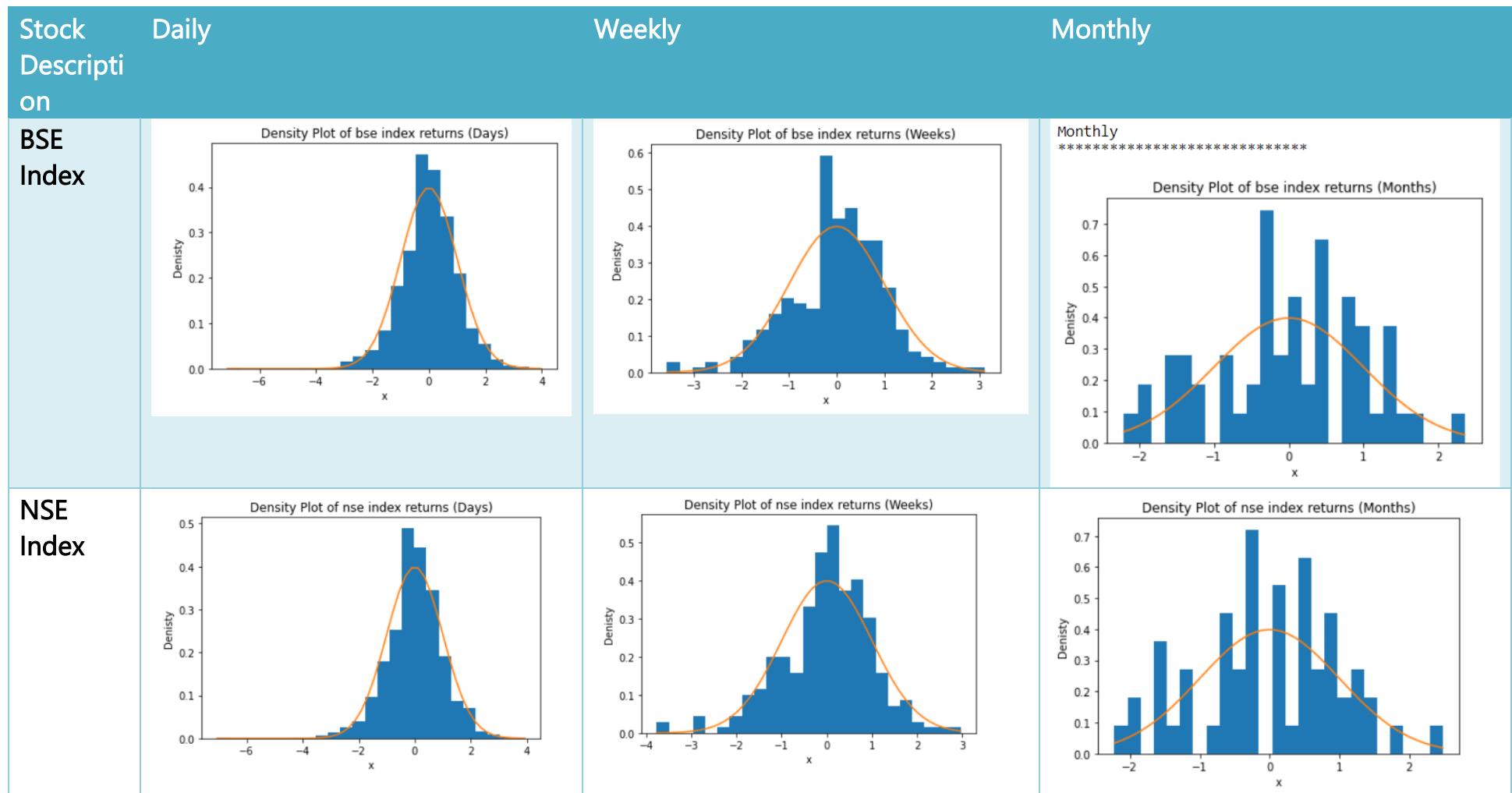


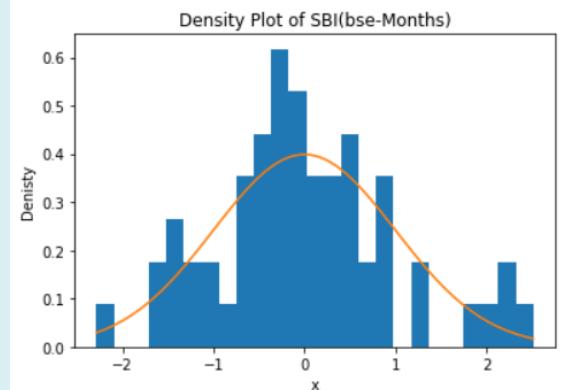
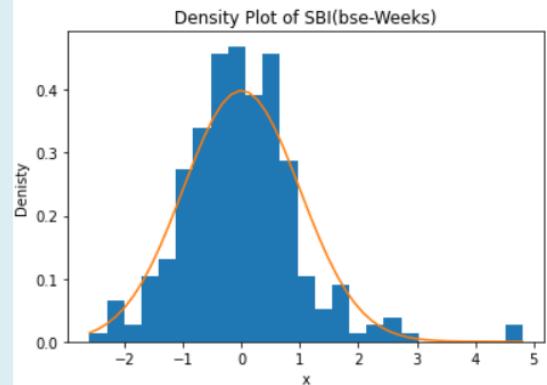
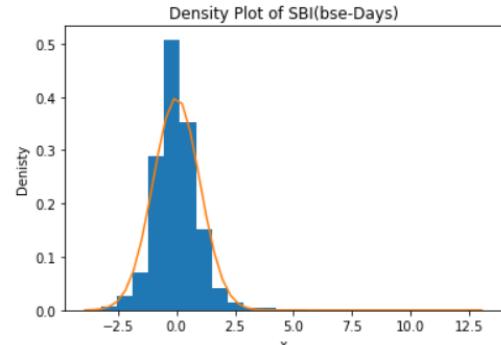
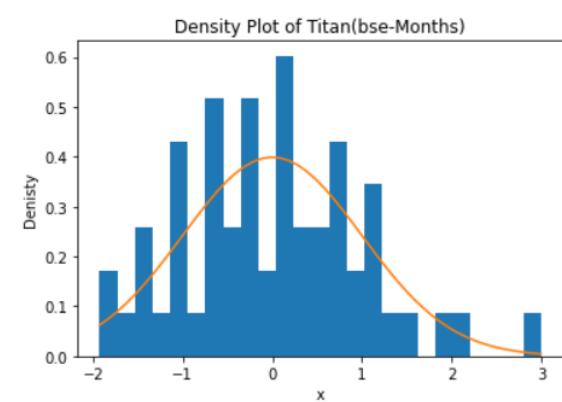
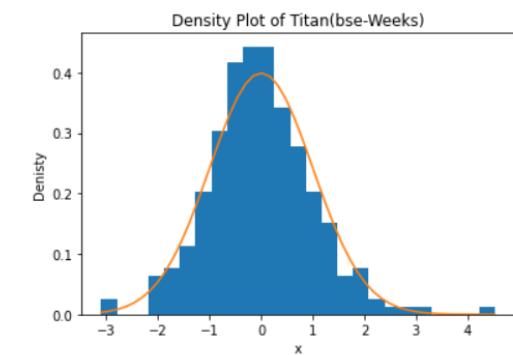
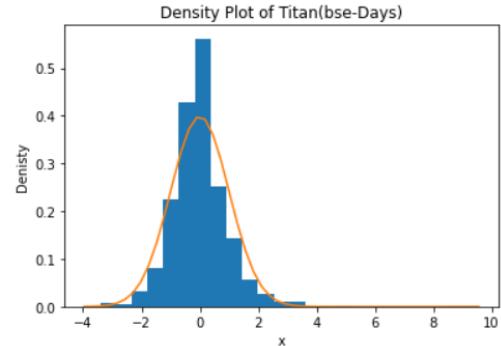
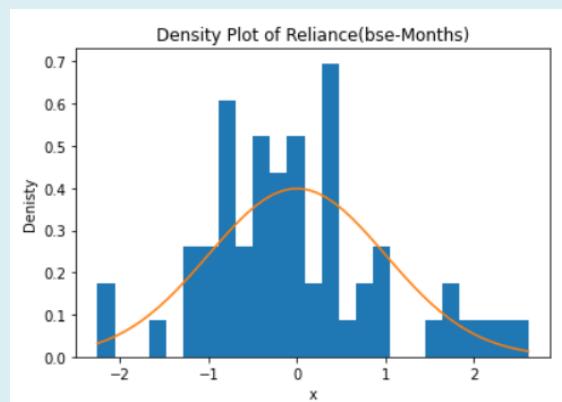
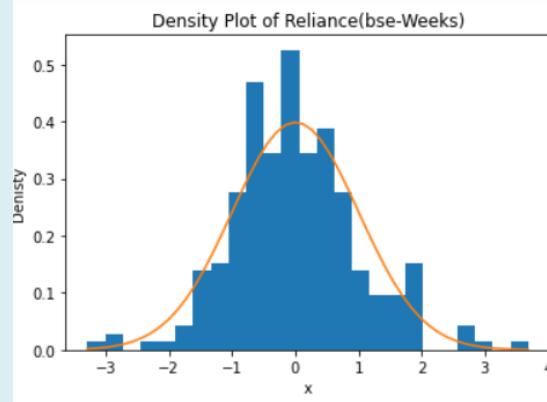
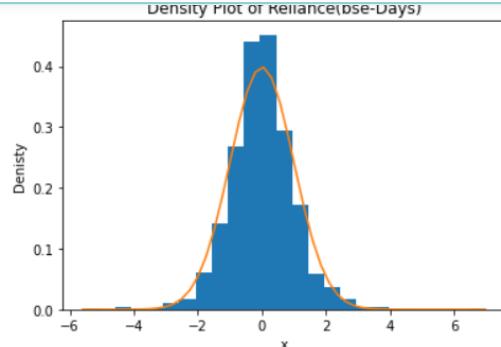
Asian**HCL****Coal**

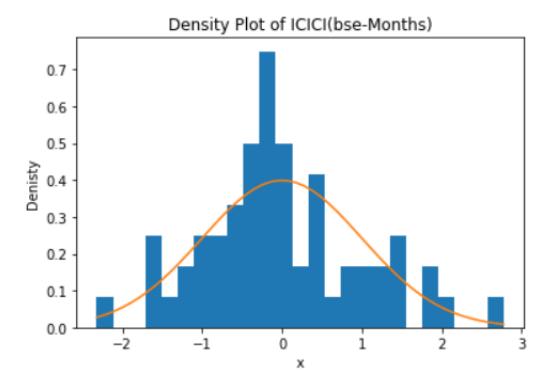
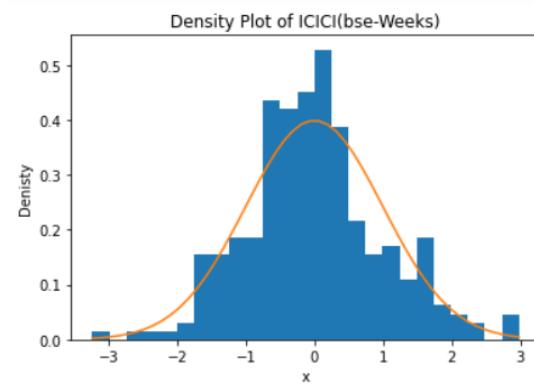
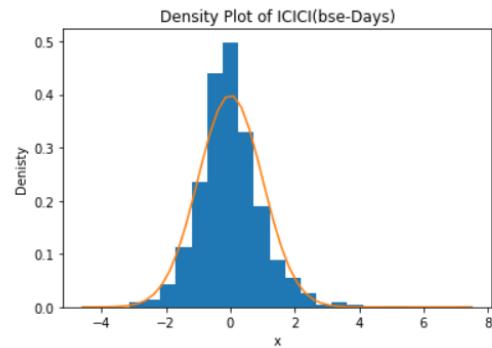
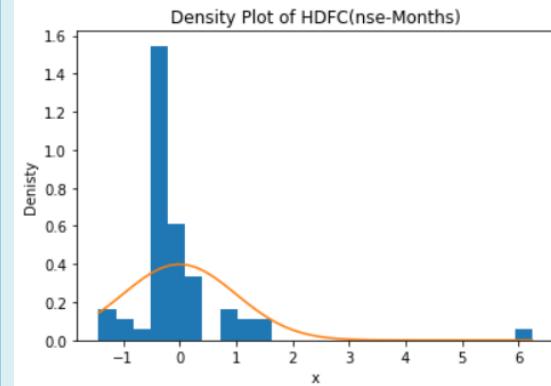
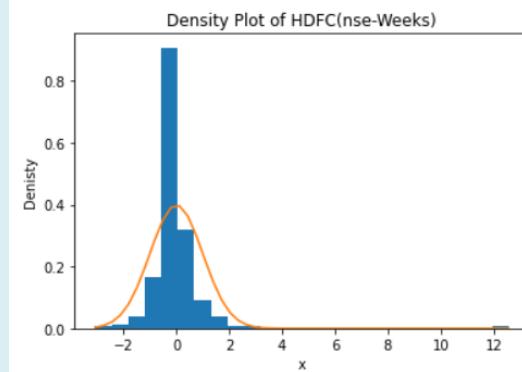
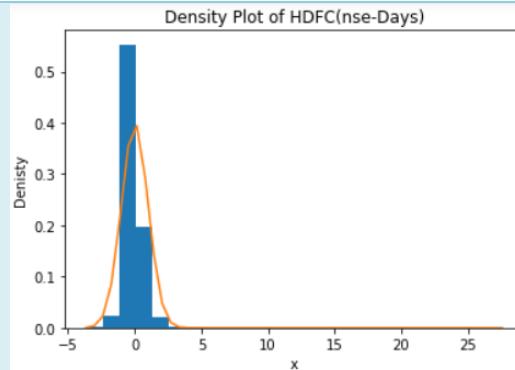
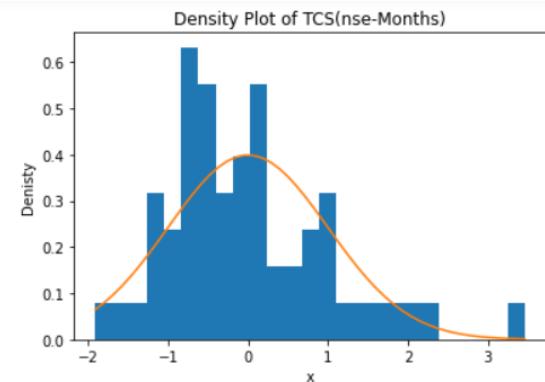
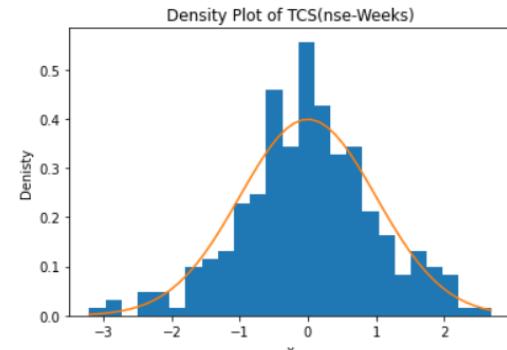
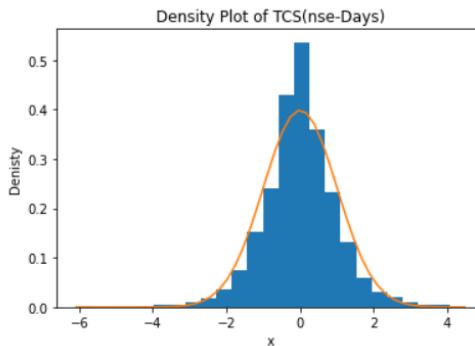
Q2.

Using the above collected data, the **returns R_i** have been calculated. And, also, corresponding values of μ and σ have been also calculated. Normalized value of returns was then calculated. The superimposed graphs of $N(0,1)$ and density histograms obtained are as follows:

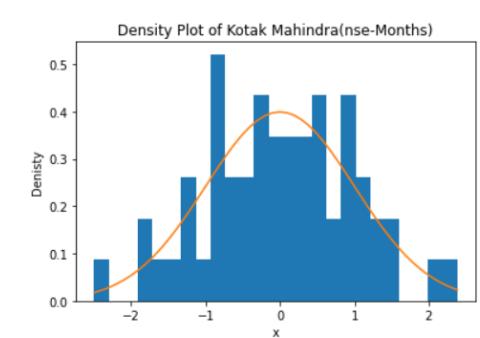
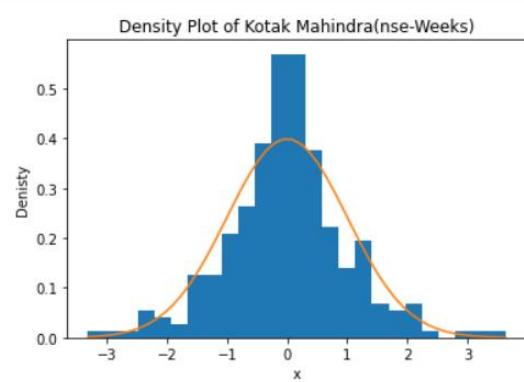
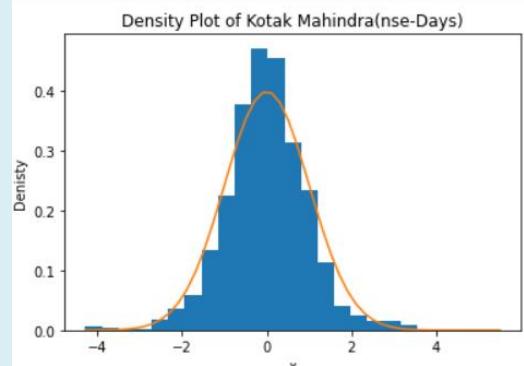
For simplicity, only 4 companies have been shown.



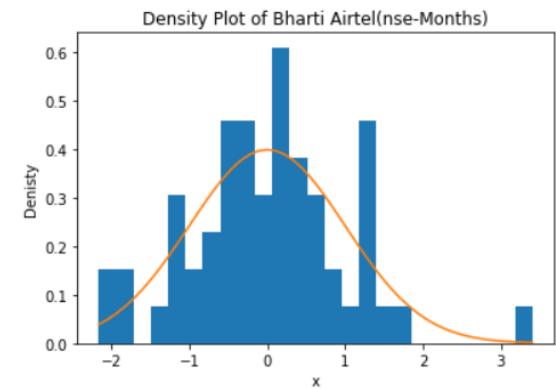
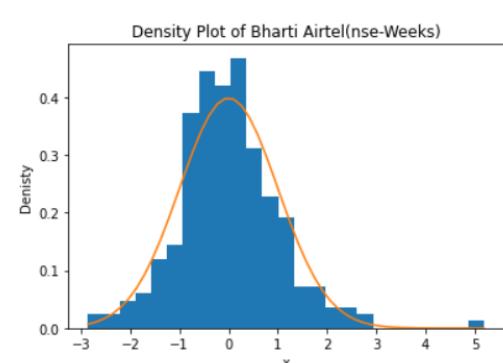
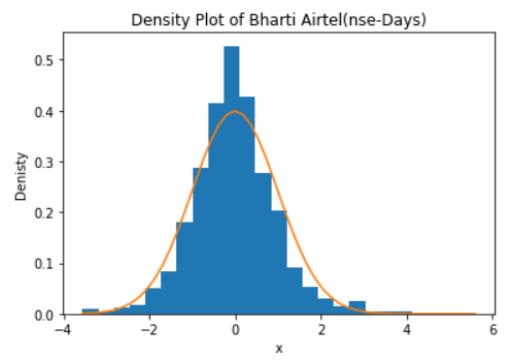
SBI**Titan****Reliance**

ICICI**HDFC****TCS**

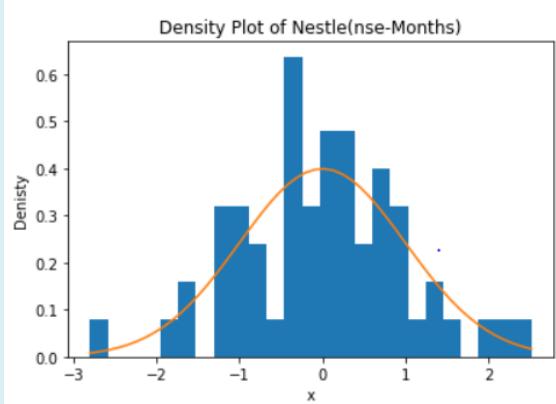
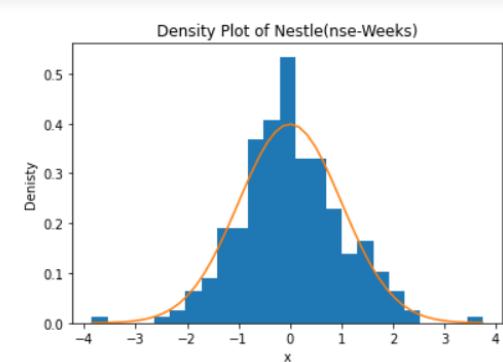
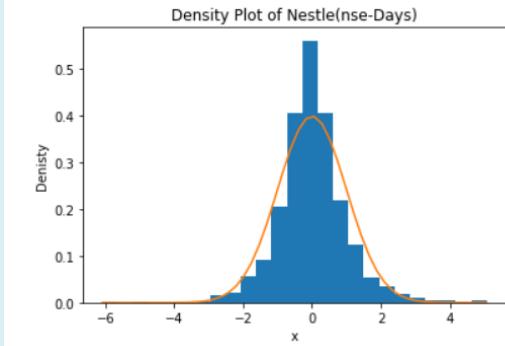
Kotak



Airtel

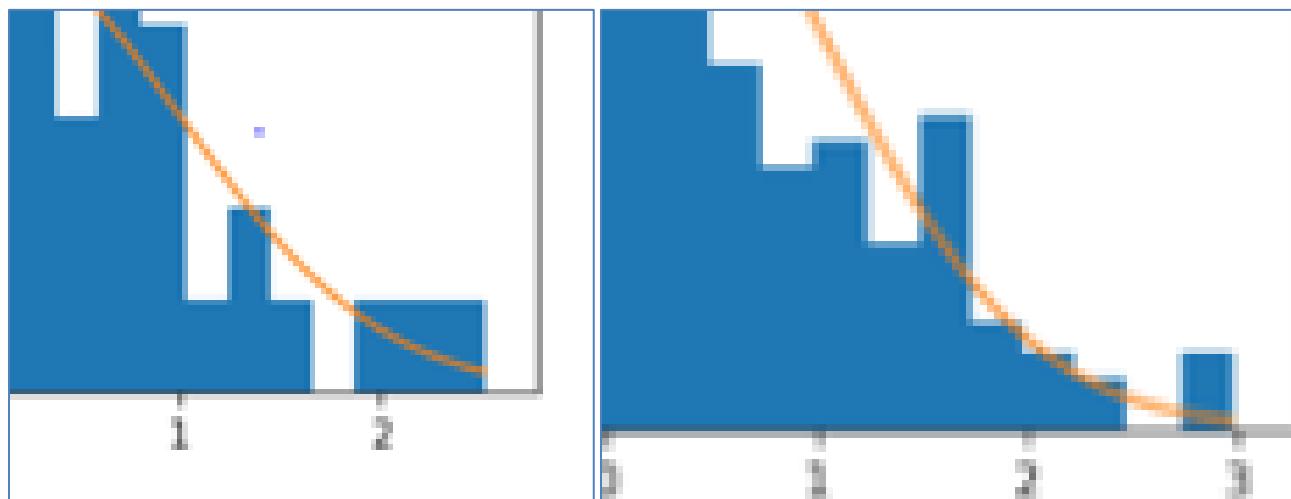


Nestle



It can be seen that the Normal Distribution estimates with great similarity the Density plot of the stocks, and the resemblance strengthens with increase in data points.

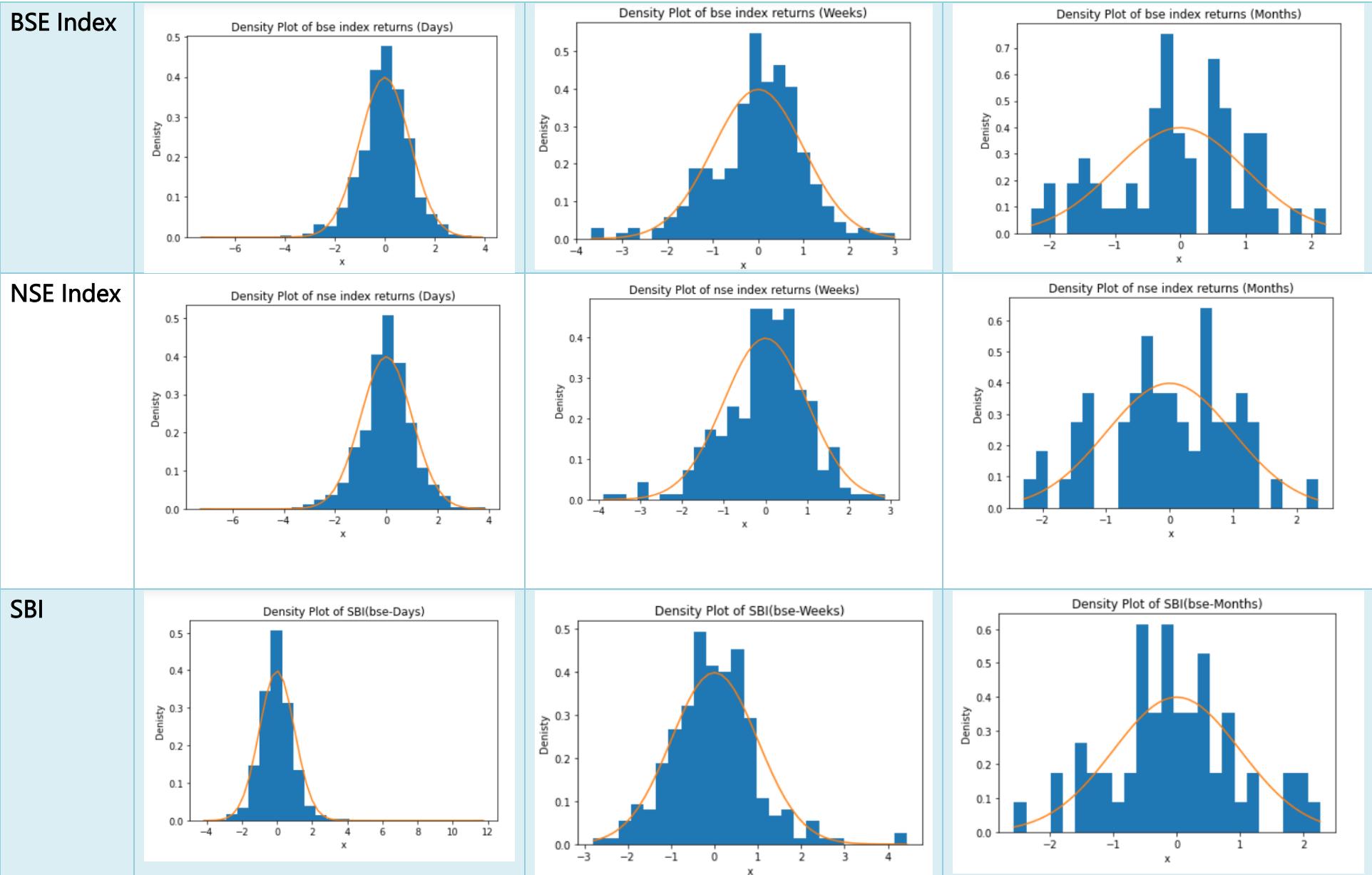
If we observe at the tails, we can see that the density plot jumps above the normal plots at some instances, and the normal ploy goes to zero. In real world scenarios, the stock prices are influences by many hard to predict factors, and hence don't exactly follow the normal distribution. Stock values might be over inflated in such scenarios, and hence can rise over the normal plots.



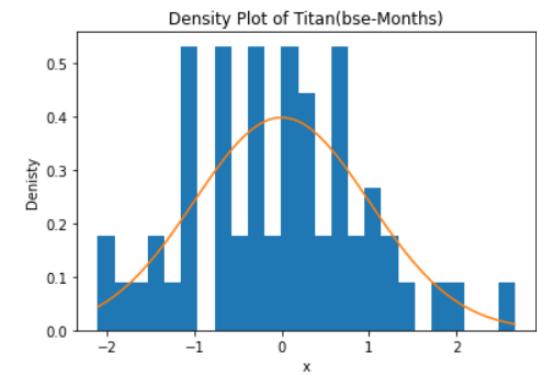
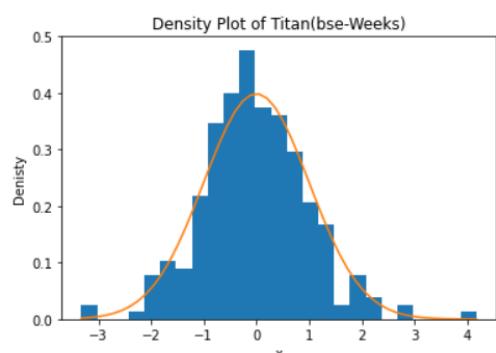
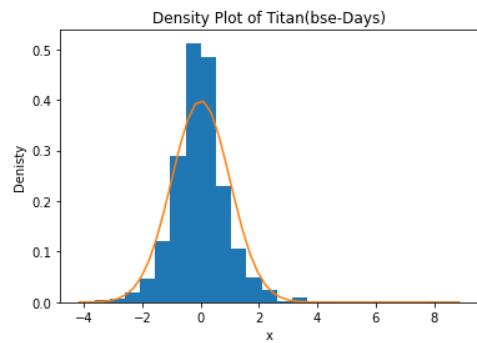
Q3.

In the logarithmic returns, we can see that the log normal returns suppress the ordinary returns. This effect amplifies when the percent return is high. Hence, we can see that tails are also somewhat suppressed. Here is a look at the log-normal returns density plots:

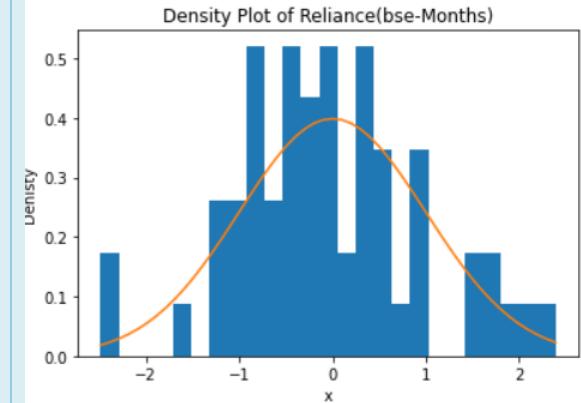
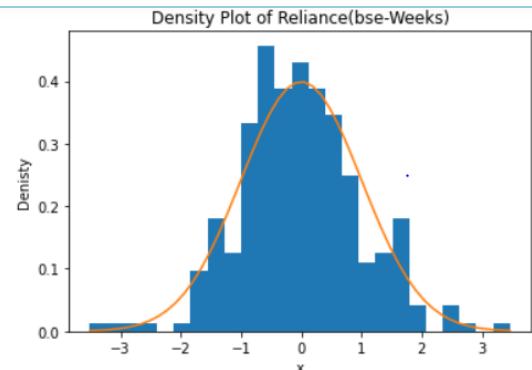
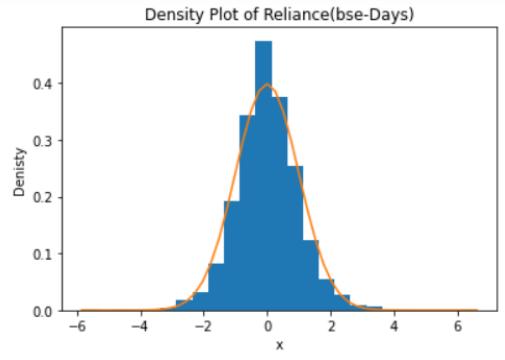




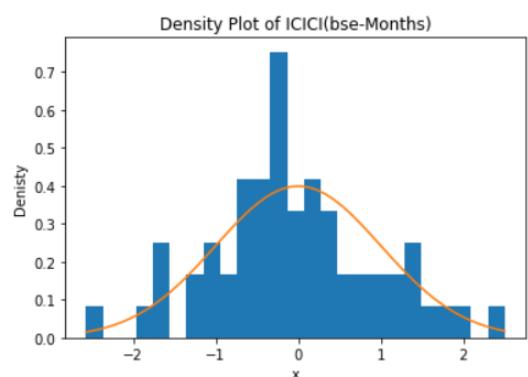
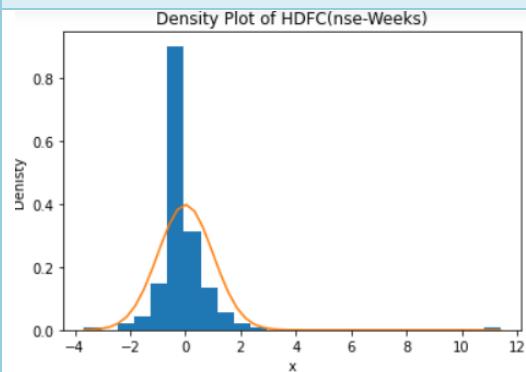
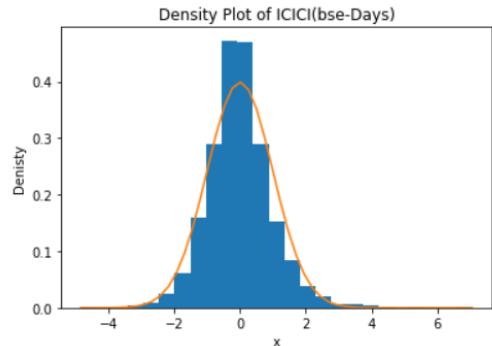
Titan



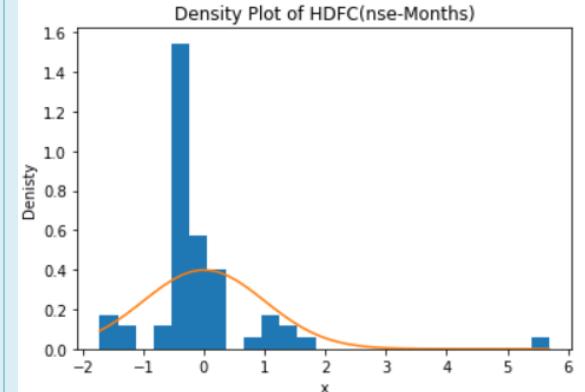
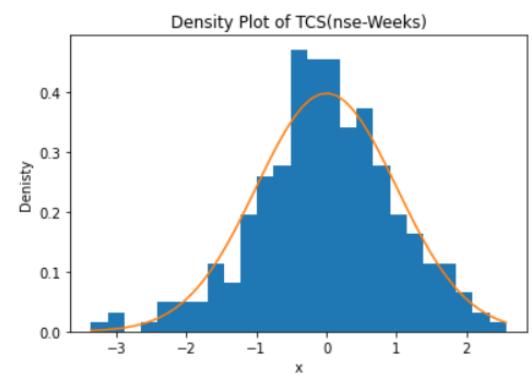
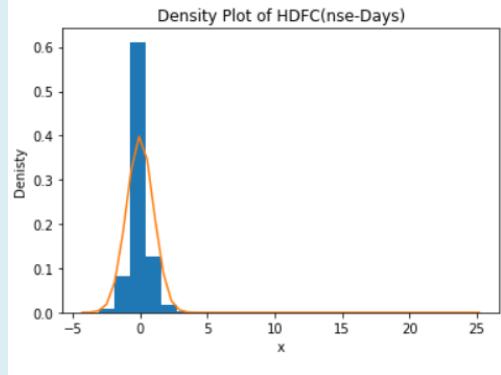
Reliance



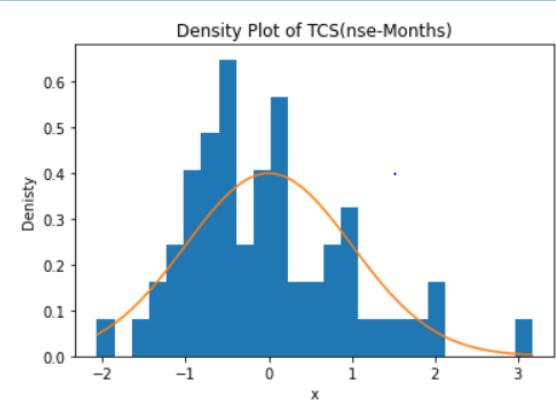
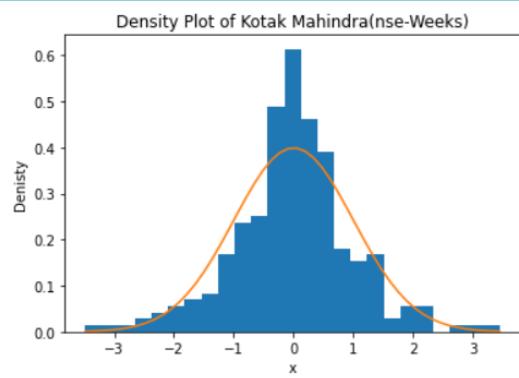
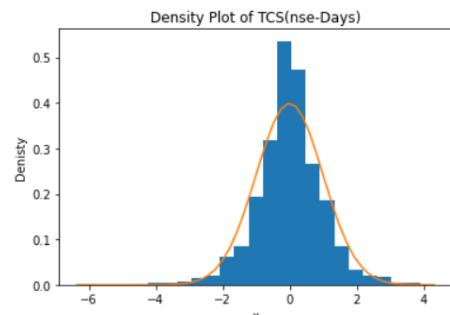
ICICI



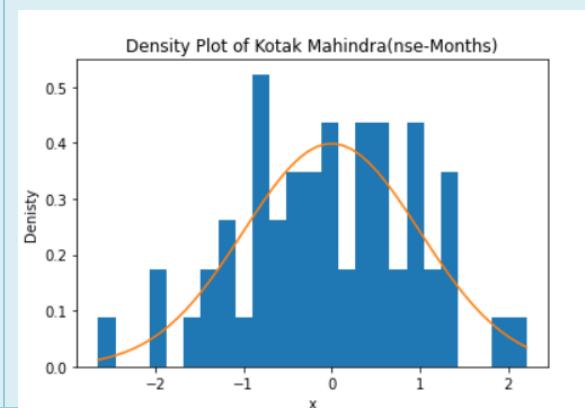
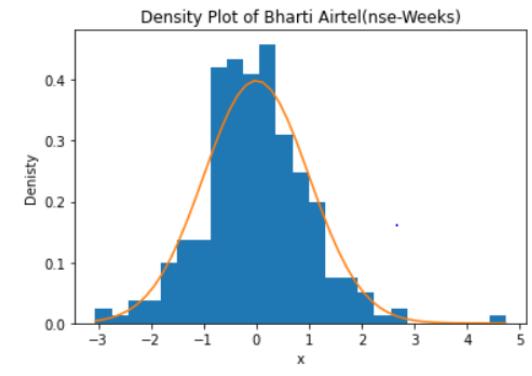
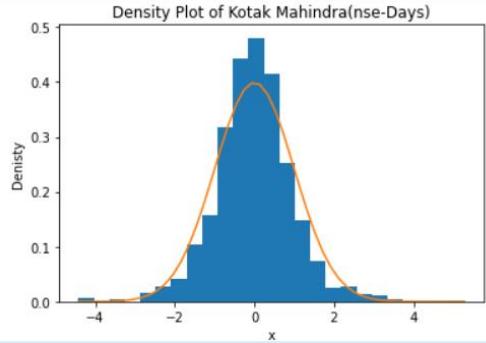
HDFC



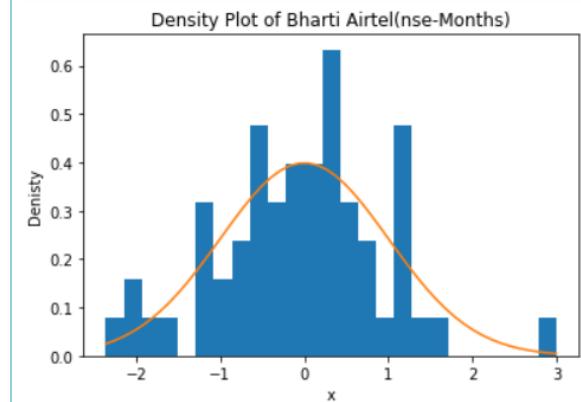
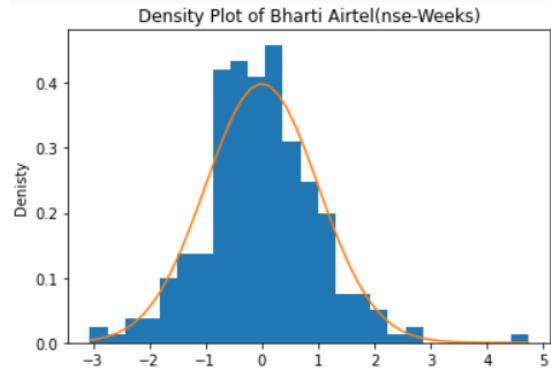
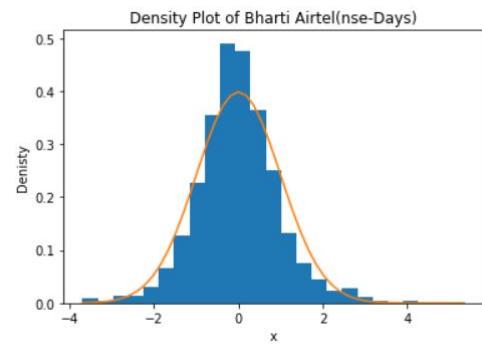
TCS



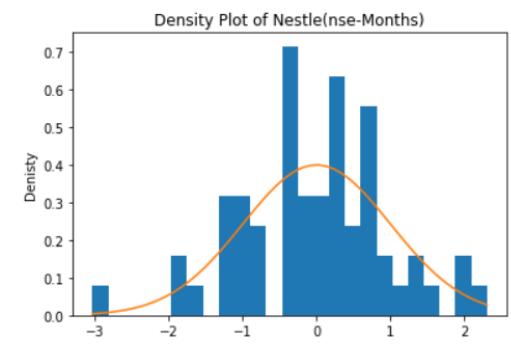
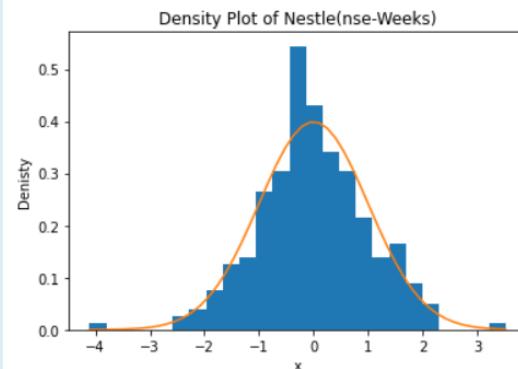
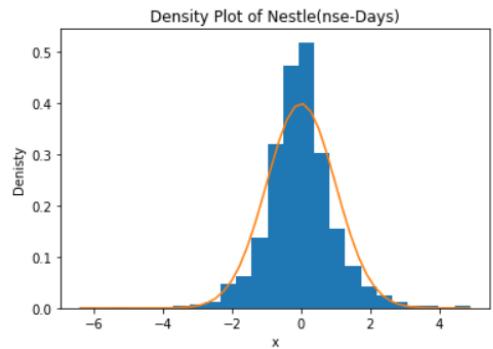
Kotak



Airtel



Nestle



Q4.

For simulating the stock prices for the period of January 1, 2018 to December 31, 2018 by using the daily, monthly and weekly data for the period **January 1, 2014 to December 31, 2017**.

We have used the jump diffusion model thinking that the ratio of asset price after and before a jump should follow the log-normal distribution $N(\mu, \sigma^2)$. Using first approach, (simulation of dates), stock prices have been simulated. **The actual vs estimated prices have been plotted out:**

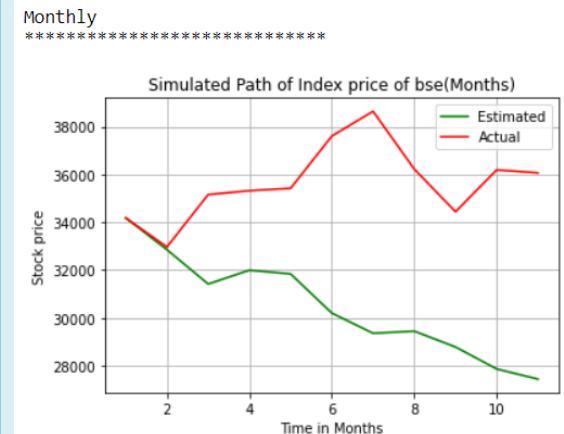
Stock Description

Daily

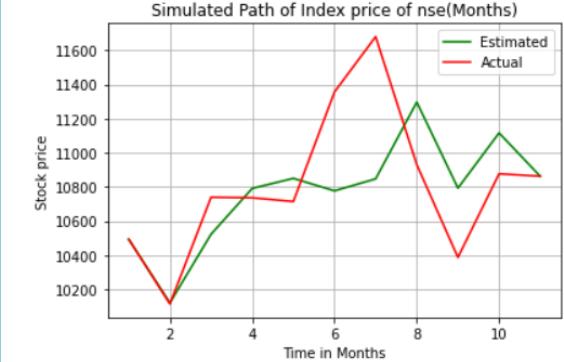
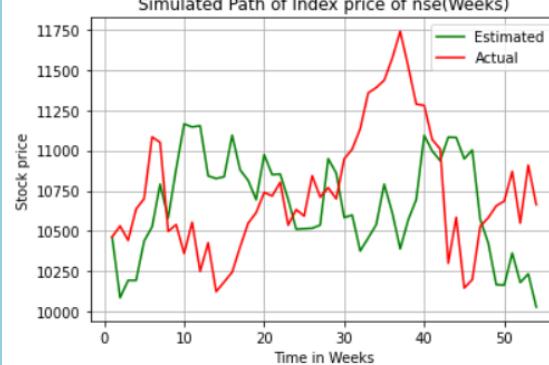
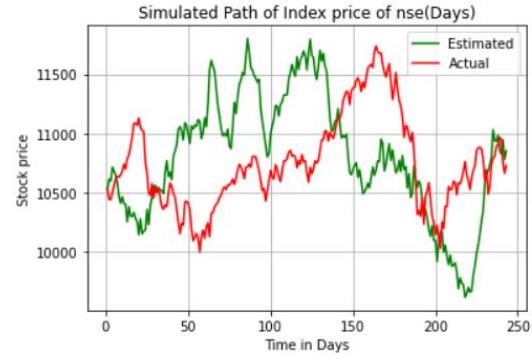
Weekly

Monthly

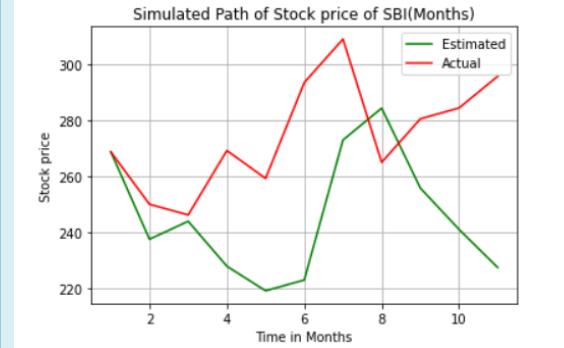
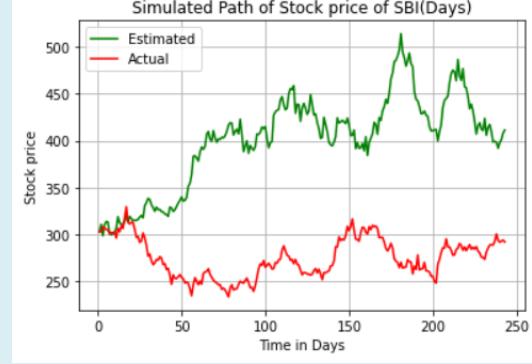
BSE Index

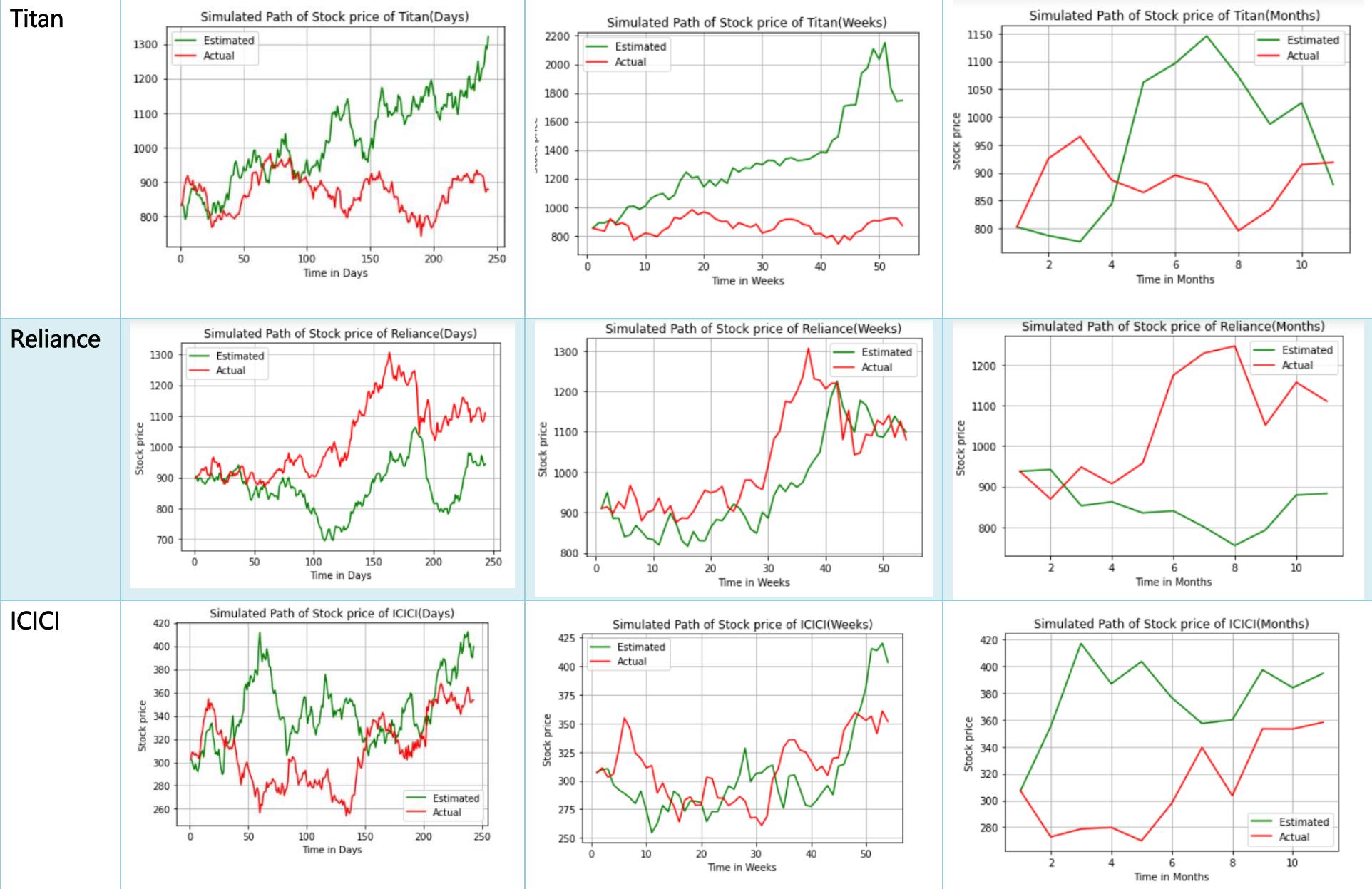


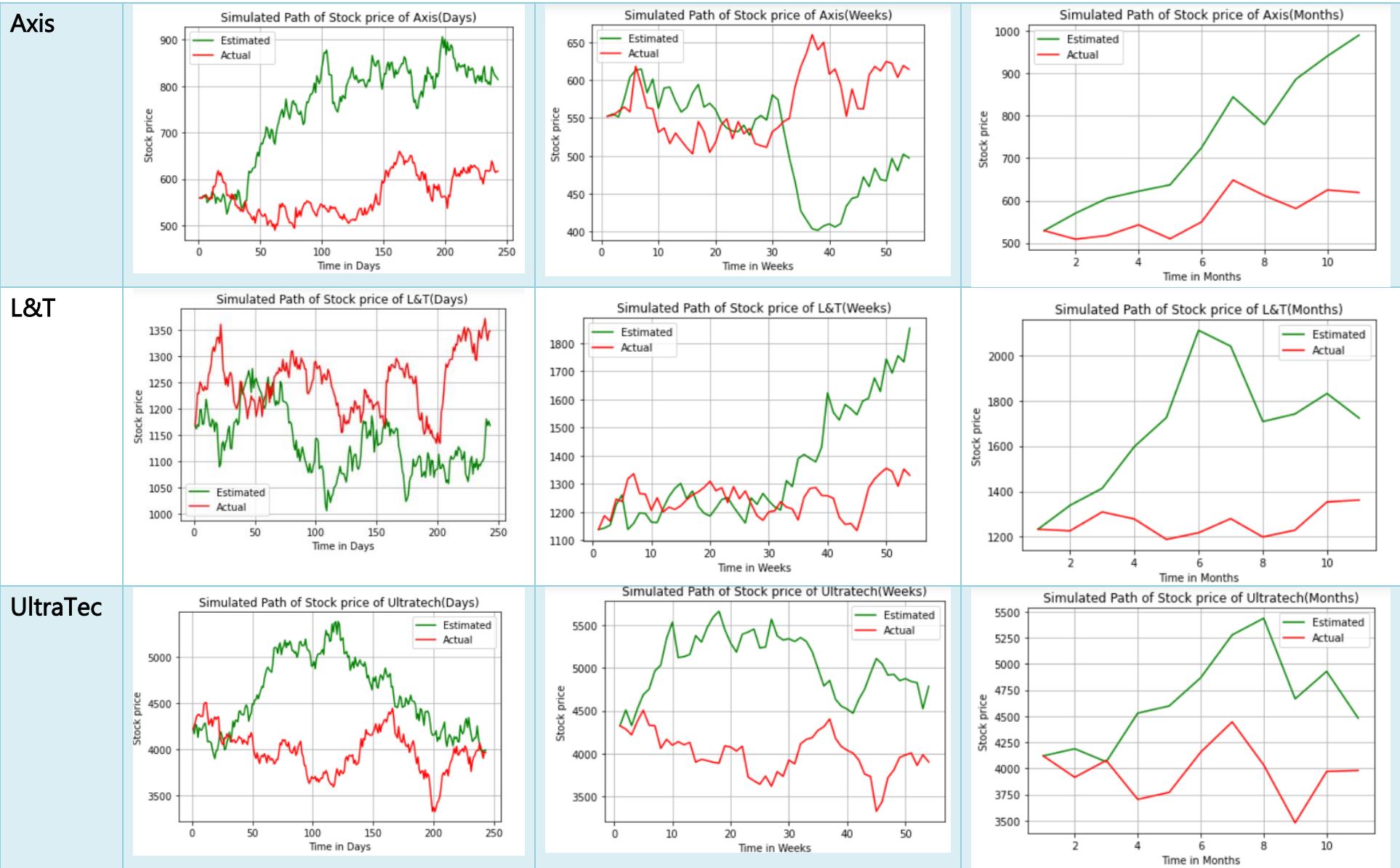
NSE Index

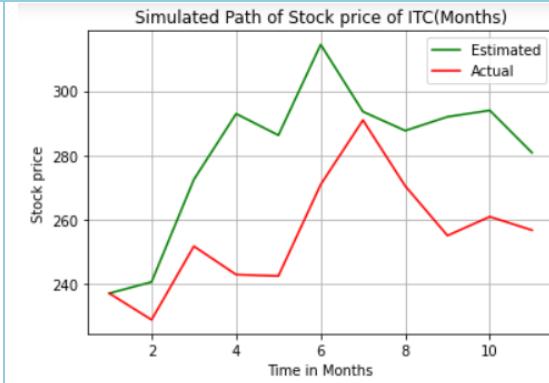
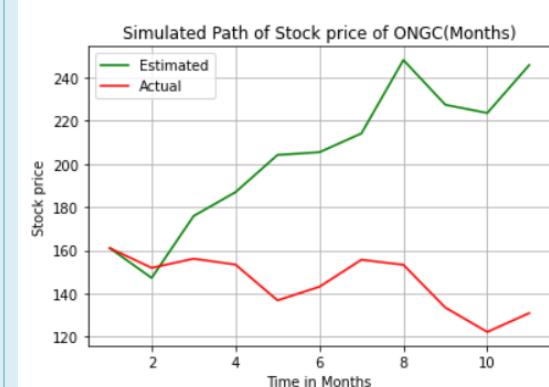
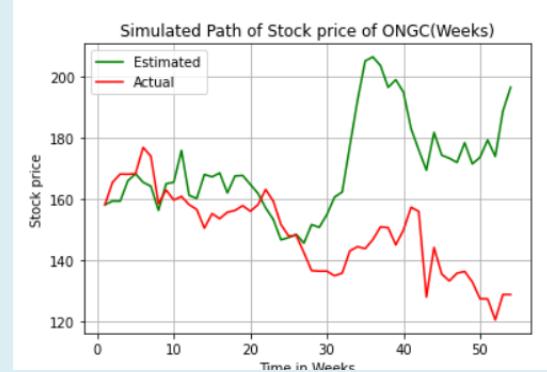
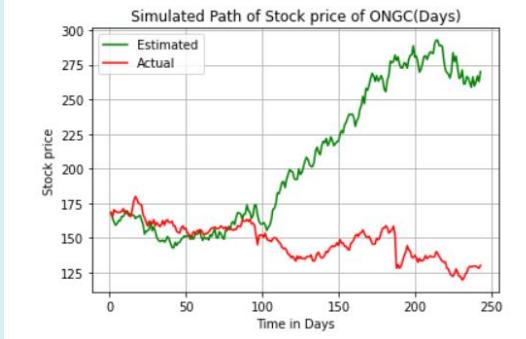
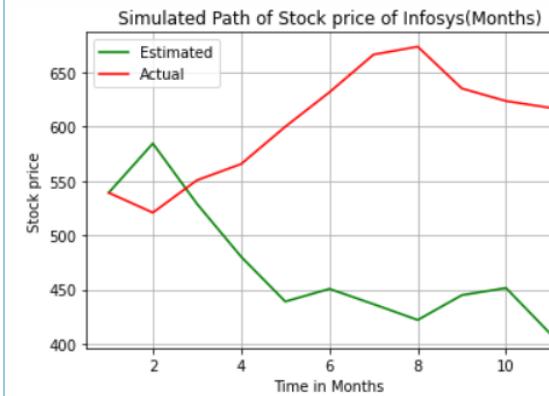
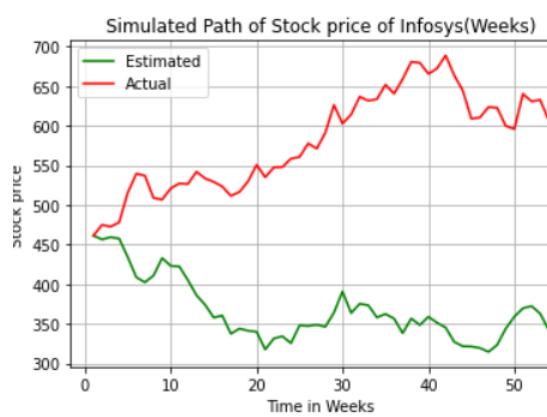
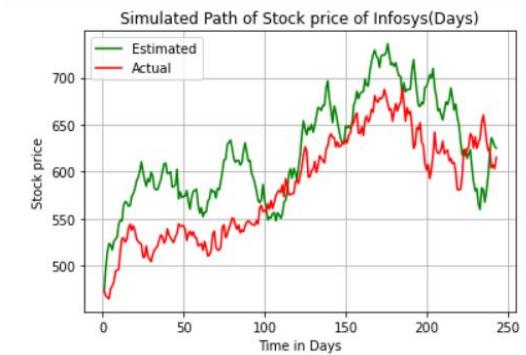


SBI

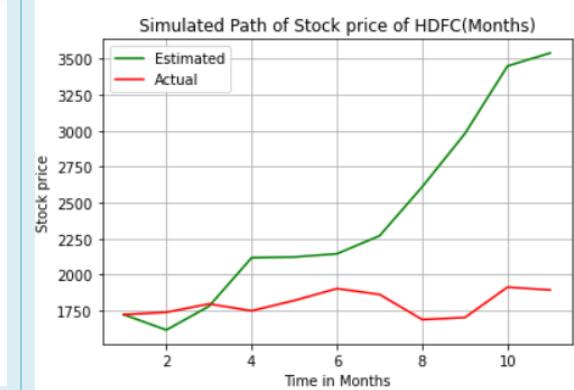
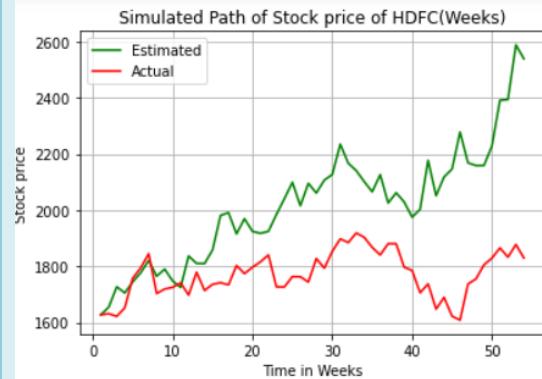




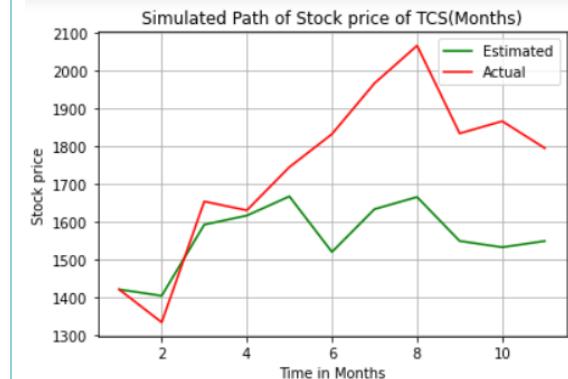
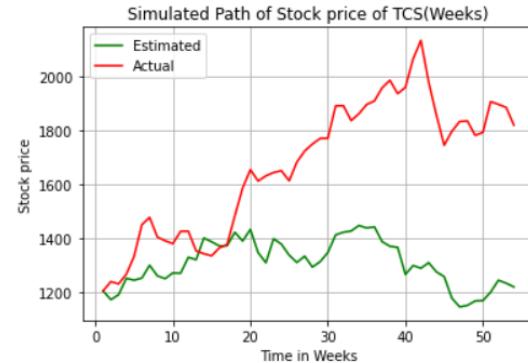
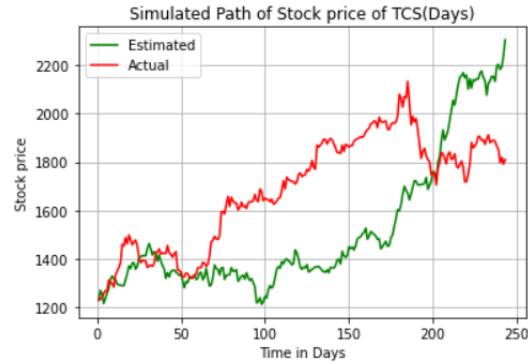


ITC**ONGC****Infosys**

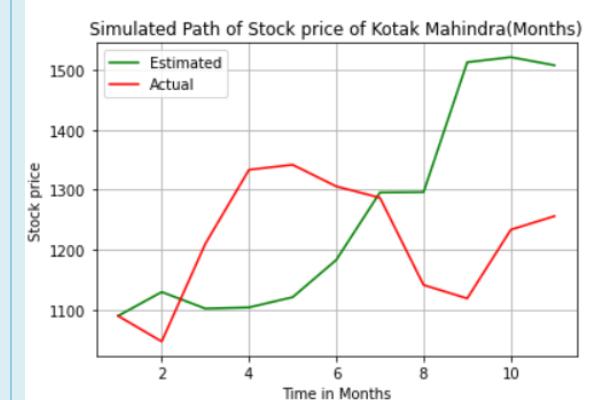
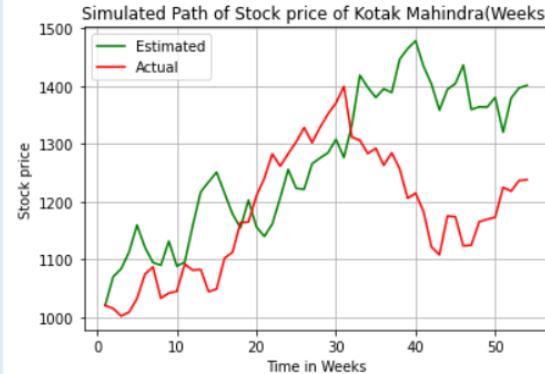
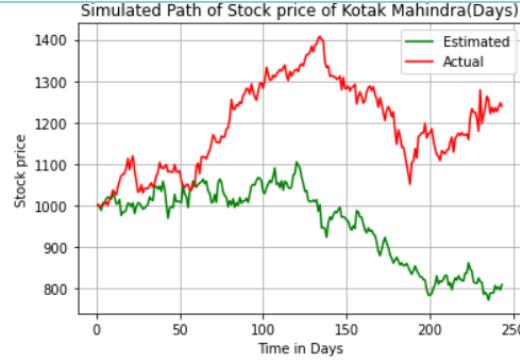
HDFC



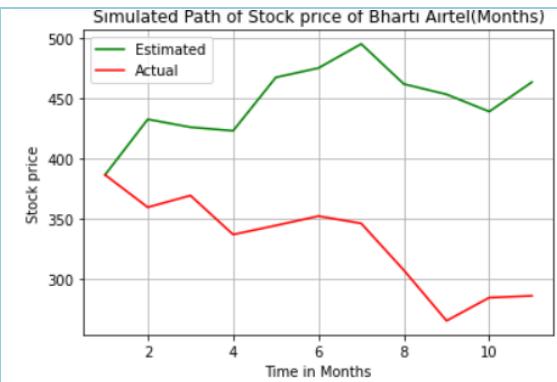
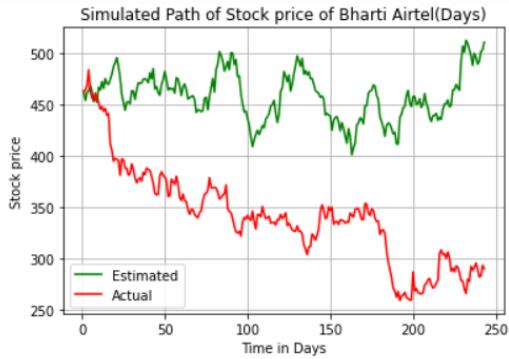
TCS



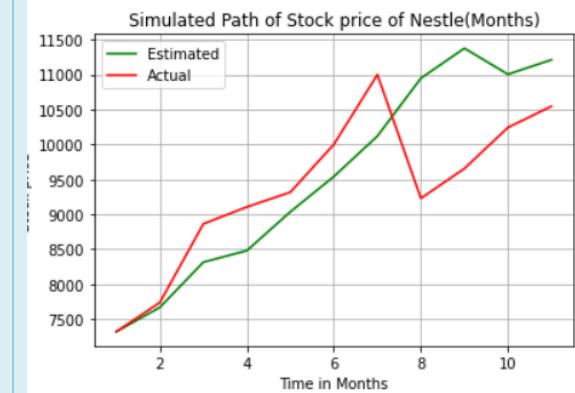
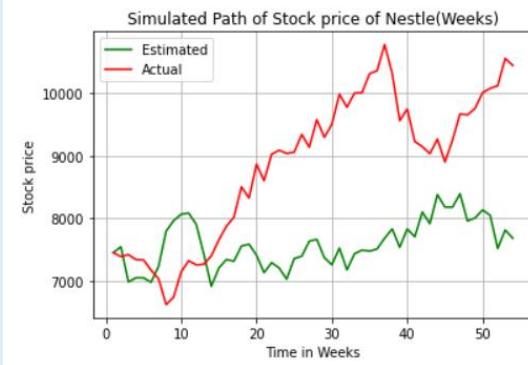
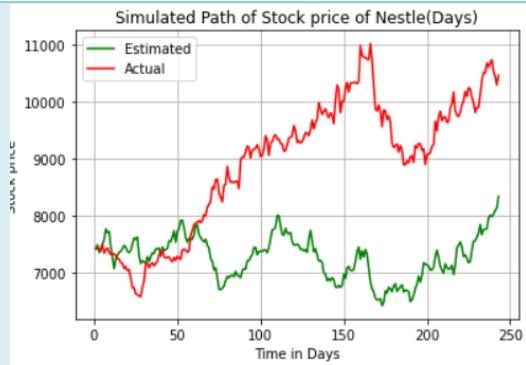
Kotak



Airtel



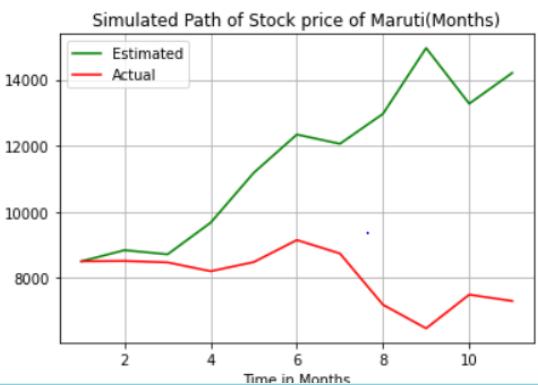
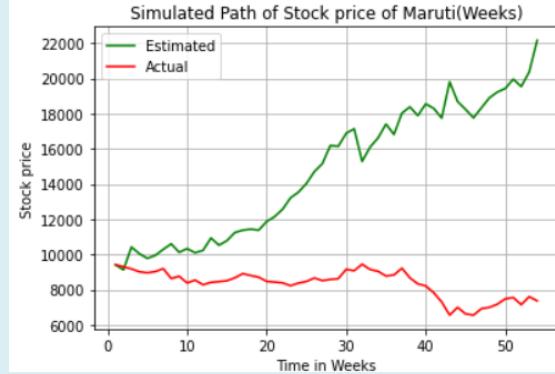
Nestle



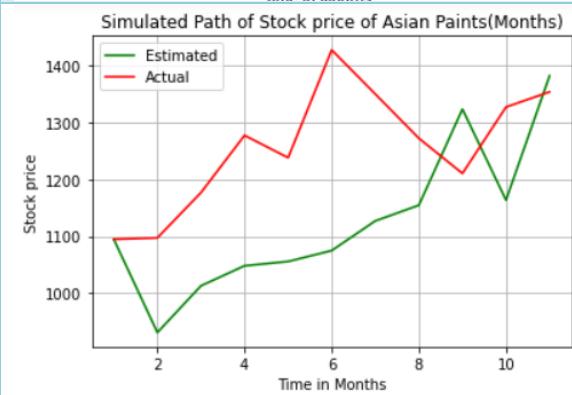
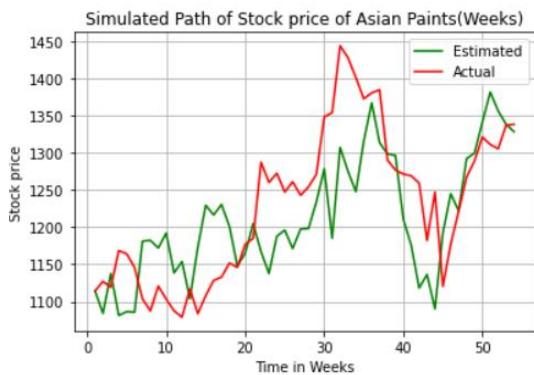
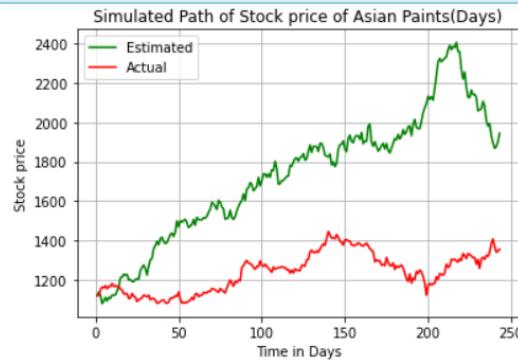
Housing



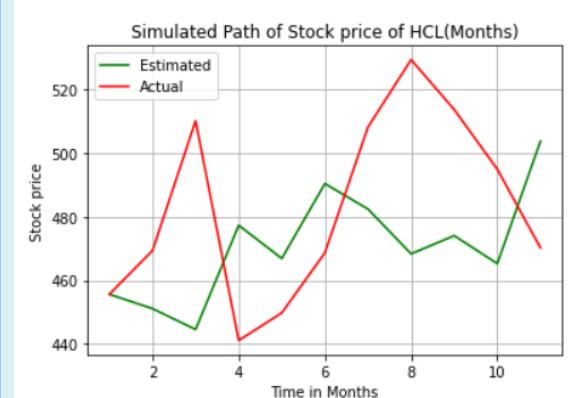
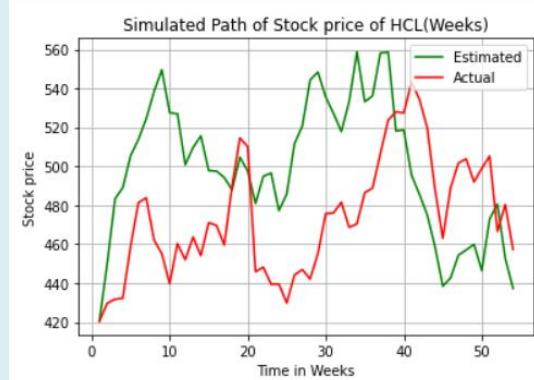
Maruti



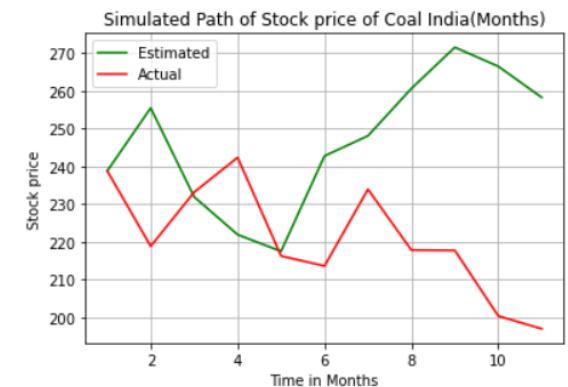
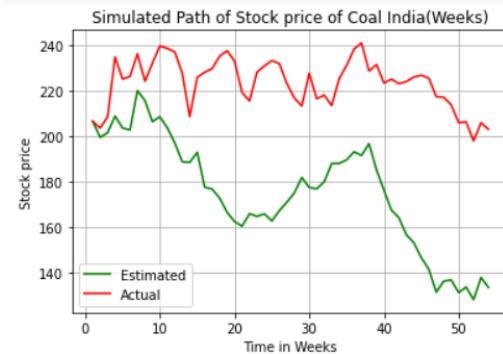
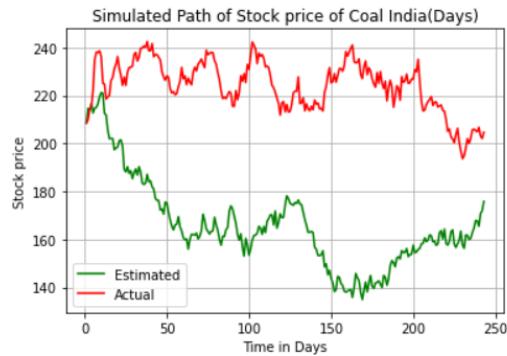
Asian



HCL



Coal



The mean, sigma and Company Name for the daily stock prices are as follows:

```
0.0008305162297699539 0.020876720872376846 SBI
0.001552094251646145 0.019906812079565937 Titan
0.0008852738314315267 0.015266566115398813 Reliance
0.0007124413845953622 0.019221051200702194 ICICI
0.0010170024056080737 0.019182360856349782 Axis
0.0007732436470887863 0.016453046298312048 L&T
0.0010412100871883961 0.016424562912385747 Ultratech
0.0003918105247003986 0.0159177897285534 ITC
0.0002977870892664703 0.01825046305398661 ONGC
0.0003974017341035103 0.01542500923828784 Infosys
*****
0.0009268108800256803 0.016261487684676546 HDFC
0.00039853935487712405 0.014257014228197537 TCS
0.001147983307096862 0.014862862090482869 Kotak Mahindra
0.0006313682665101231 0.01765910292125515 Bharti Airtel
0.0005453640746230837 0.014836334979326316 Nestle
0.0007894111346566795 0.03582375703660881 Housing Development
0.0018735421490940502 0.015407850053974678 Maruti
0.0009997536798403268 0.01595635101082707 Asian Paints
0.0005677794705507553 0.01676640064422657 HCL
0.00036417168708485445 0.01712638670596415 Coal India
```

Here, mean and sigma for Sensex and Nifty are as follows:

```
Daily
*****
0.0005144429664410076 0.008496861030054315
*****
0.000571444320528465 0.008549372761066924
```

Q5.

They have been done in the above question.