

MA-374 Lab Assignment 6

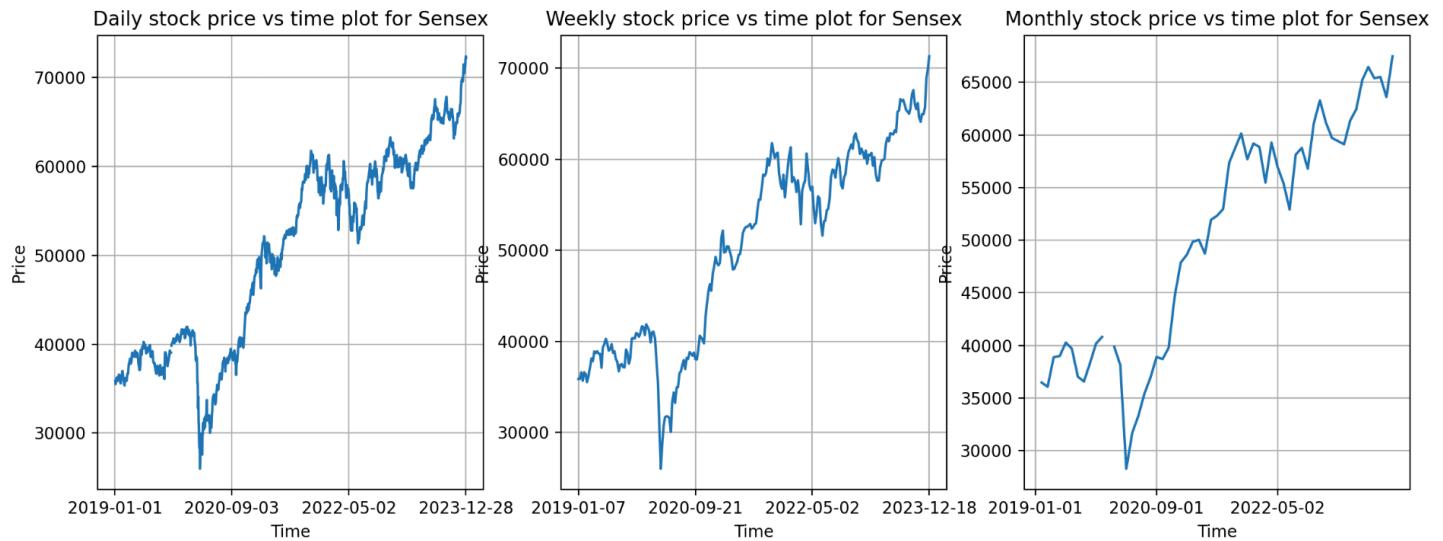
By-Arush Gupta

210123008

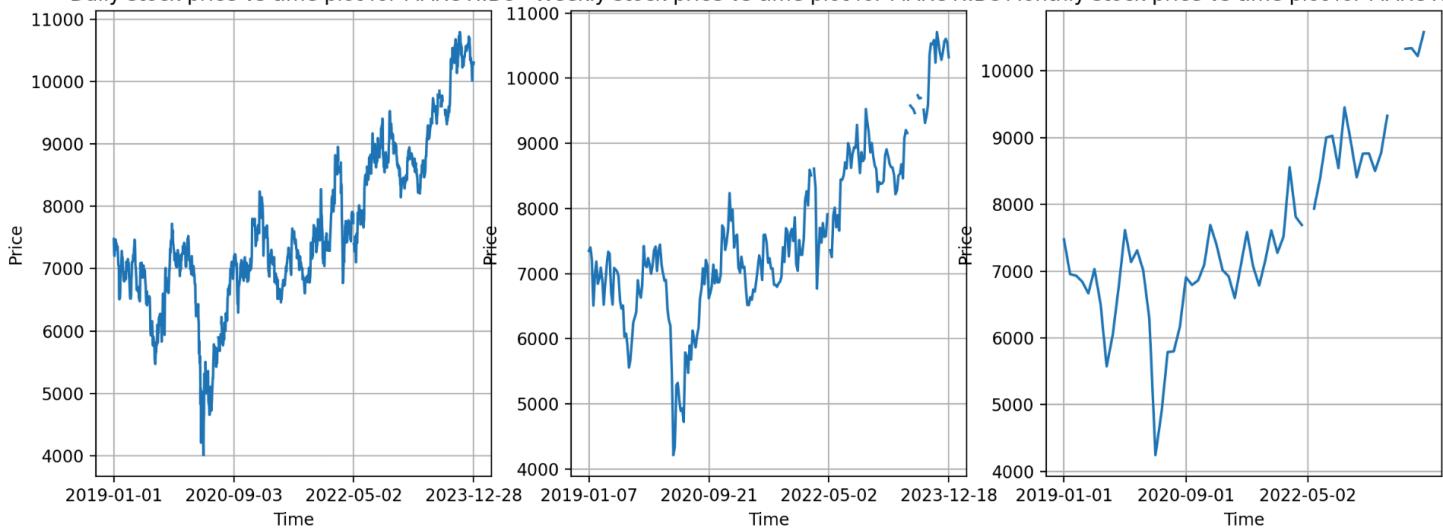
Question 1:

Some of the plots for the data in bse index is as follows :

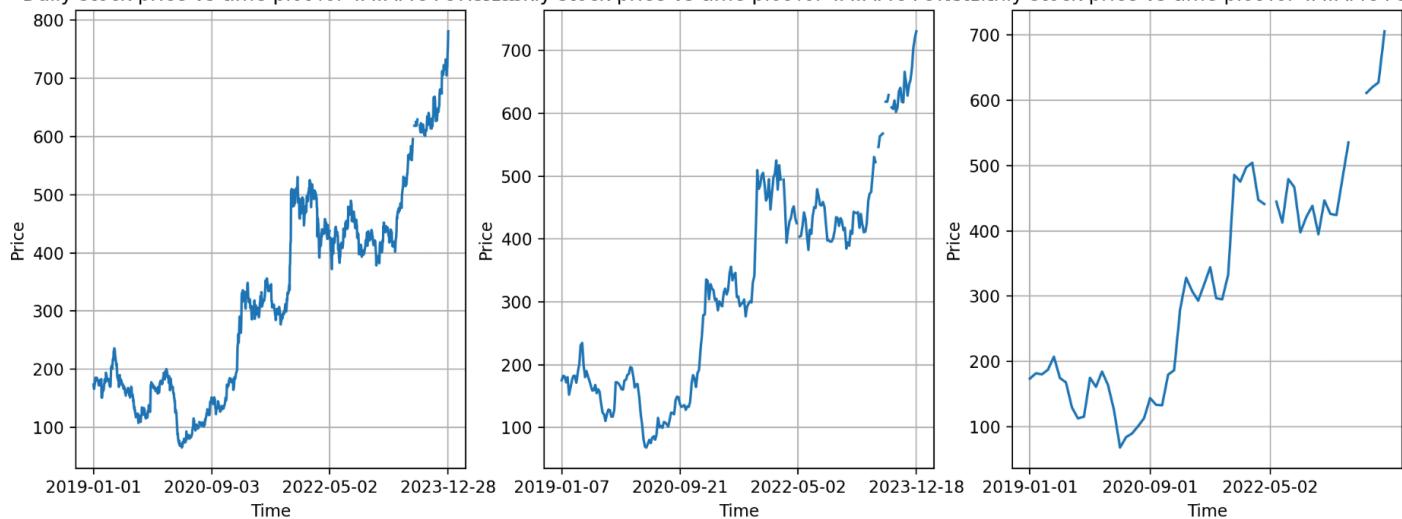
STOCKS IN BSE SENSEX



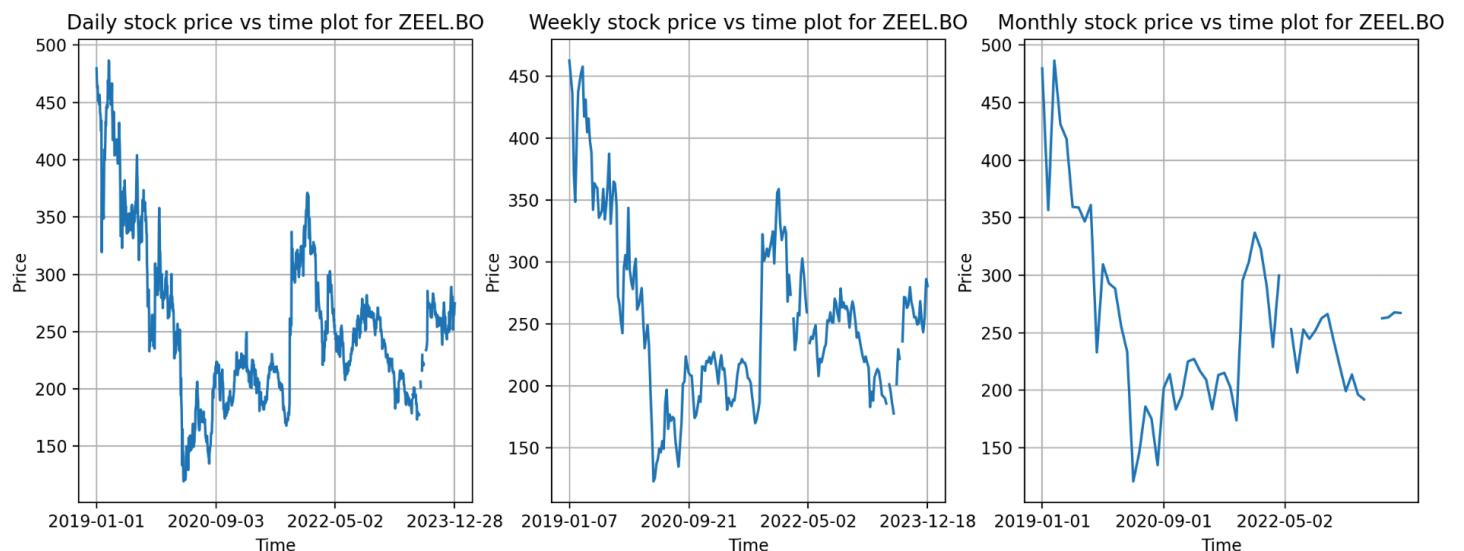
Daily stock price vs time plot for MARUTI.BO Weekly stock price vs time plot for MARUTI.BO Monthly stock price vs time plot for MARUTI.BO

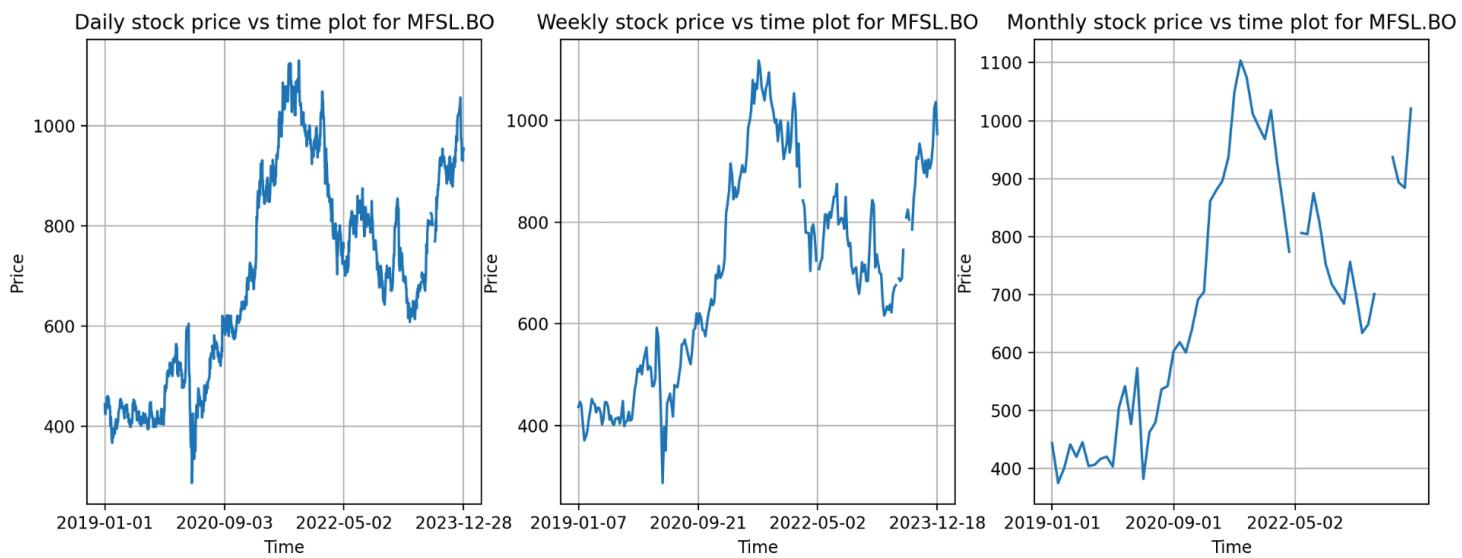


Daily stock price vs time plot for TATAMOTORS.BO Weekly stock price vs time plot for TATAMOTORS.BO Monthly stock price vs time plot for TATAMOTORS.BO



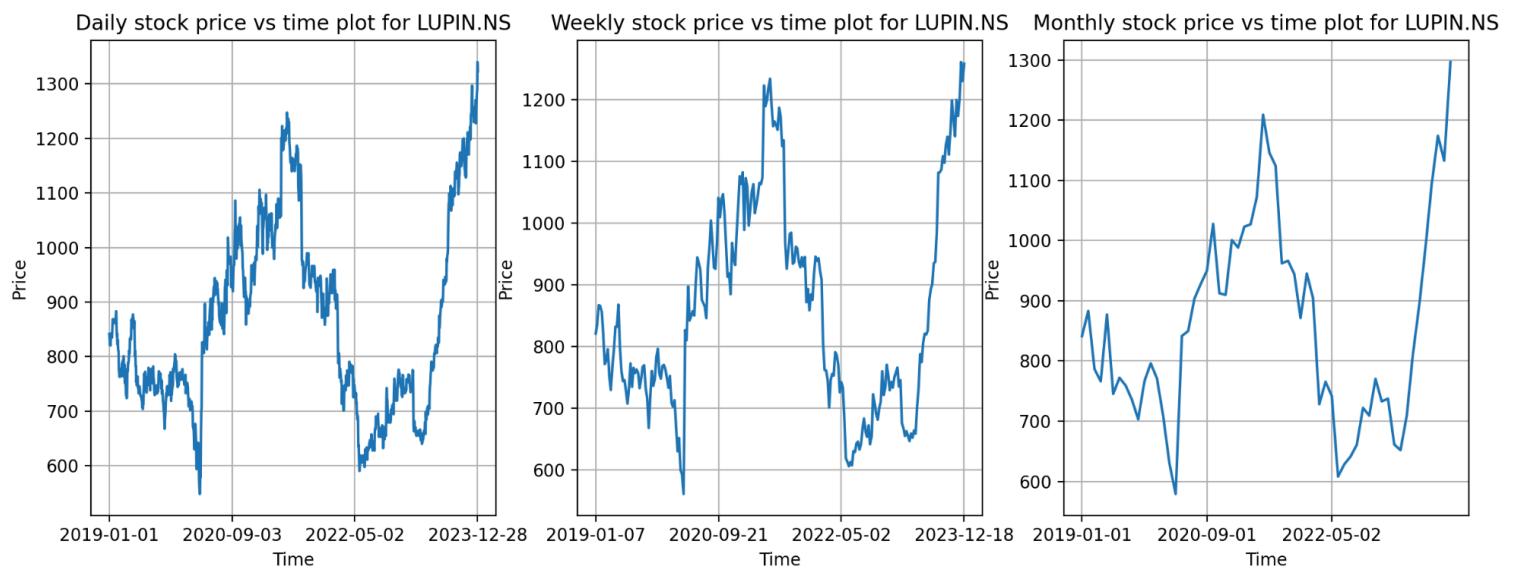
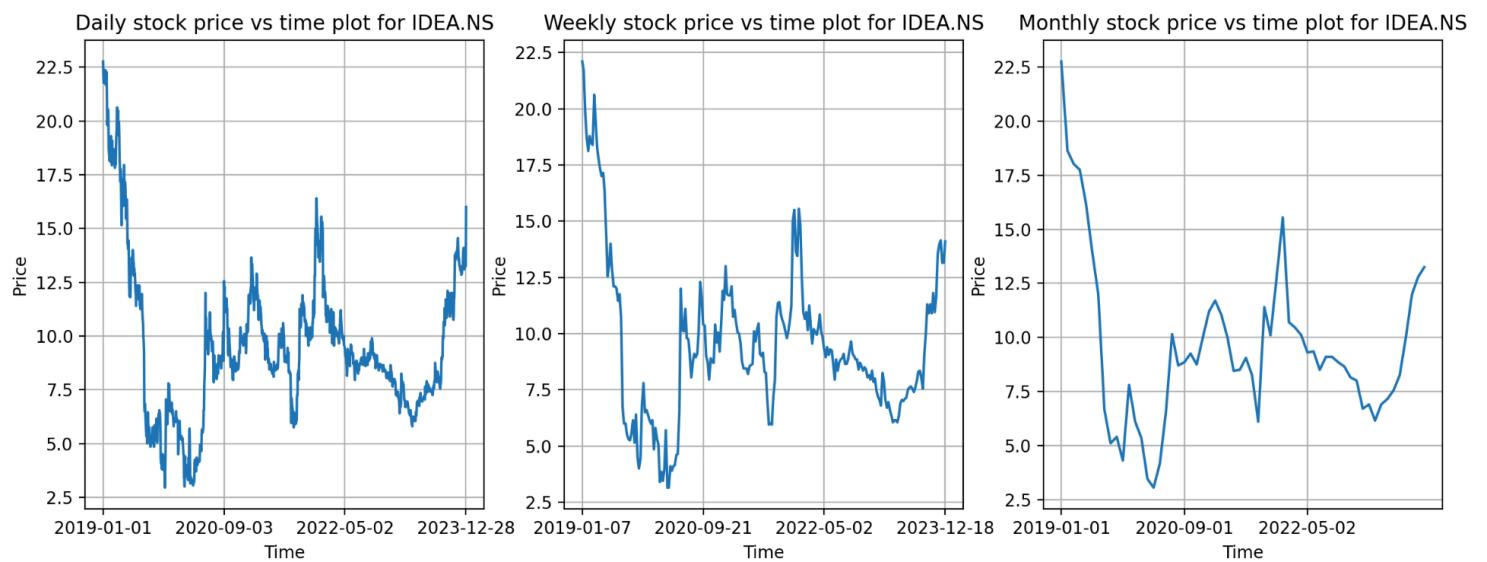
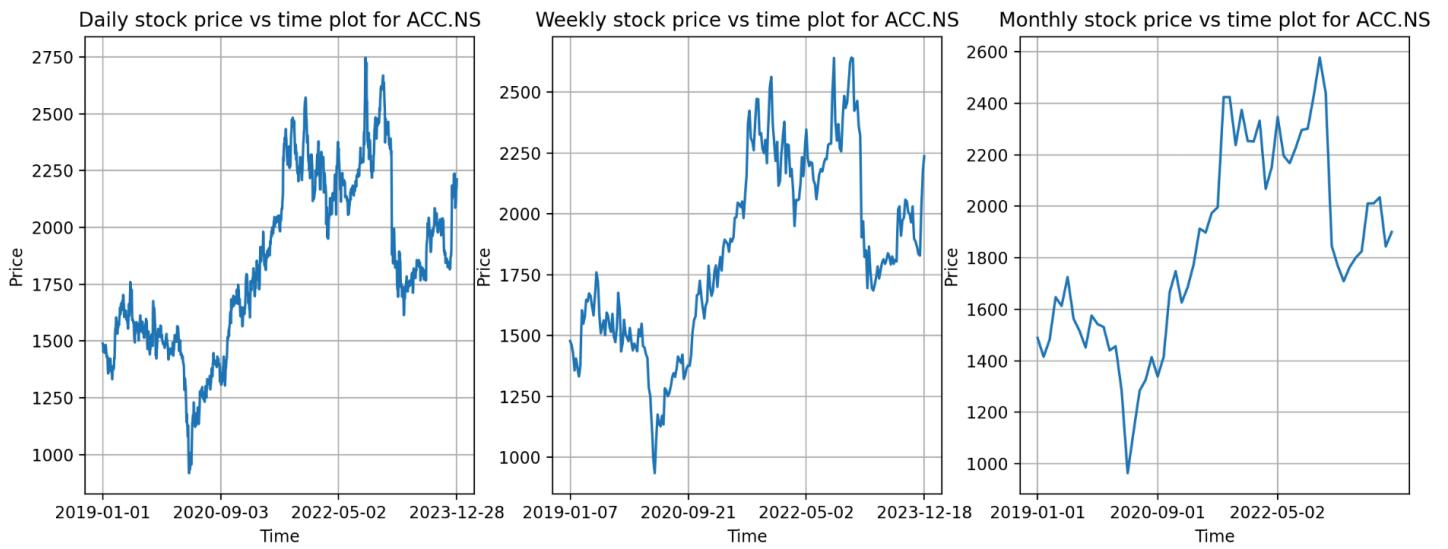
STOCKS NOT IN BSE SENSEX



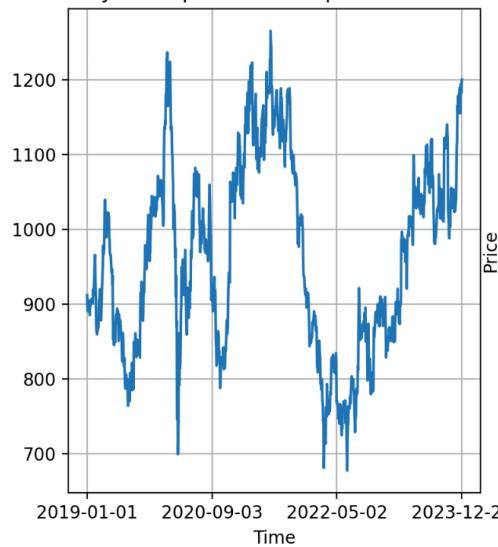


STOCKS IN NSE NIFTY





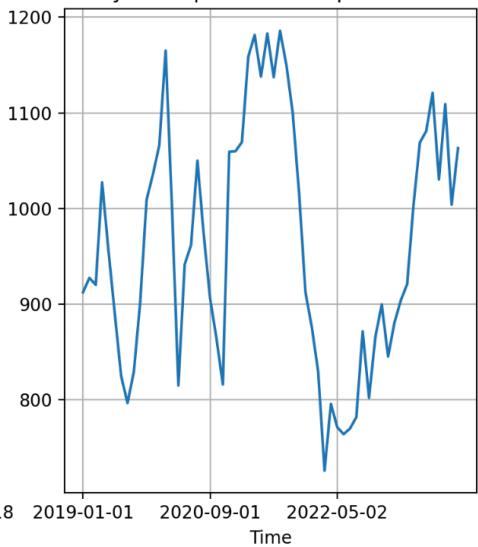
Daily stock price vs time plot for MGL.NS



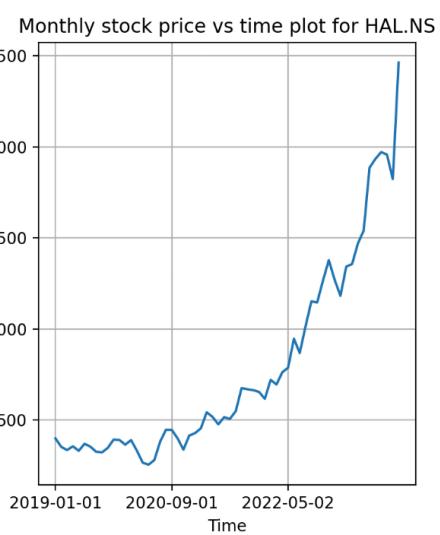
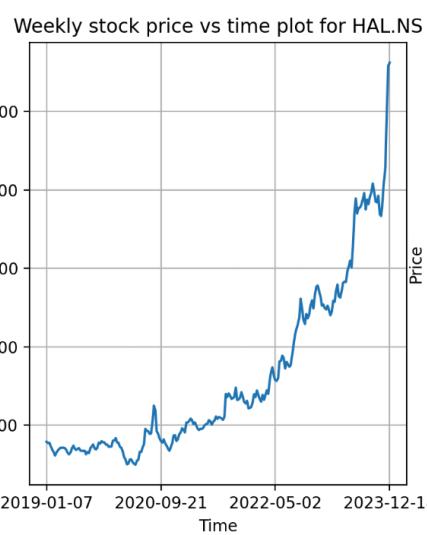
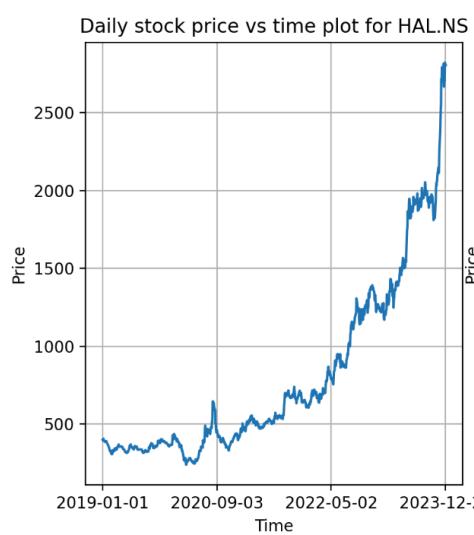
Weekly stock price vs time plot for MGL.NS



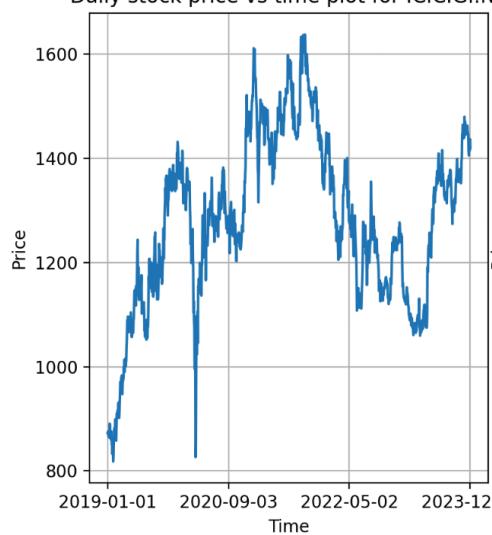
Monthly stock price vs time plot for MGL.NS



STOCKS NOT IN NSE NIFTY



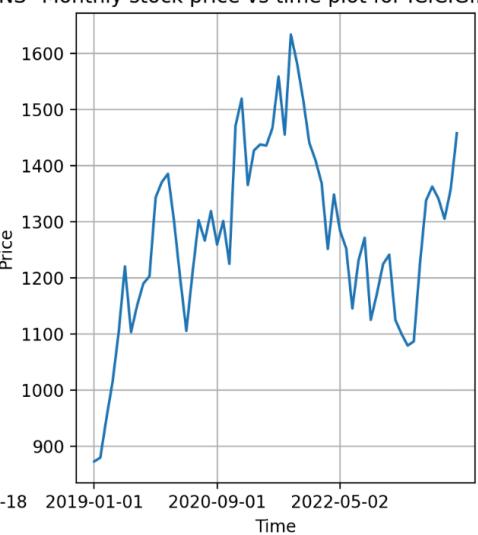
Daily stock price vs time plot for ICICIGI.NS

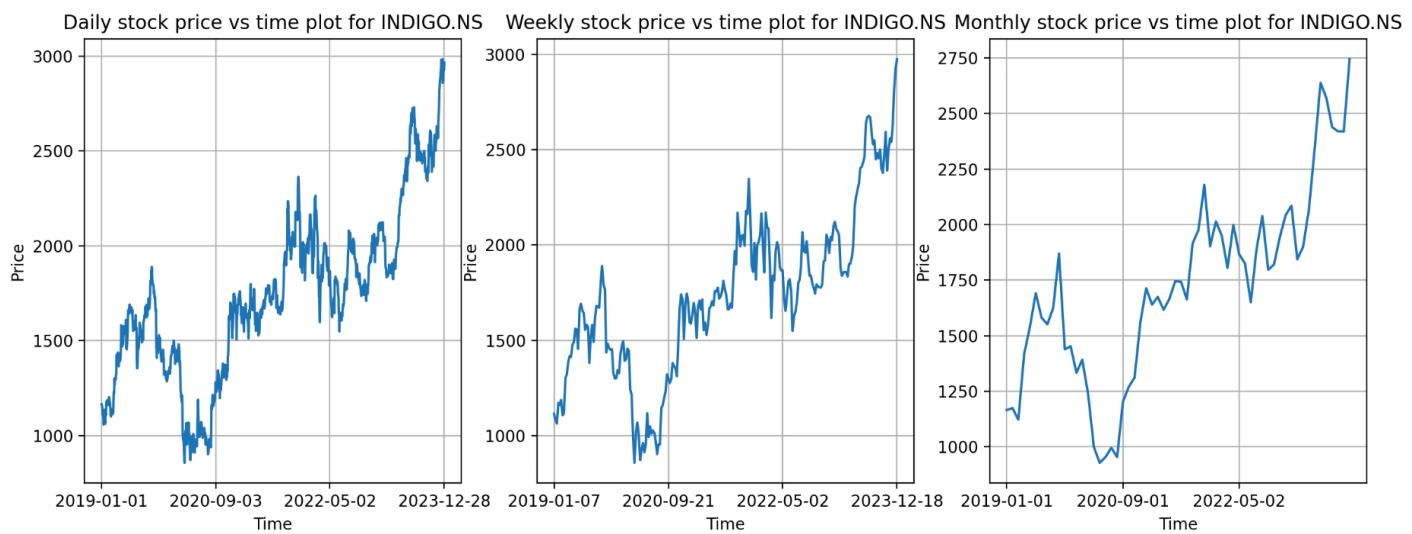
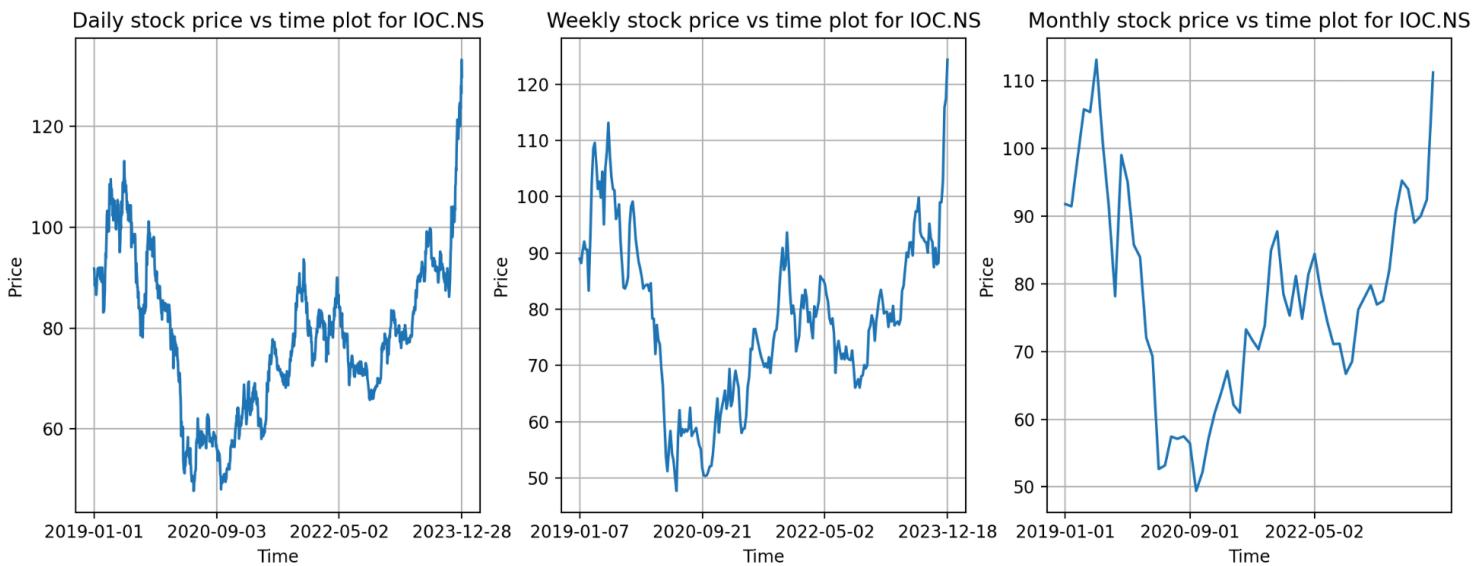


Weekly stock price vs time plot for ICICIGI.NS



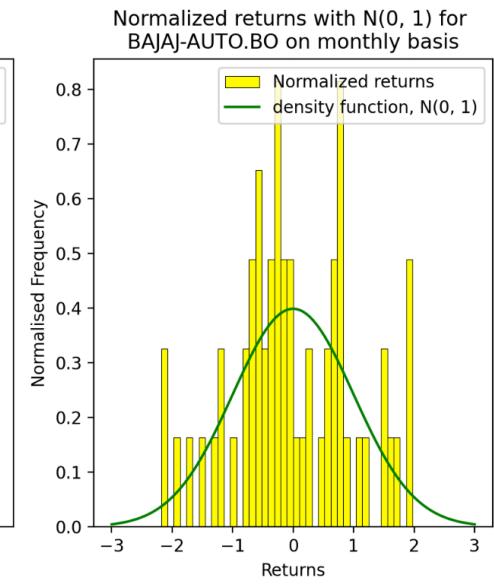
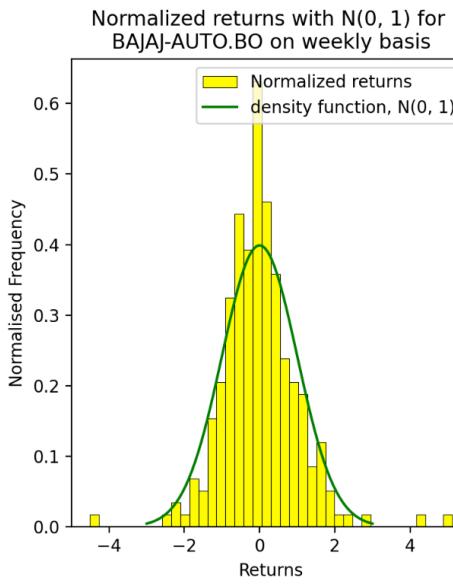
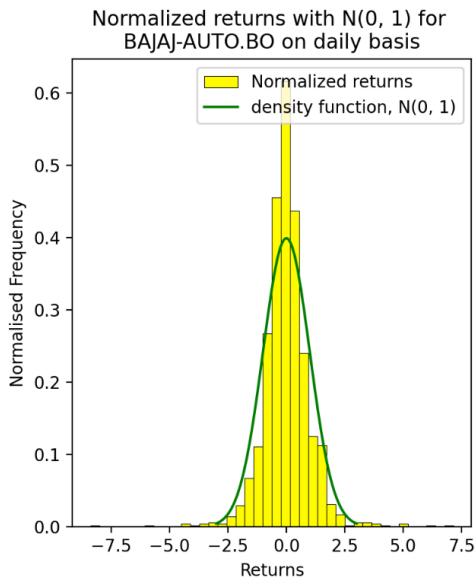
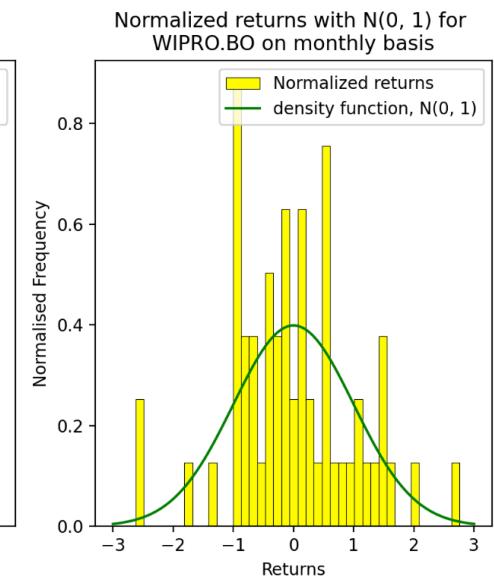
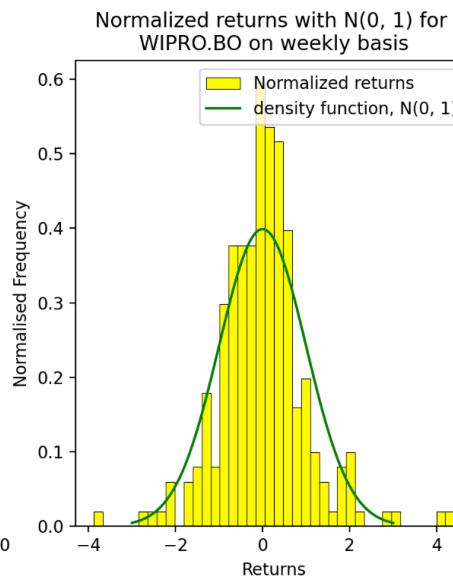
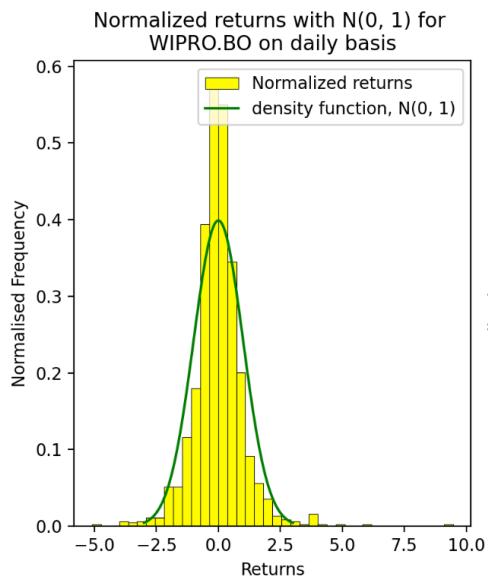
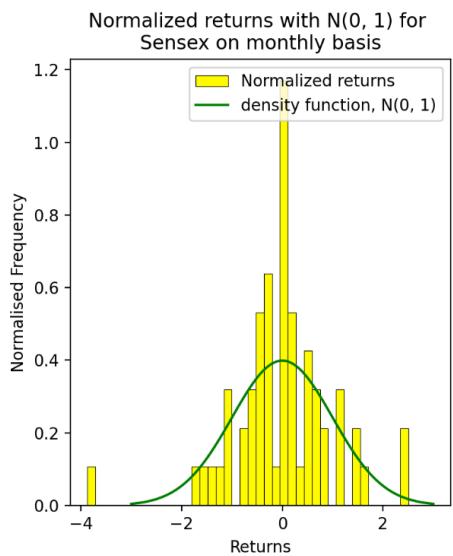
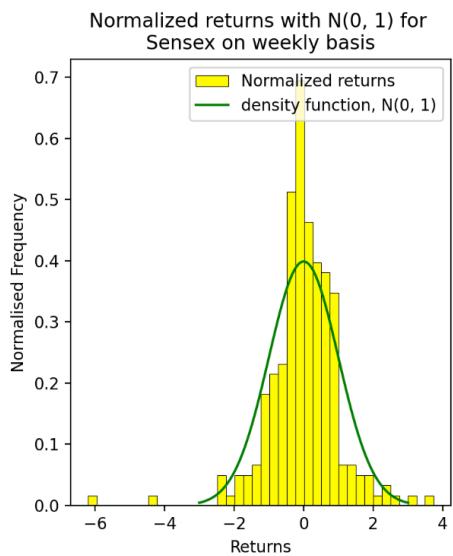
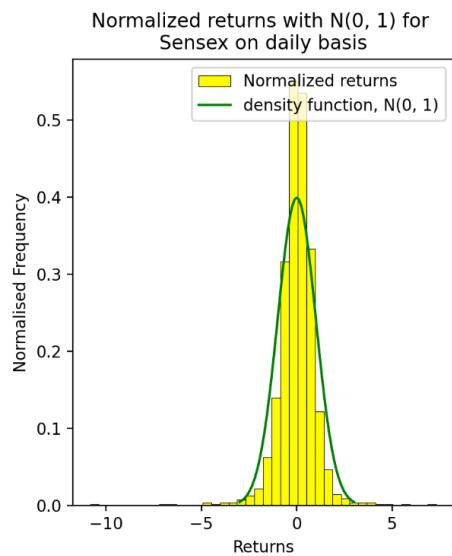
Monthly stock price vs time plot for ICICIGI.NS

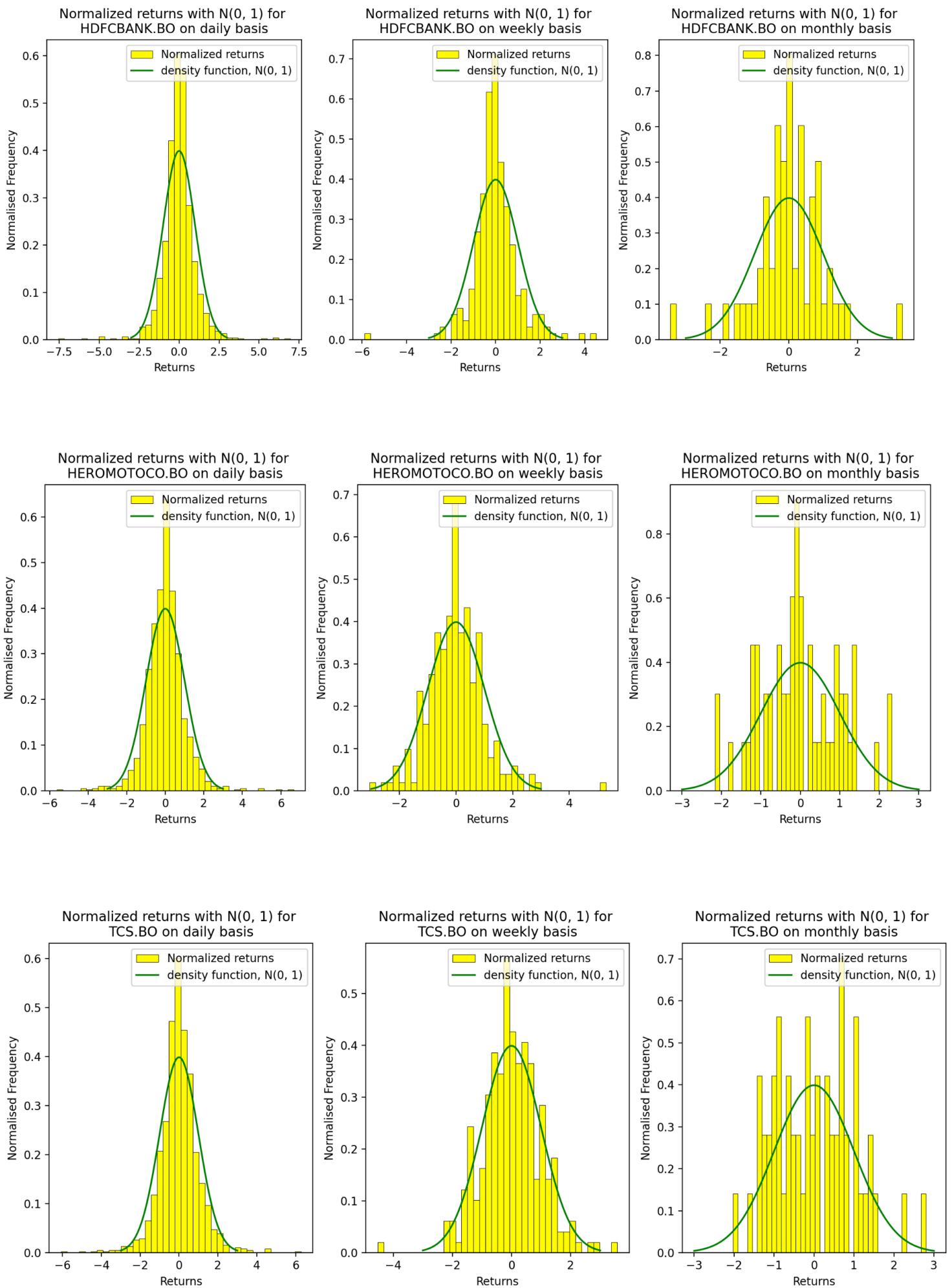




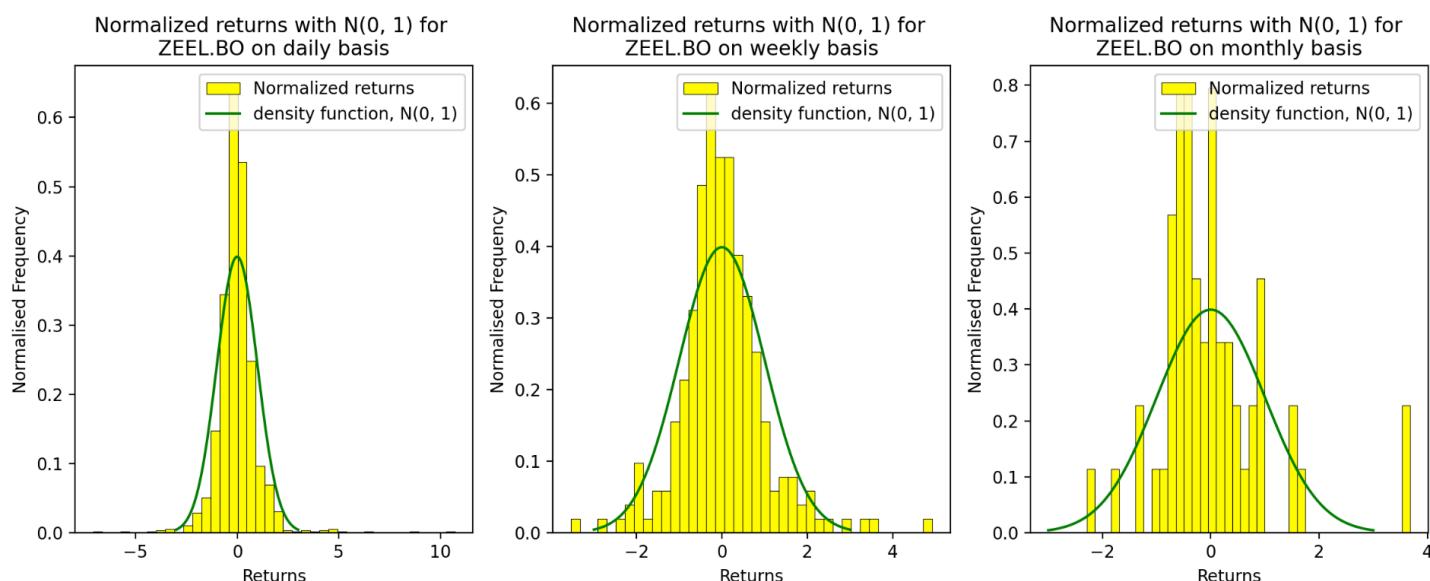
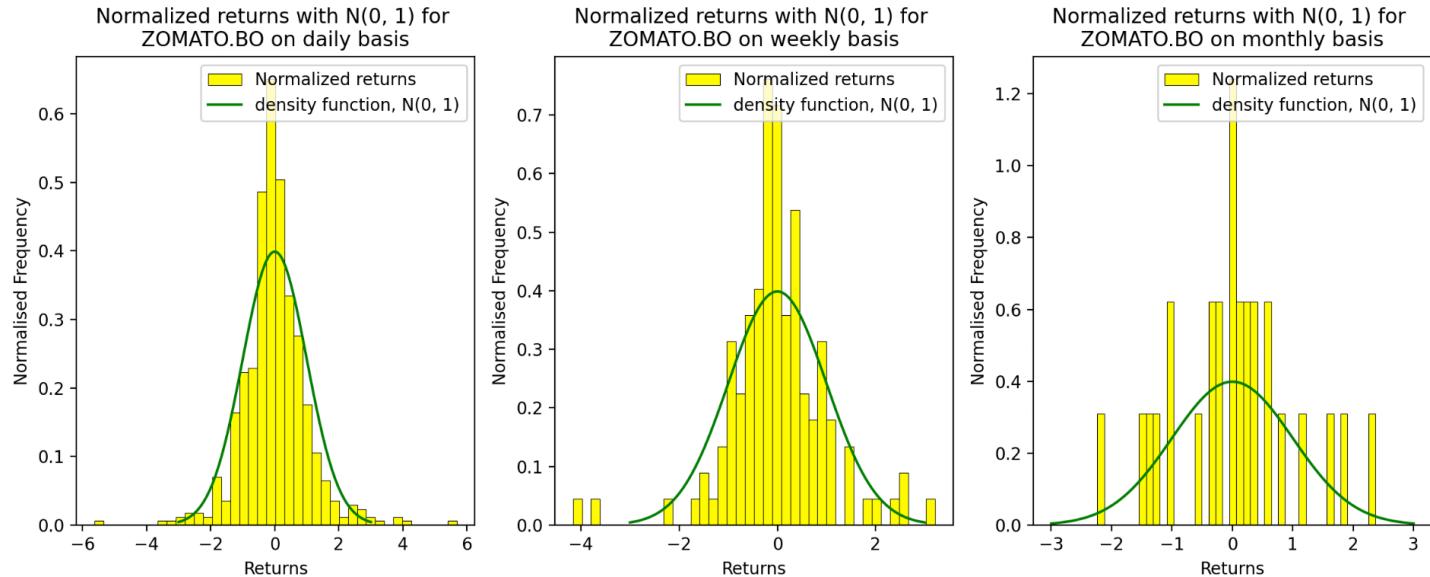
Question 2:

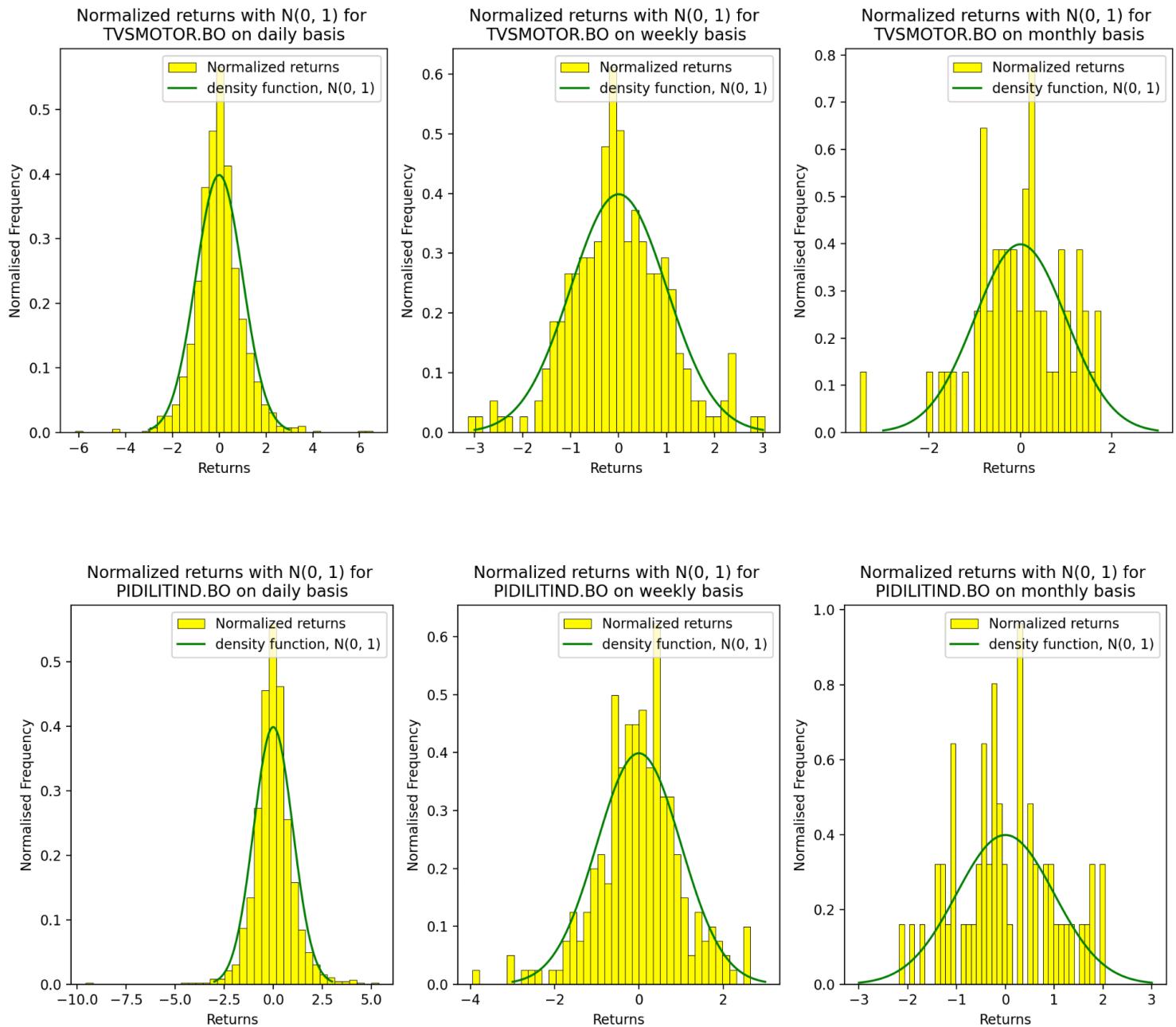
Some of the histogram plots of the normalized returns superimposing in a graph of the density function $N(0, 1)$ for the data in bse index are:





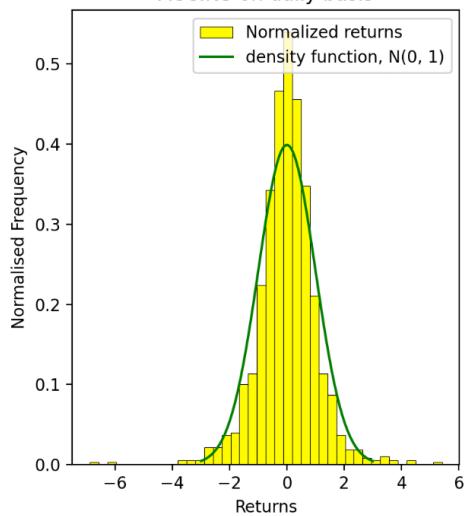
Some of the histogram plots of the normalized returns superimposing in a graph of the density function $N(0, 1)$ for the data NOT in bse index are:



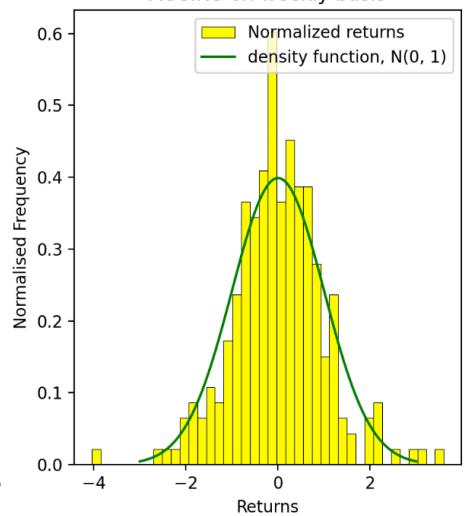


Some of the histogram plots of the normalized returns superimposing in a graph of the density function $N(0, 1)$ for the data in nse index are:

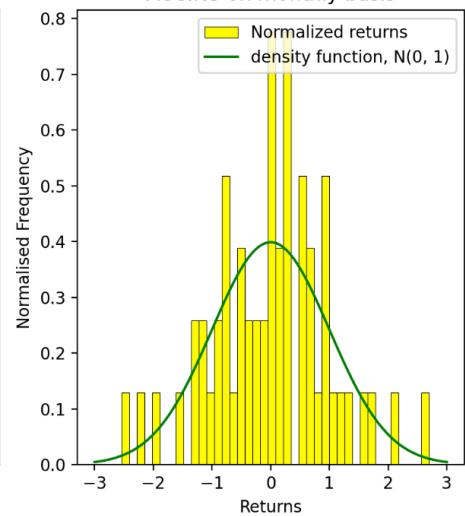
Normalized returns with $N(0, 1)$ for
ACC.NS on daily basis



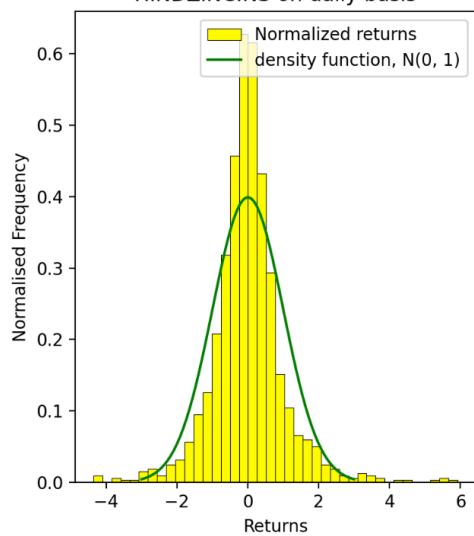
Normalized returns with $N(0, 1)$ for
ACC.NS on weekly basis



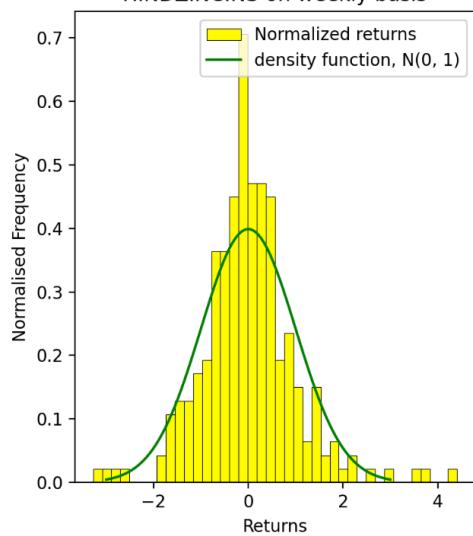
Normalized returns with $N(0, 1)$ for
ACC.NS on monthly basis



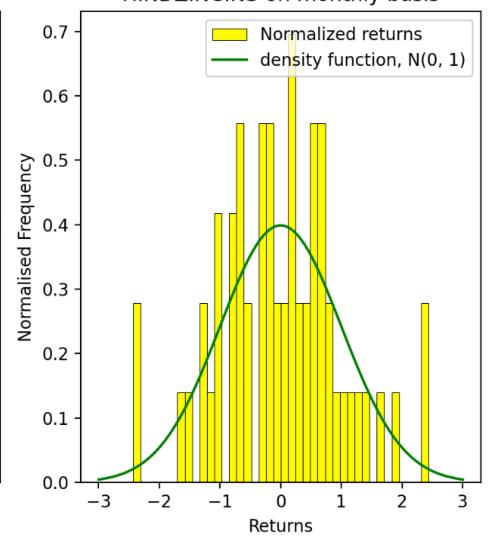
Normalized returns with $N(0, 1)$ for
HINDZINC.NS on daily basis



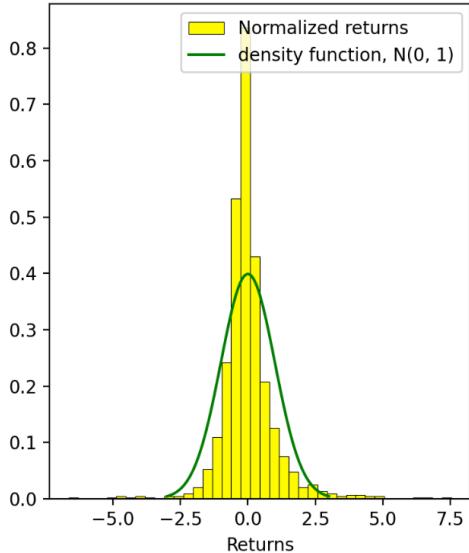
Normalized returns with $N(0, 1)$ for
HINDZINC.NS on weekly basis



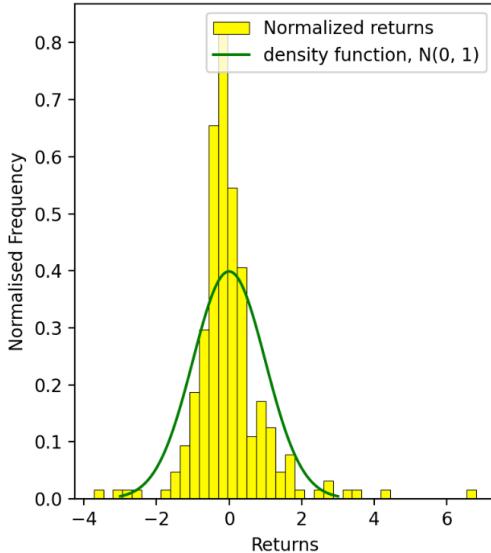
Normalized returns with $N(0, 1)$ for
HINDZINC.NS on monthly basis



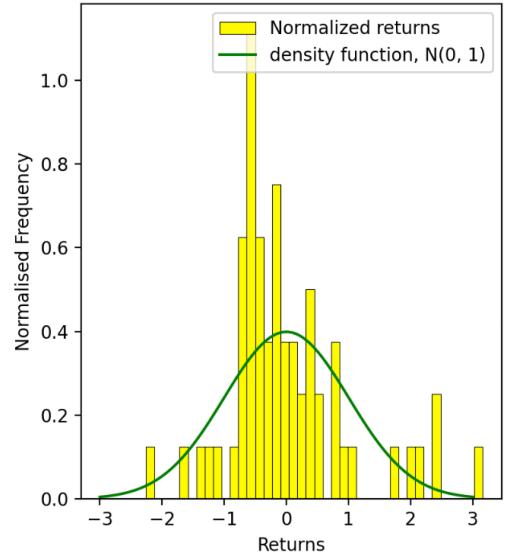
Normalized returns with $N(0, 1)$ for IDEA.NS on daily basis



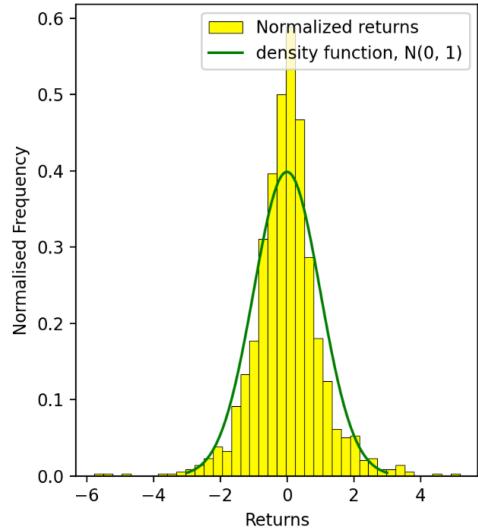
Normalized returns with $N(0, 1)$ for IDEA.NS on weekly basis



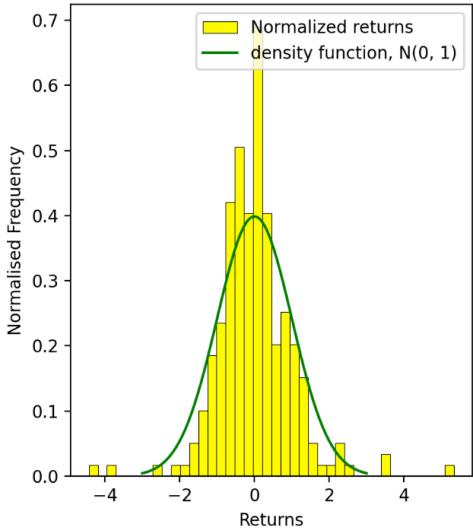
Normalized returns with $N(0, 1)$ for IDEA.NS on monthly basis



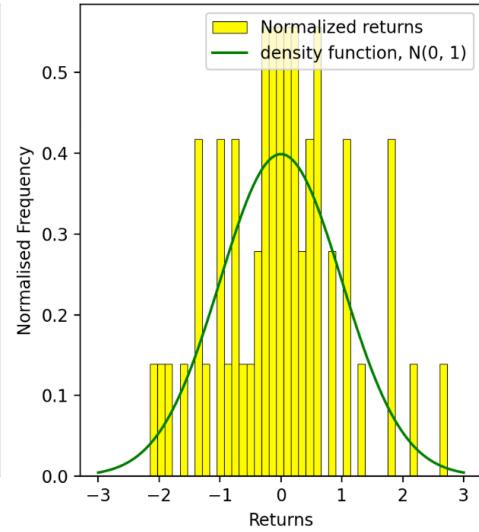
Normalized returns with $N(0, 1)$ for IGL.NS on daily basis



Normalized returns with $N(0, 1)$ for IGL.NS on weekly basis

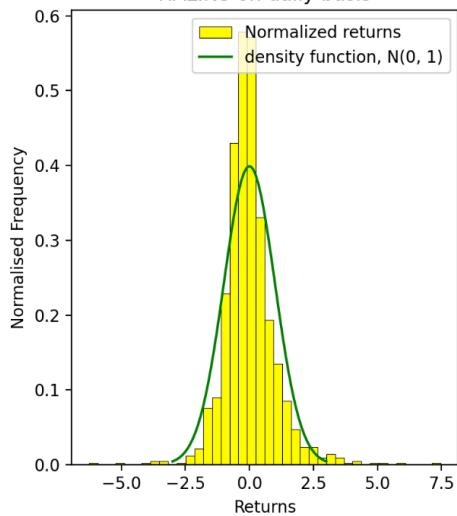


Normalized returns with $N(0, 1)$ for IGL.NS on monthly basis

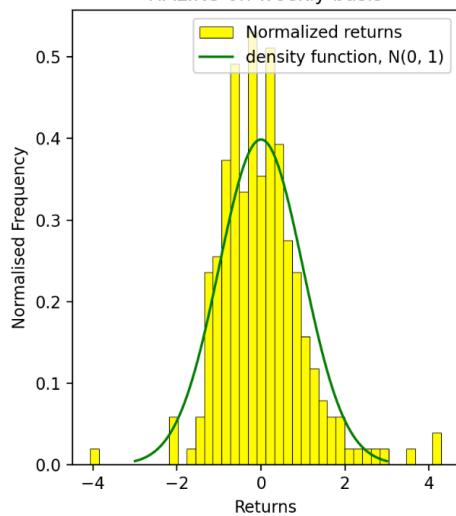


Some of the histogram plots of the normalized returns superimposing in a graph of the density function $N(0, 1)$ for the data NOT IN nse index are:

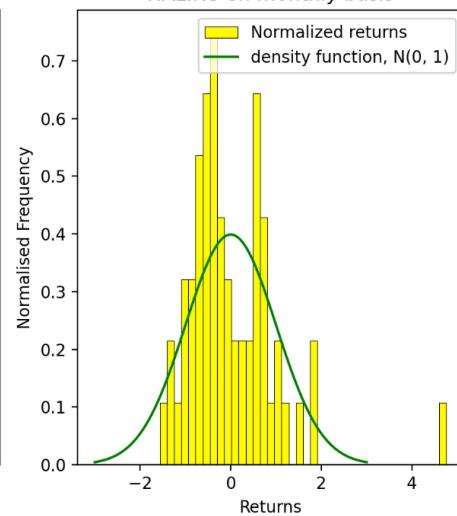
Normalized returns with $N(0, 1)$ for HAL.NS on daily basis



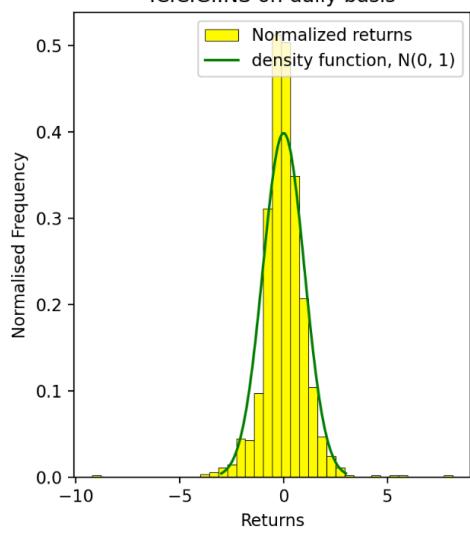
Normalized returns with $N(0, 1)$ for HAL.NS on weekly basis



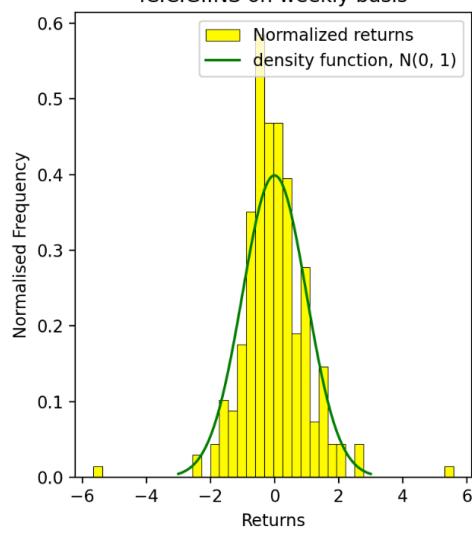
Normalized returns with $N(0, 1)$ for HAL.NS on monthly basis



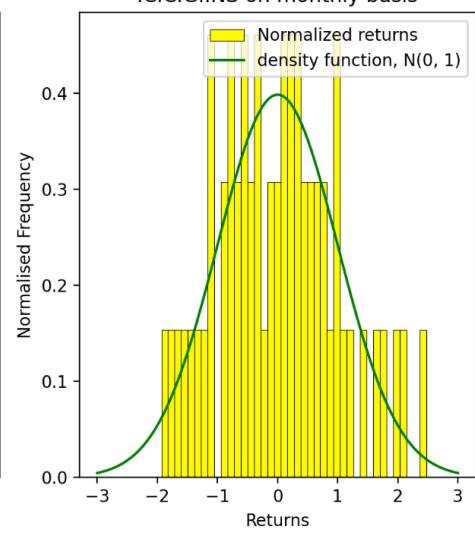
Normalized returns with $N(0, 1)$ for ICICIGI.NS on daily basis



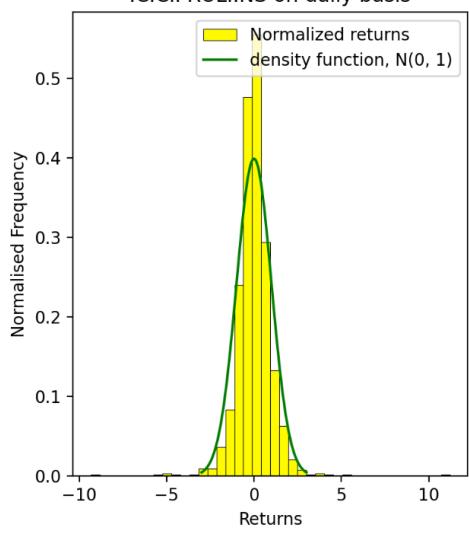
Normalized returns with $N(0, 1)$ for ICICIGI.NS on weekly basis



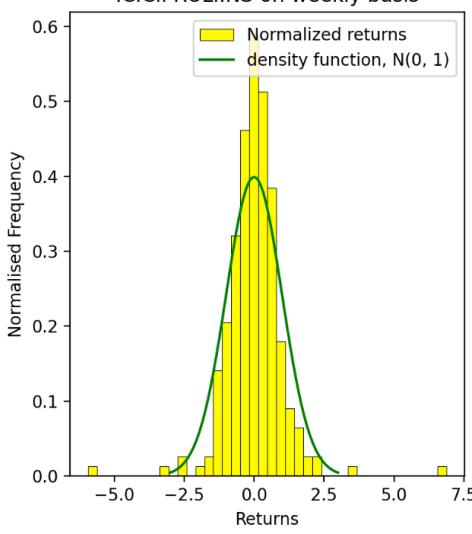
Normalized returns with $N(0, 1)$ for ICICIGI.NS on monthly basis



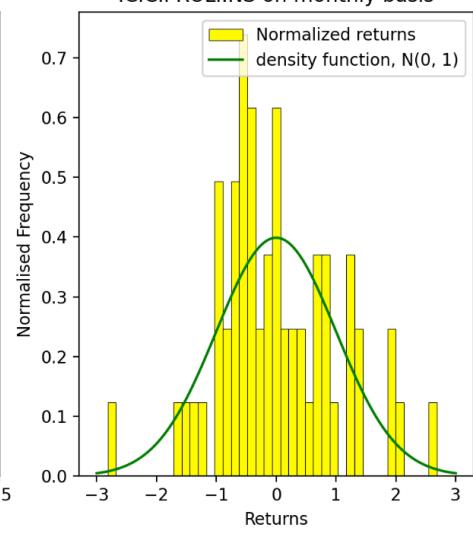
Normalized returns with $N(0, 1)$ for ICICIPRULI.NS on daily basis

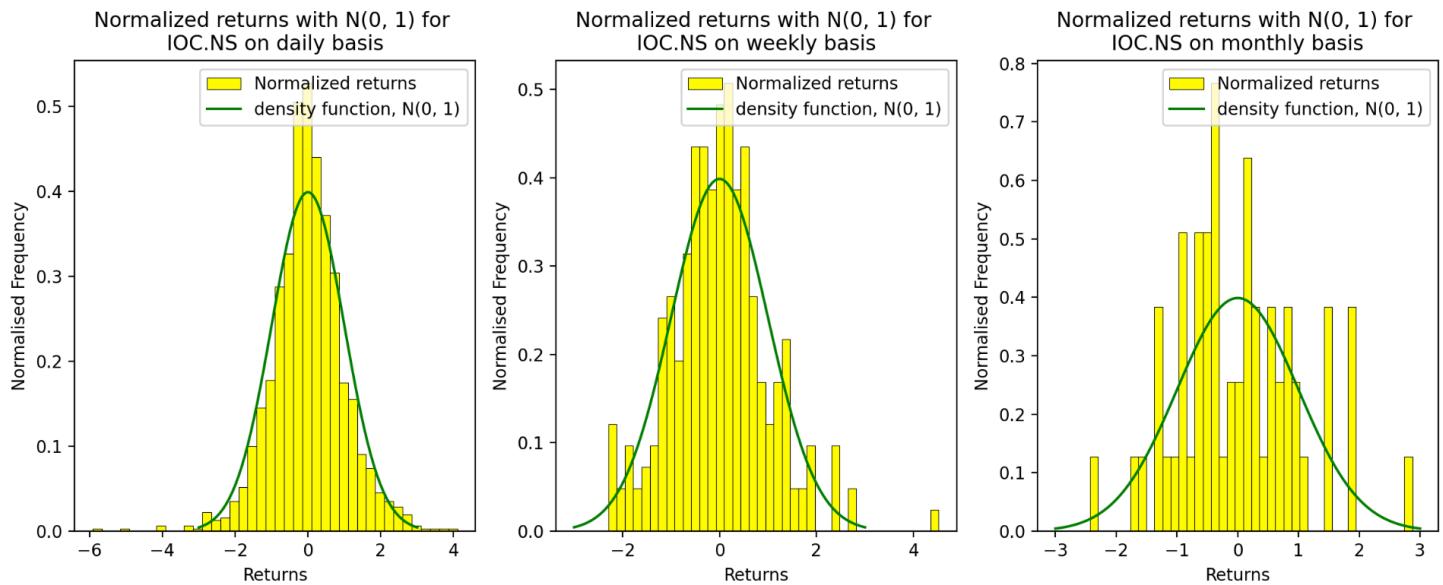


Normalized returns with $N(0, 1)$ for ICICIPRULI.NS on weekly basis

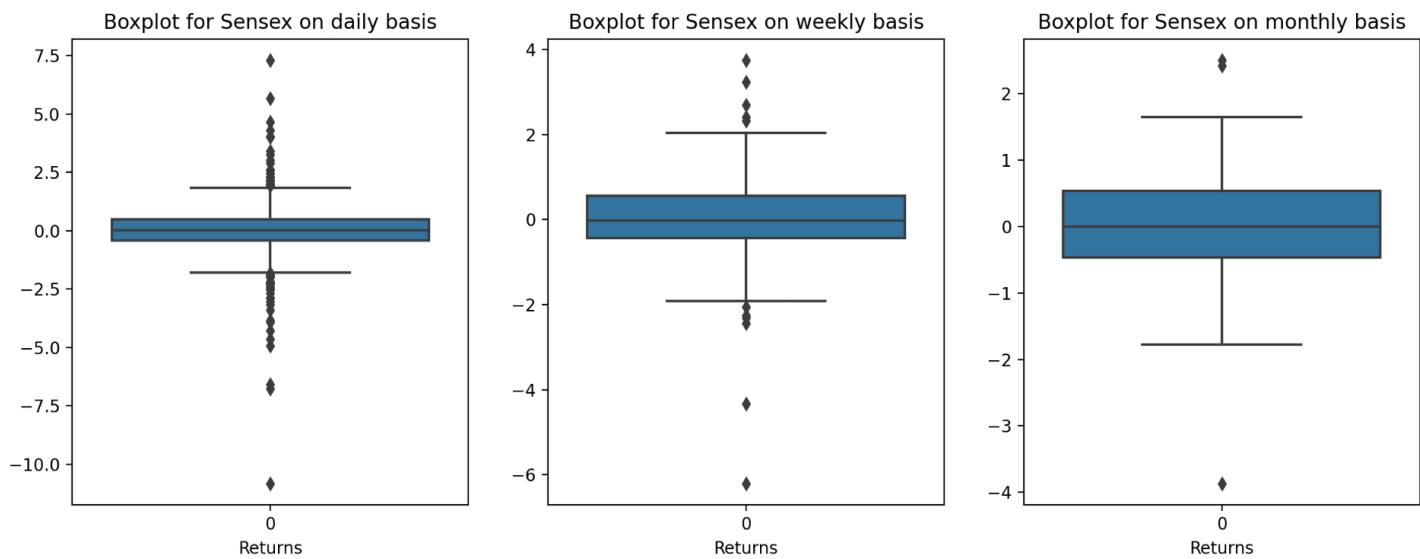


Normalized returns with $N(0, 1)$ for ICICIPRULI.NS on monthly basis

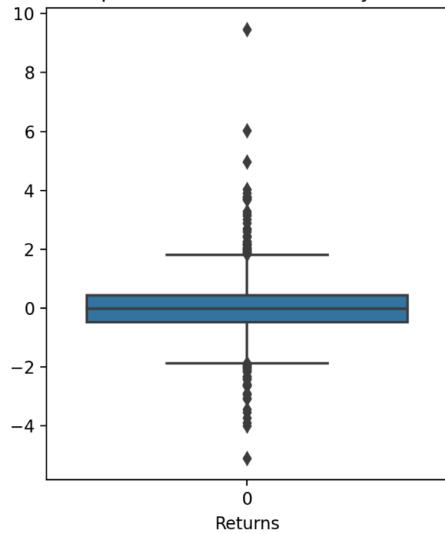




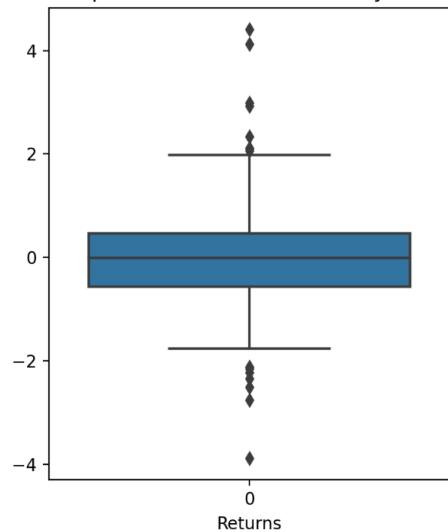
Now the corresponding boxplot of the normalized return of some of the stocks of bse index are as follows:



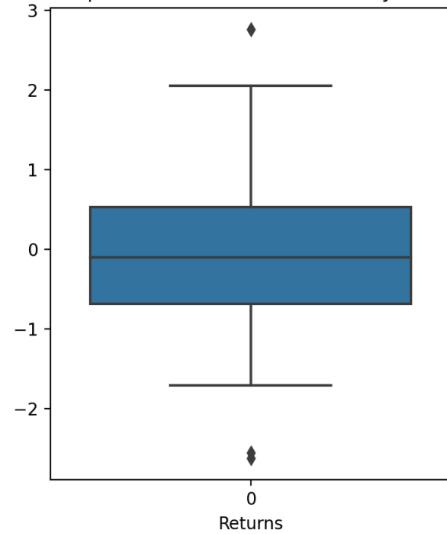
Boxplot for WIPRO.BO on daily basis



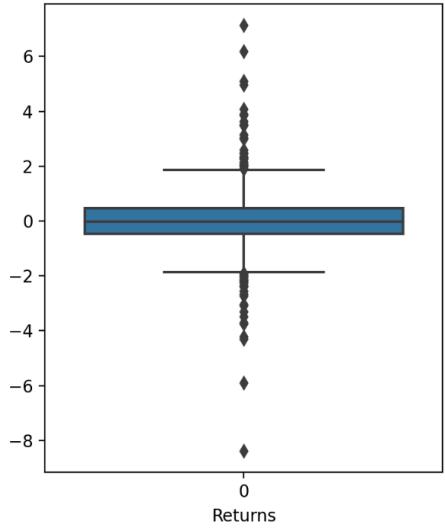
Boxplot for WIPRO.BO on weekly basis



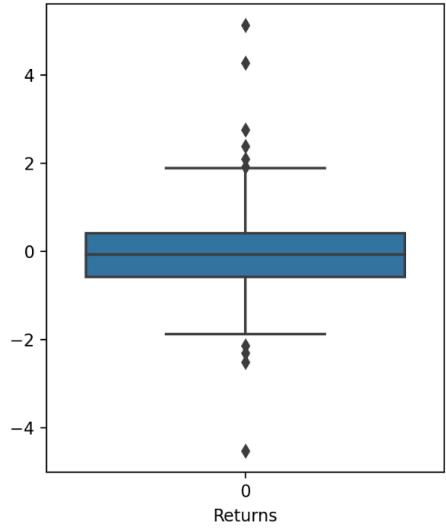
Boxplot for WIPRO.BO on monthly basis



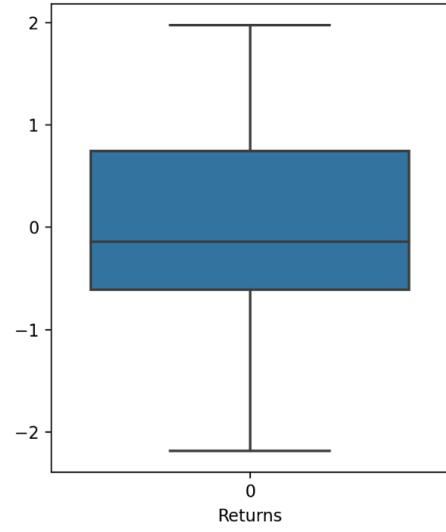
Boxplot for BAJAJ-AUTO.BO on daily basis



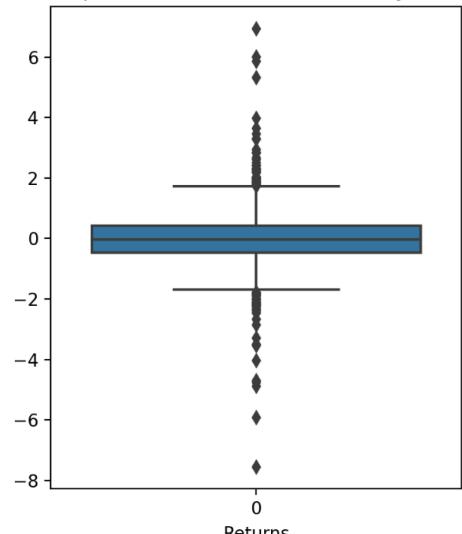
Boxplot for BAJAJ-AUTO.BO on weekly basis



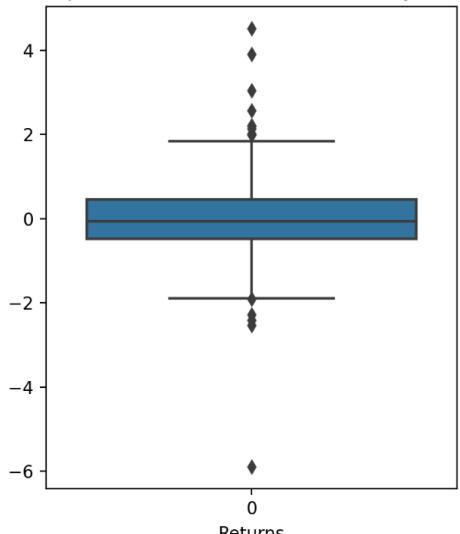
Boxplot for BAJAJ-AUTO.BO on monthly basis



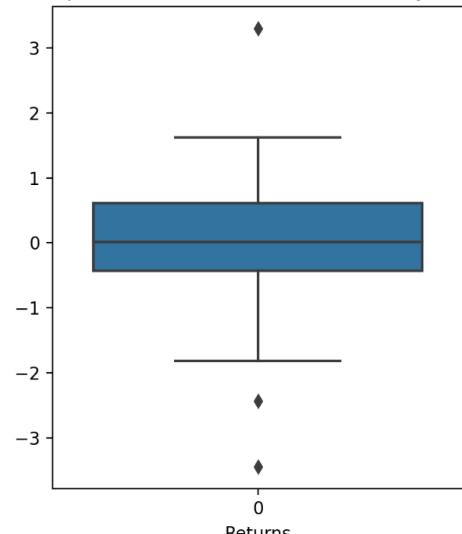
Boxplot for HDFCBANK.BO on daily basis



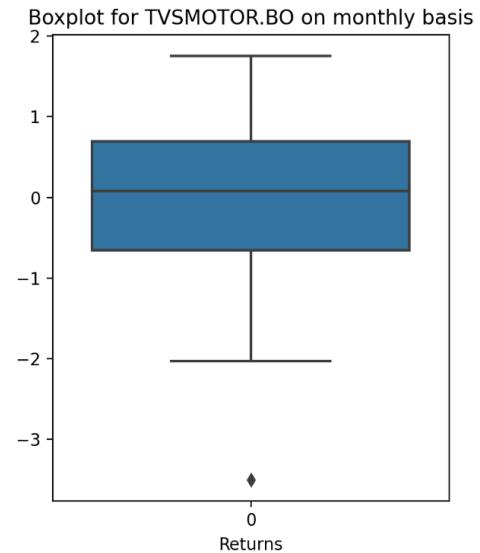
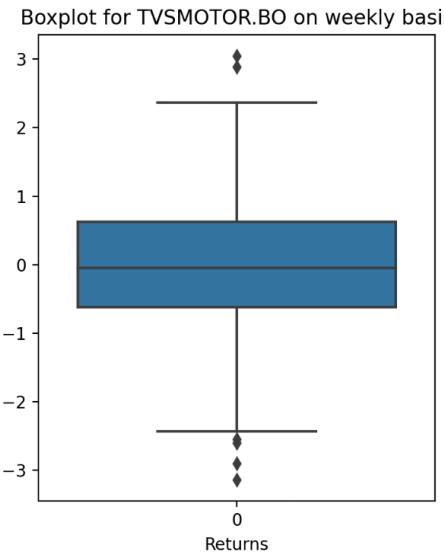
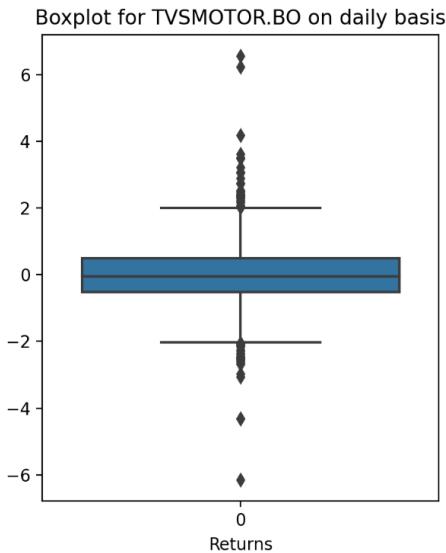
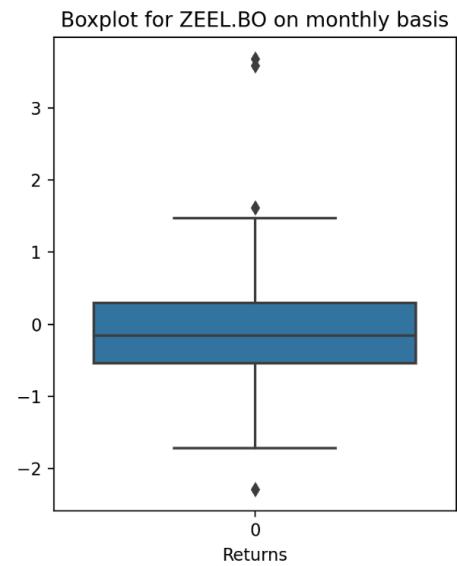
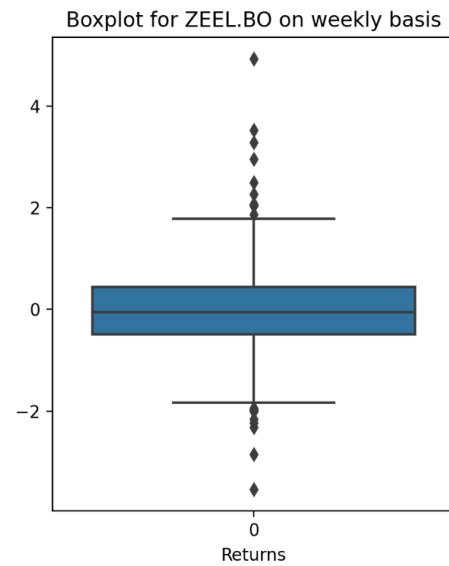
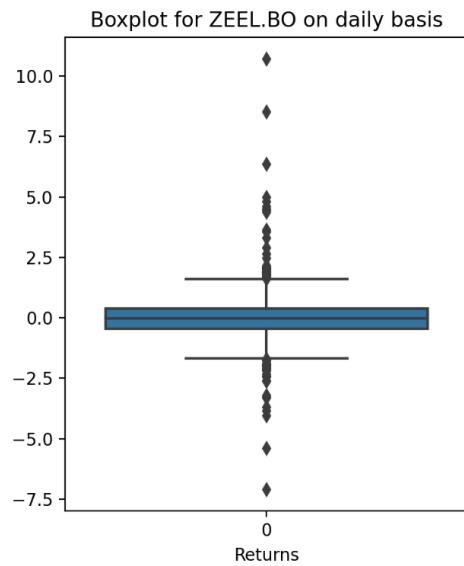
Boxplot for HDFCBANK.BO on weekly basis



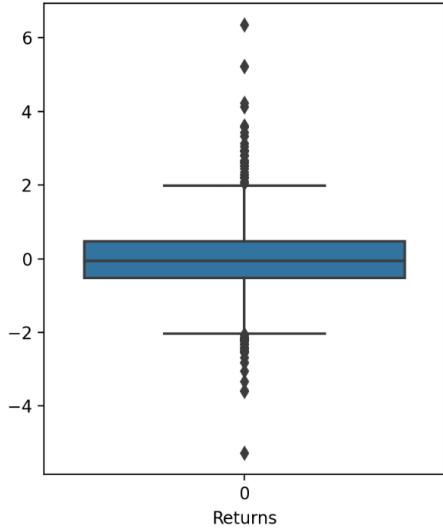
Boxplot for HDFCBANK.BO on monthly basis



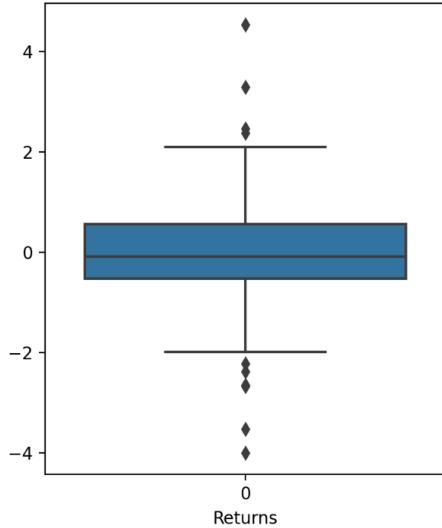
Now the corresponding boxplot of the normalized return of some of the stocks NOT IN bse index are as follows:



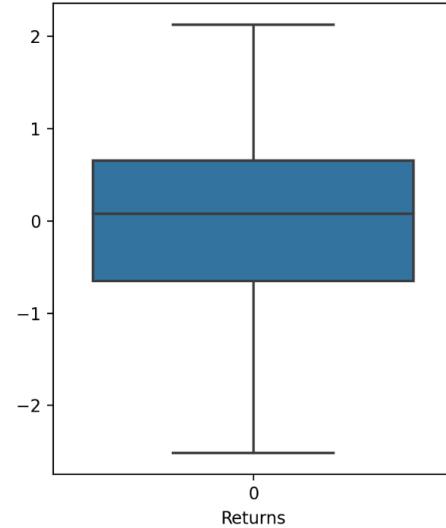
Boxplot for NAUKRI.BO on daily basis



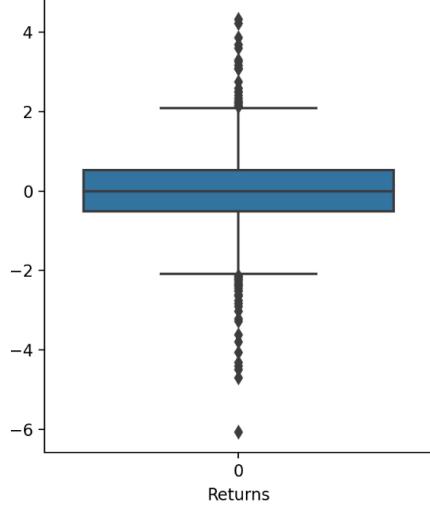
Boxplot for NAUKRI.BO on weekly basis



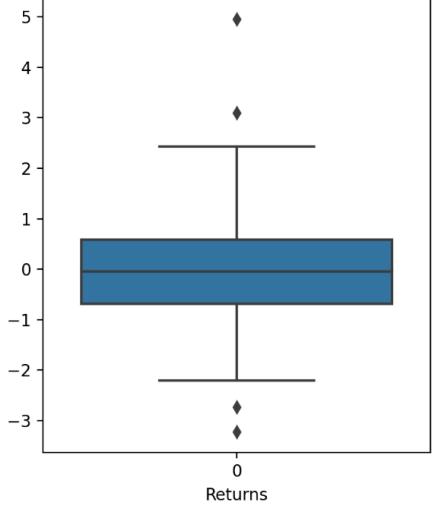
Boxplot for NAUKRI.BO on monthly basis



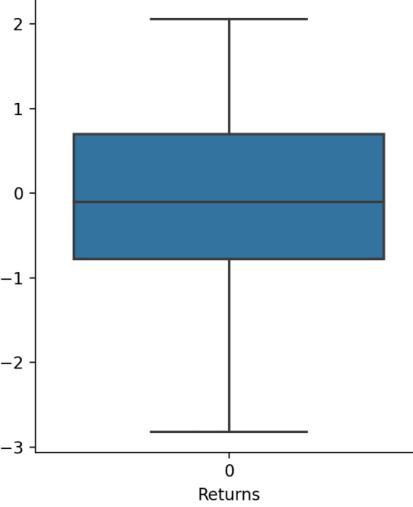
Boxplot for DLF.BO on daily basis



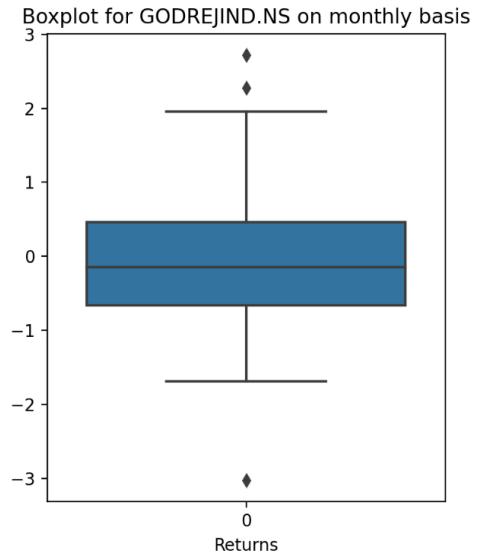
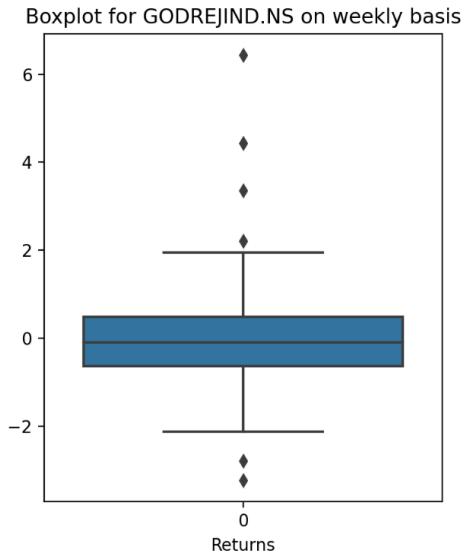
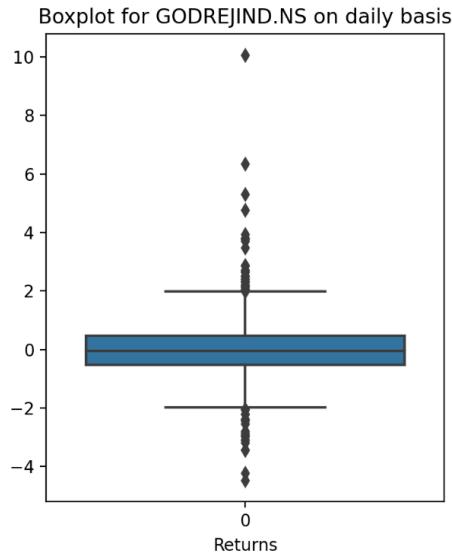
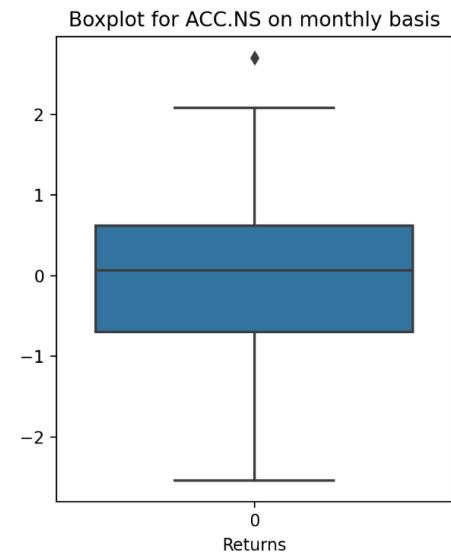
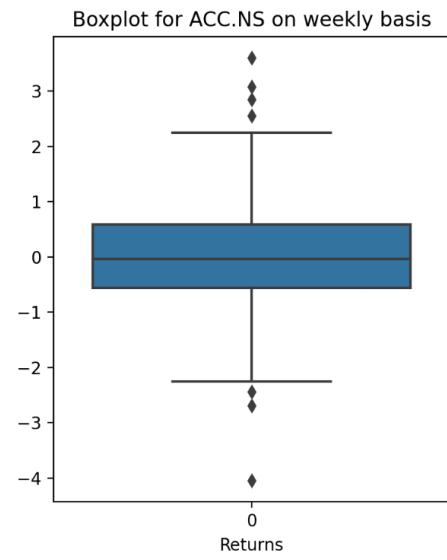
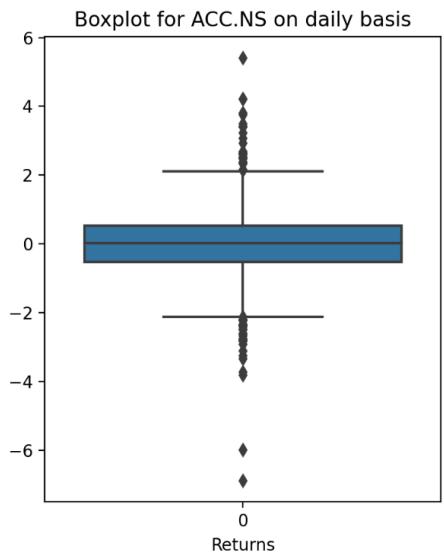
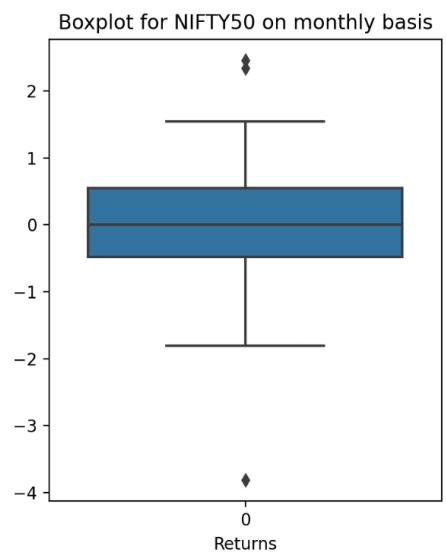
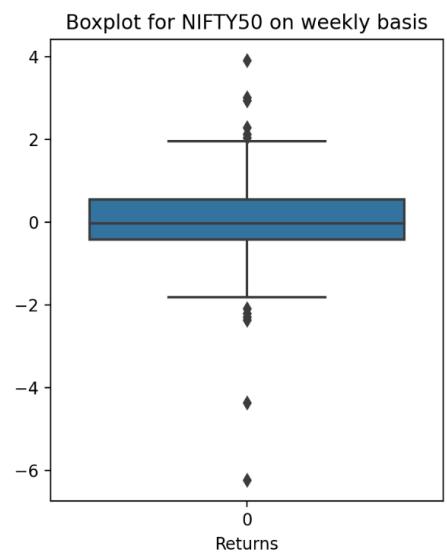
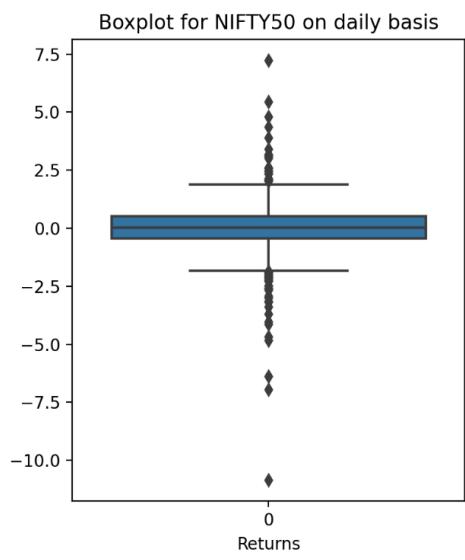
Boxplot for DLF.BO on weekly basis



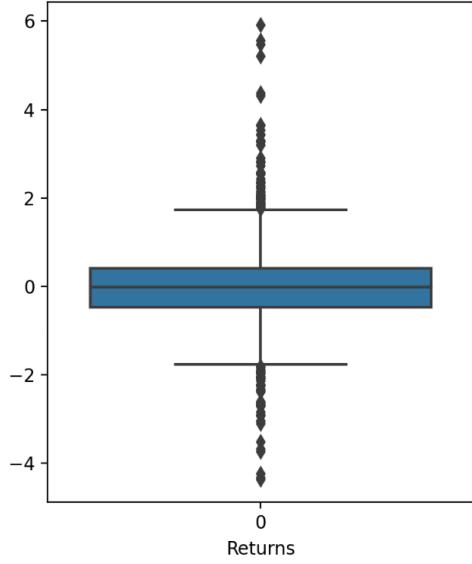
Boxplot for DLF.BO on monthly basis



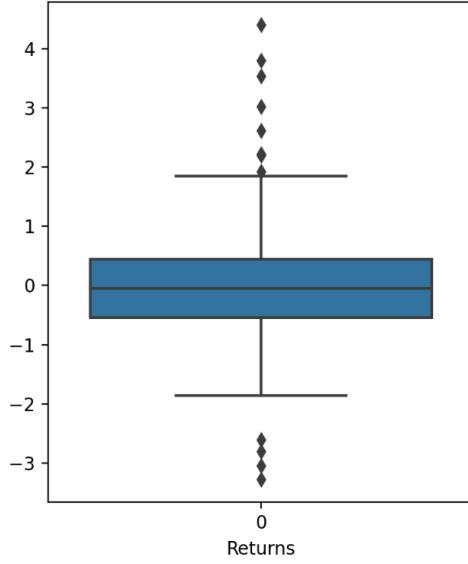
Now the corresponding boxplot of the normalized return of some of the stocks of nse index are as follows:



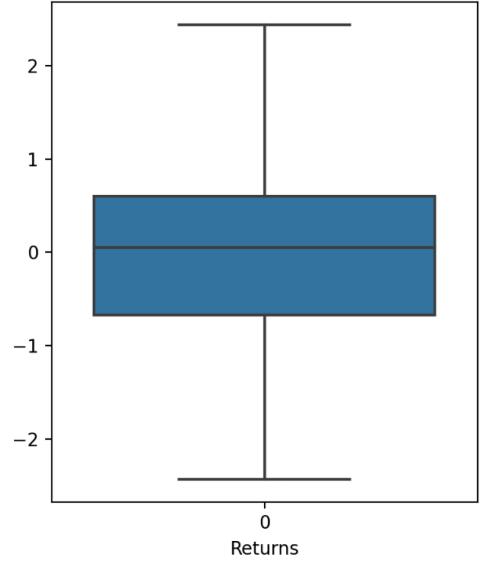
Boxplot for HINDZINC.NS on daily basis



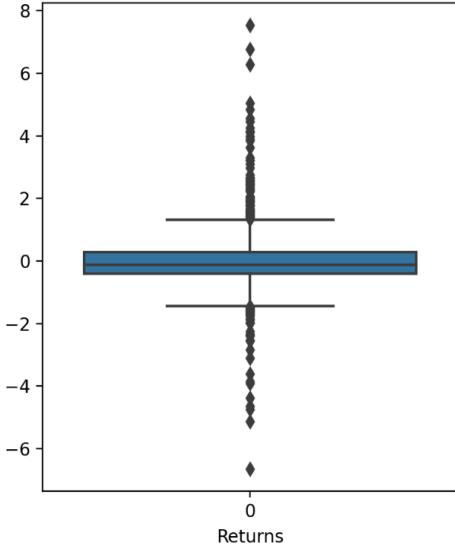
Boxplot for HINDZINC.NS on weekly basis



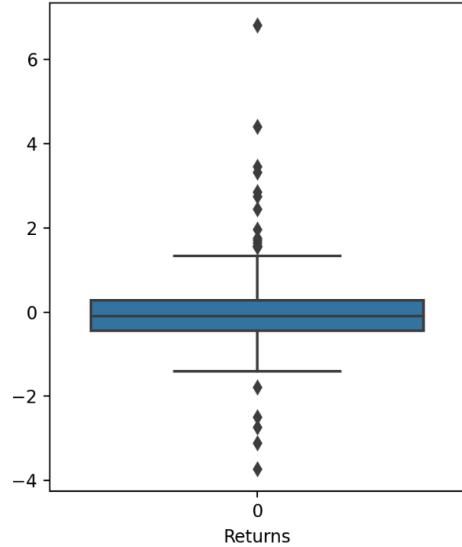
Boxplot for HINDZINC.NS on monthly basis



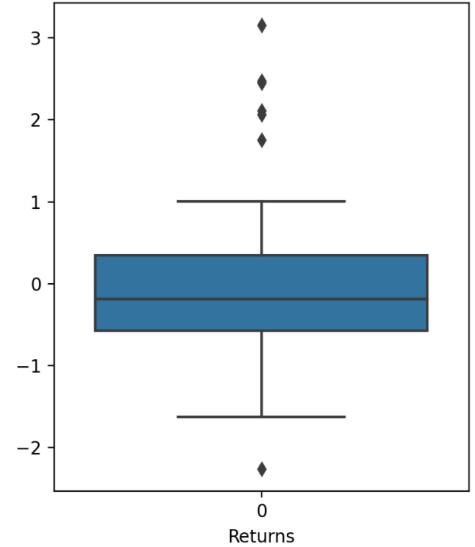
Boxplot for IDEA.NS on daily basis



Boxplot for IDEA.NS on weekly basis

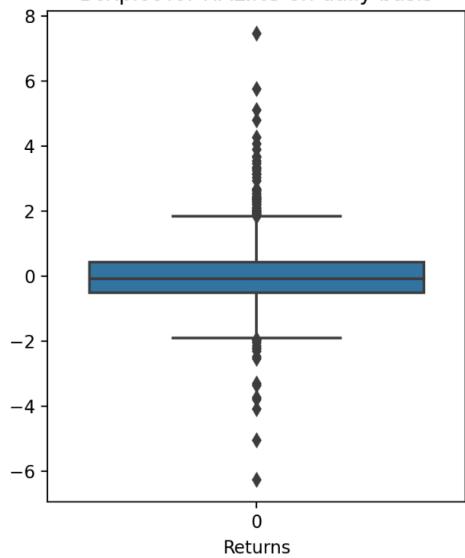


Boxplot for IDEA.NS on monthly basis

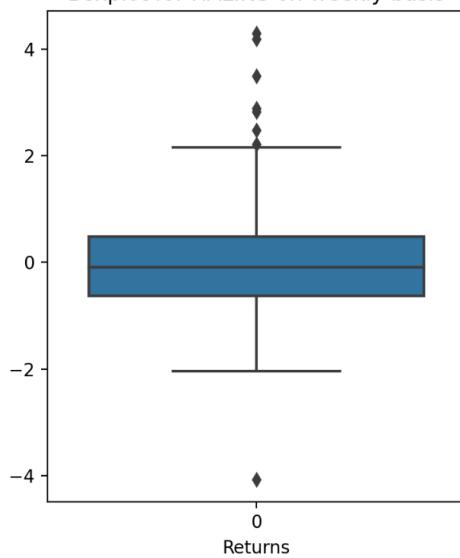


Now the corresponding boxplot of the normalized return of some of the stocks NOT IN nse index are as follows:

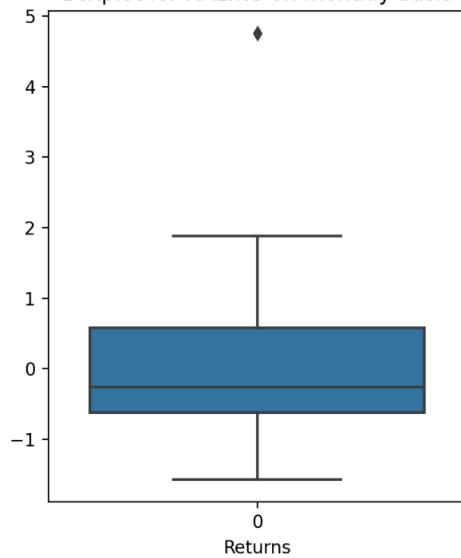
Boxplot for HAL.NS on daily basis



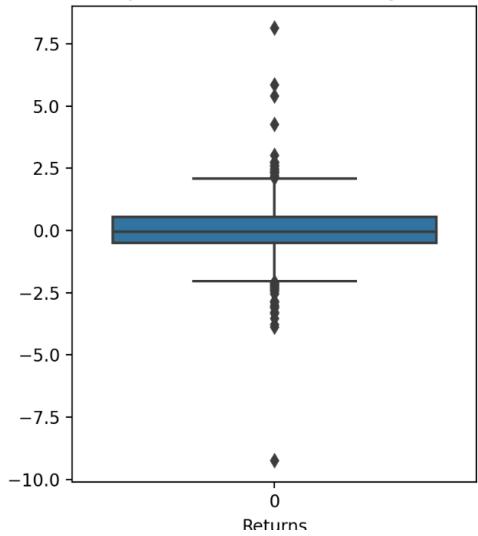
Boxplot for HAL.NS on weekly basis



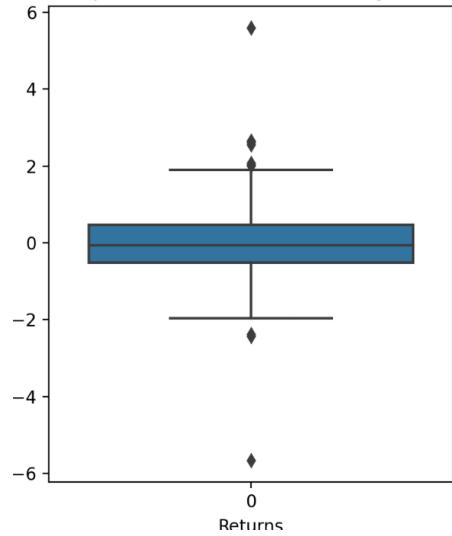
Boxplot for HAL.NS on monthly basis



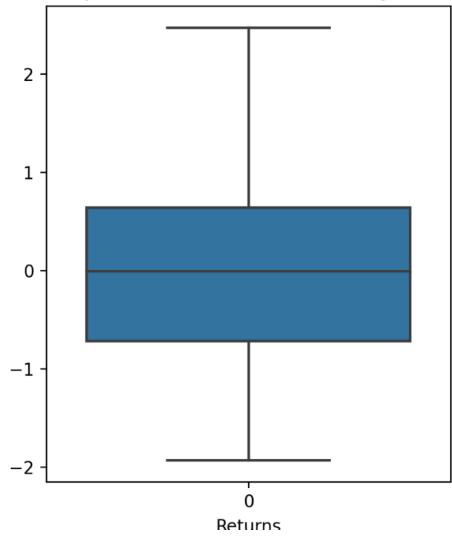
Boxplot for ICICIGI.NS on daily basis



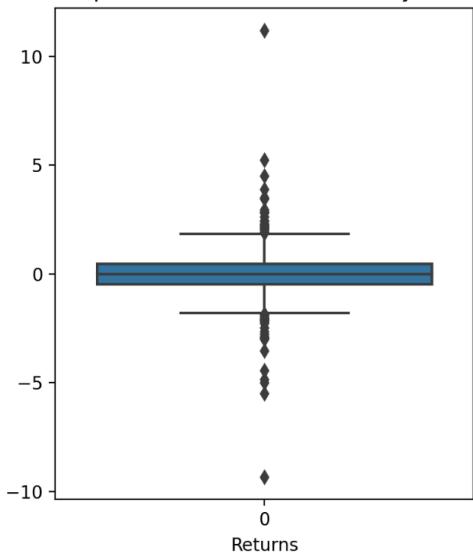
Boxplot for ICICIGI.NS on weekly basis



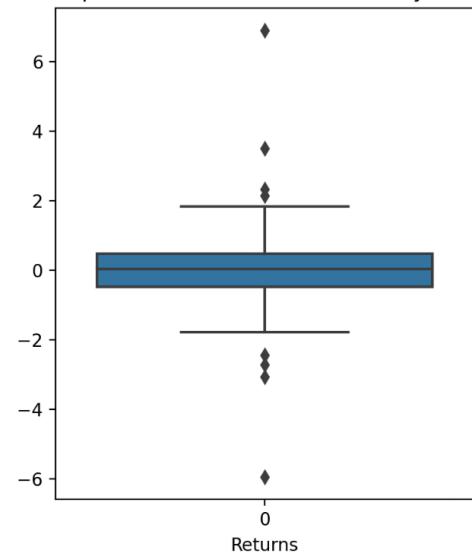
Boxplot for ICICIGI.NS on monthly basis



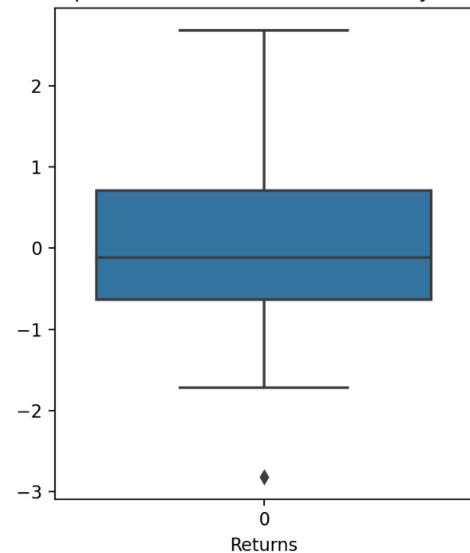
Boxplot for ICICIPRULI.NS on daily basis

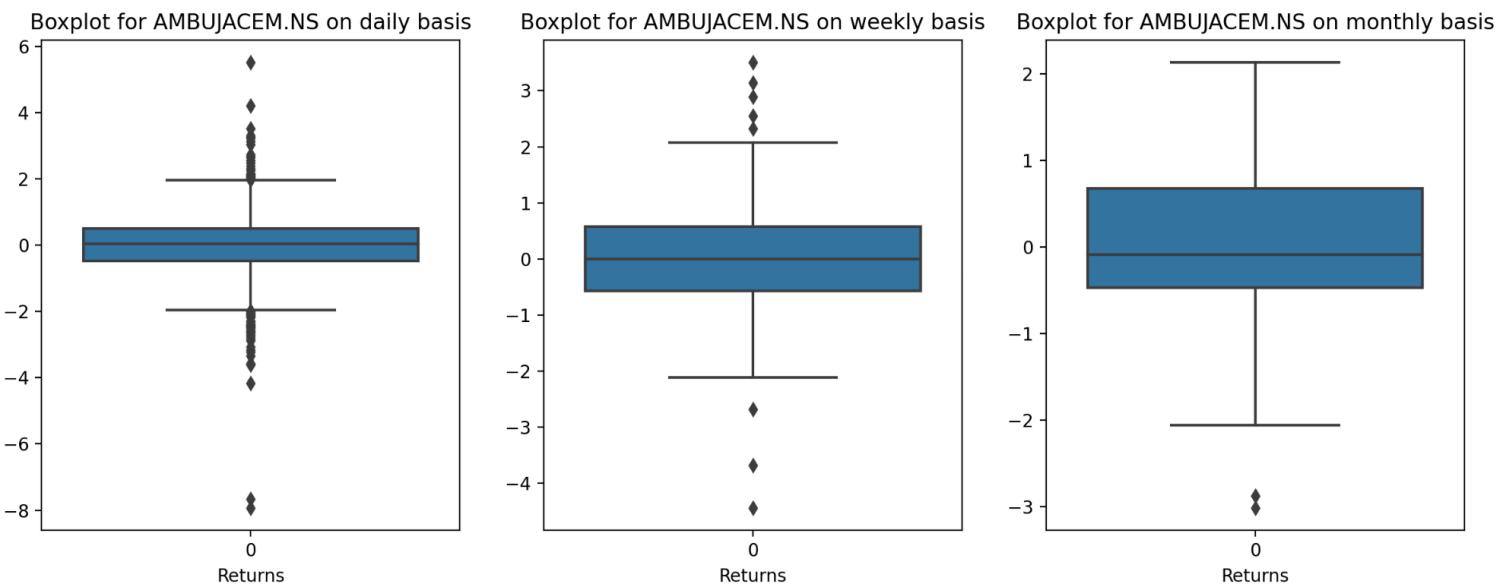


Boxplot for ICICIPRULI.NS on weekly basis



Boxplot for ICICIPRULI.NS on monthly basis





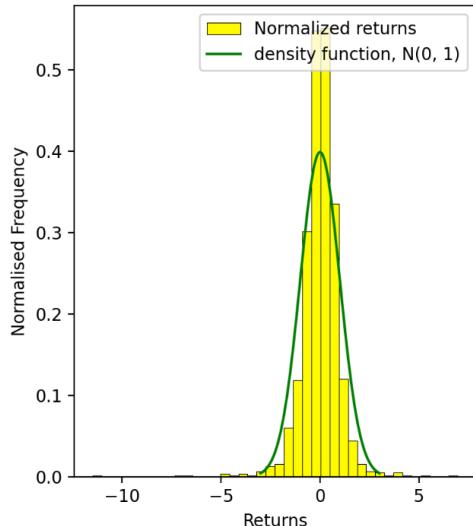
Observations – 1. We can observe that the $N(0, 1)$ roughly estimates the normalized returns, which is more accurate if the returns are computed on daily basis instead of weekly or monthly.

2. The deviations are due to the random fluctuations in the real world market, so, naïve Gaussian distribution can't completely model it.
3. It is more evident when a closer look is taken at the tails of these plots. The curve for $N(0, 1)$ steeply decreases to 0, but the returns on the prices does not. At the tails, there seem to be more deviations, and more proper model using a mix of different distributions is required to capture those changes.
4. Such a behavior is called as leptokurtic, i.e., high peaks and heavy tails. Jump diffusion model (by Merton) take these so called jumps at the tails into account.

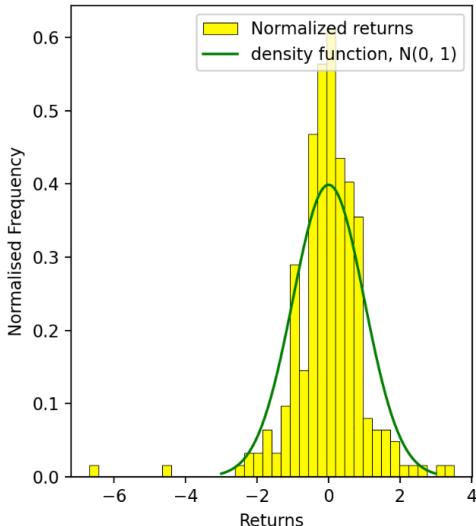
Question 3:

The similar plots for the log returns for the data in bse index are:

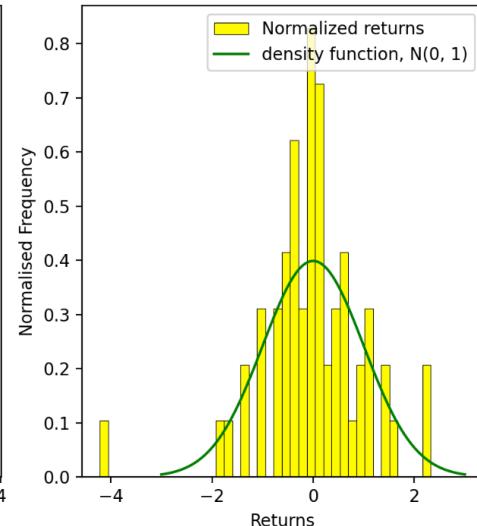
Normalized log returns with $N(0, 1)$ for Sensex on daily basis



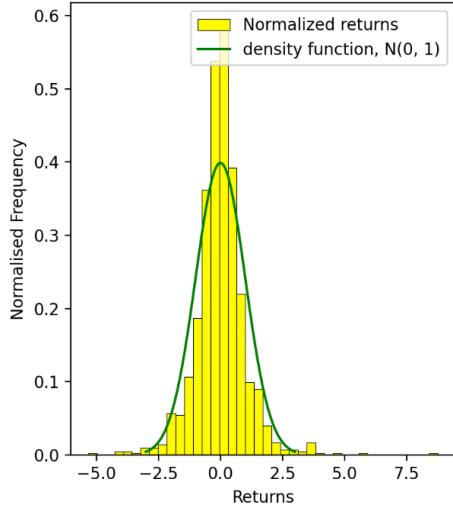
Normalized log returns with $N(0, 1)$ for Sensex on weekly basis



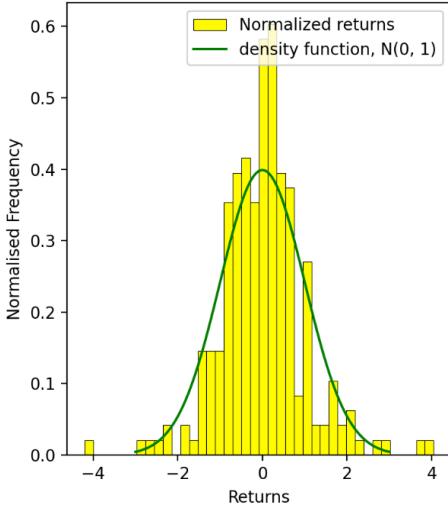
Normalized log returns with $N(0, 1)$ for Sensex on monthly basis



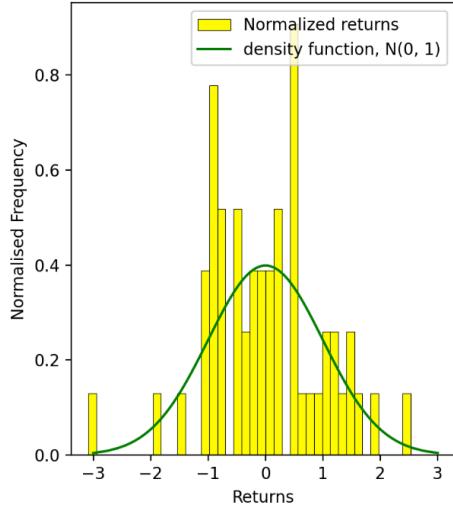
Normalized log returns with $N(0, 1)$ for WIPRO.BO on daily basis



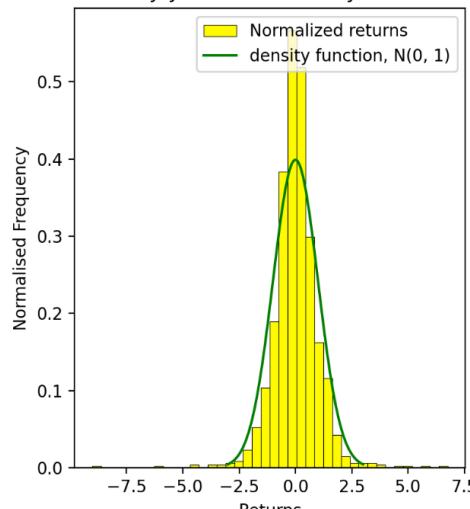
Normalized log returns with $N(0, 1)$ for WIPRO.BO on weekly basis



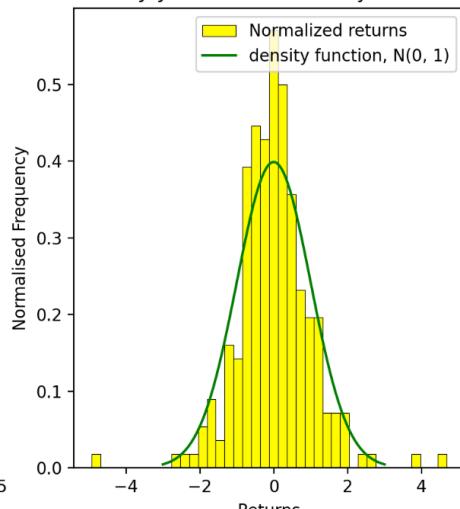
Normalized log returns with $N(0, 1)$ for WIPRO.BO on monthly basis



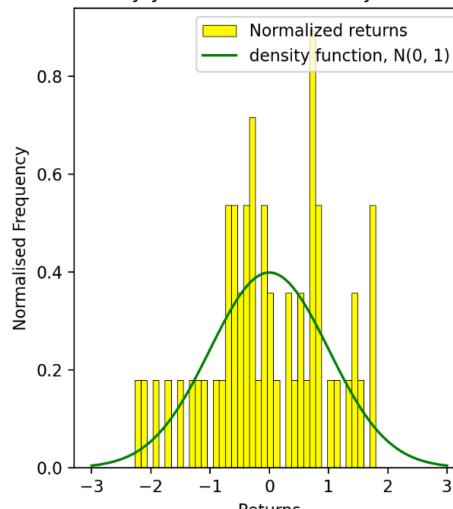
Normalized log returns with $N(0, 1)$ for BAJAJ-AUTO.BO on daily basis

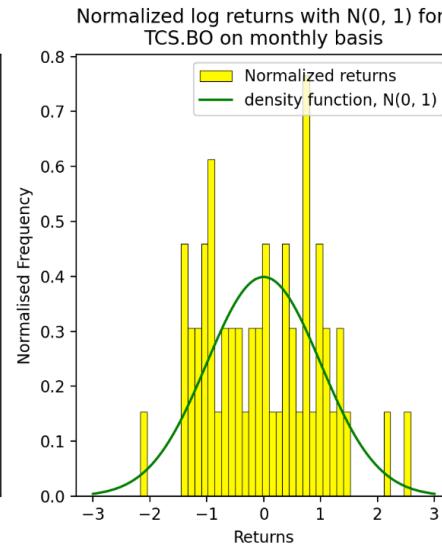
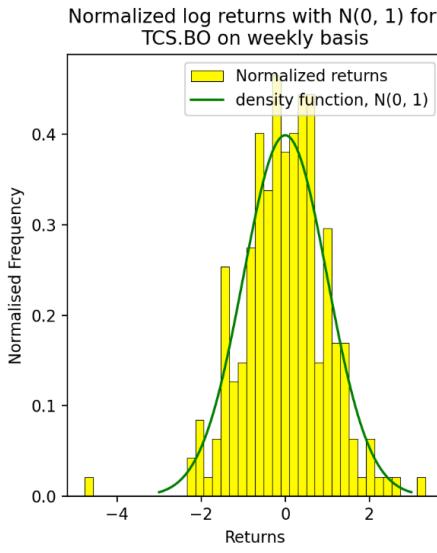
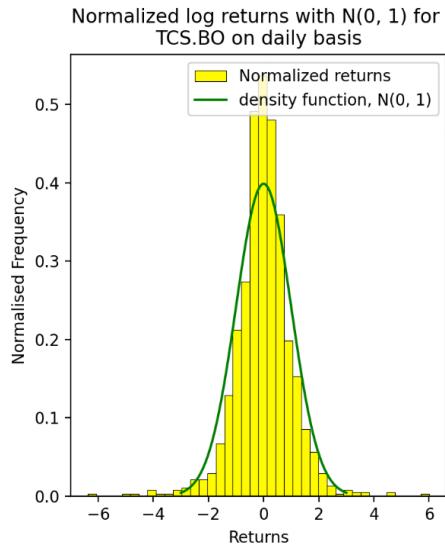
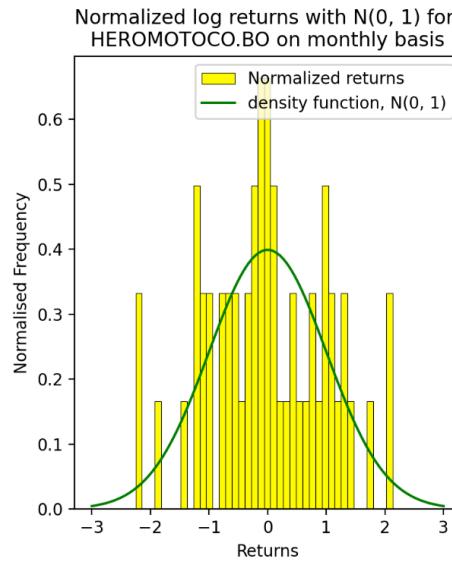
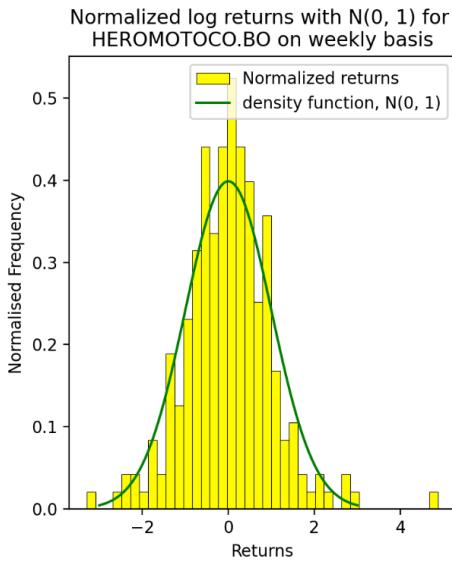
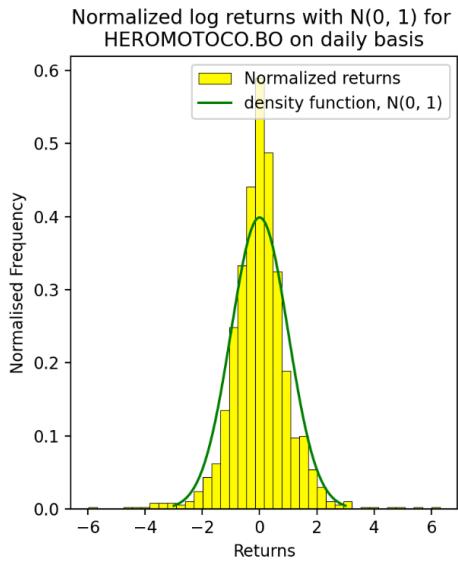


Normalized log returns with $N(0, 1)$ for BAJAJ-AUTO.BO on weekly basis

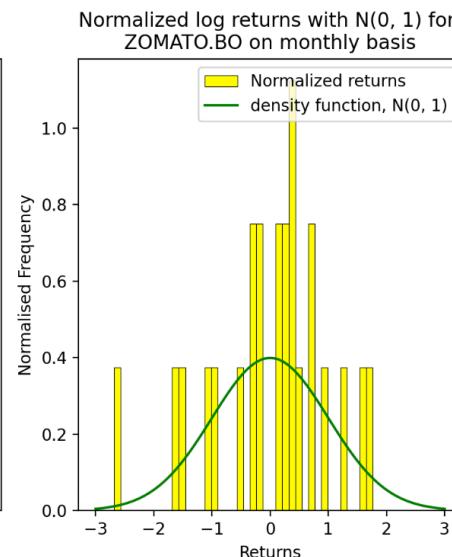
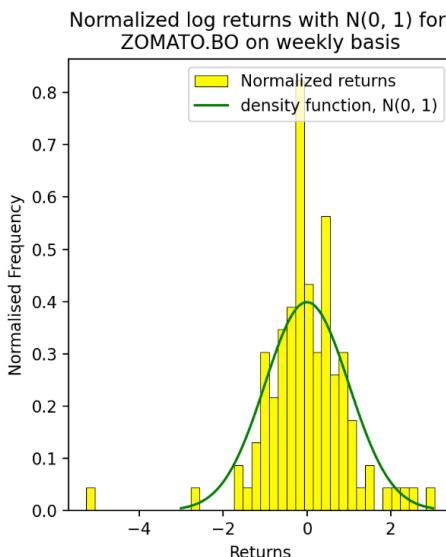
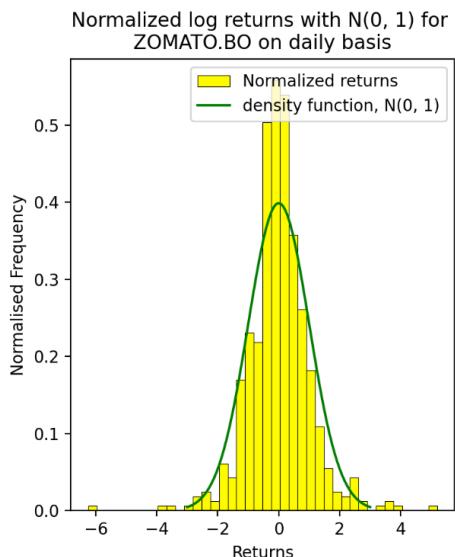


Normalized log returns with $N(0, 1)$ for BAJAJ-AUTO.BO on monthly basis

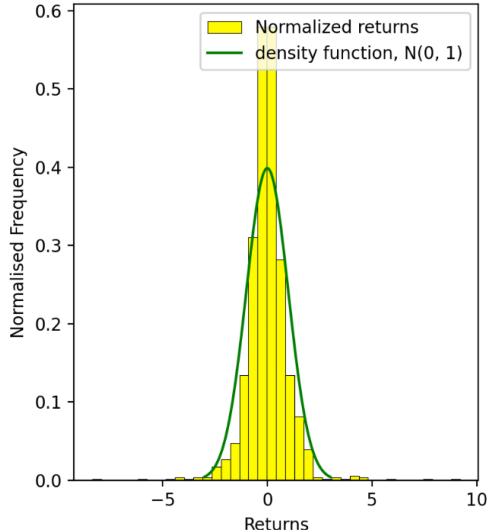




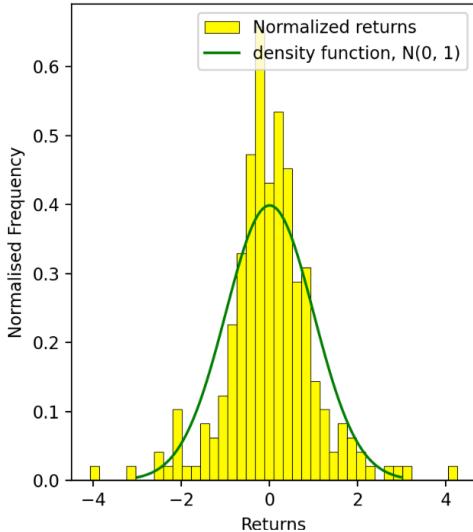
The similar plots for the log returns for the data NOT in bse index are:



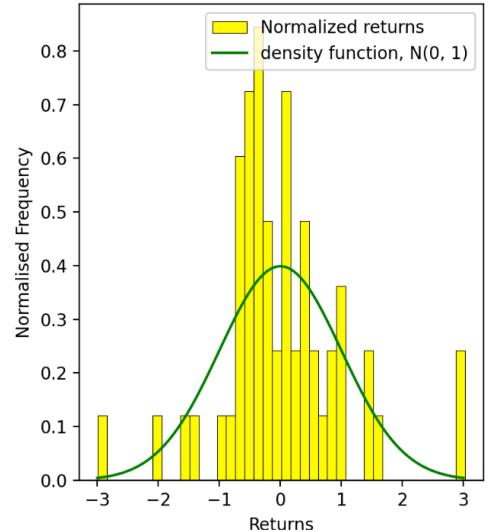
Normalized log returns with $N(0, 1)$ for ZEEL.BO on daily basis



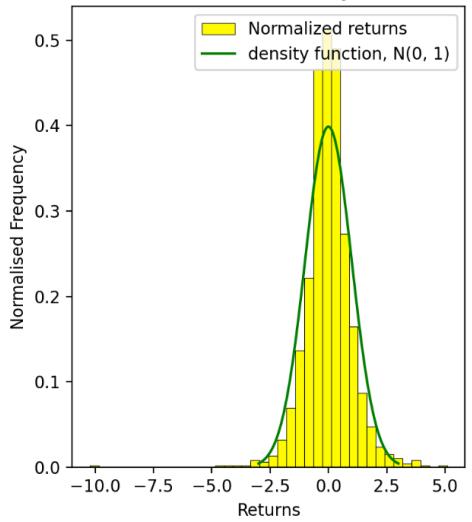
Normalized log returns with $N(0, 1)$ for ZEEL.BO on weekly basis



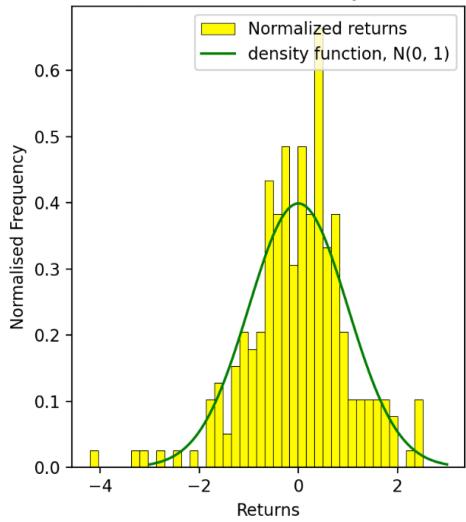
Normalized log returns with $N(0, 1)$ for ZEEL.BO on monthly basis



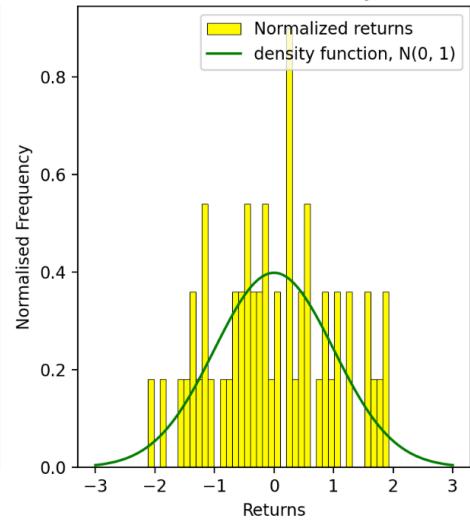
Normalized log returns with $N(0, 1)$ for PIDILITIND.BO on daily basis



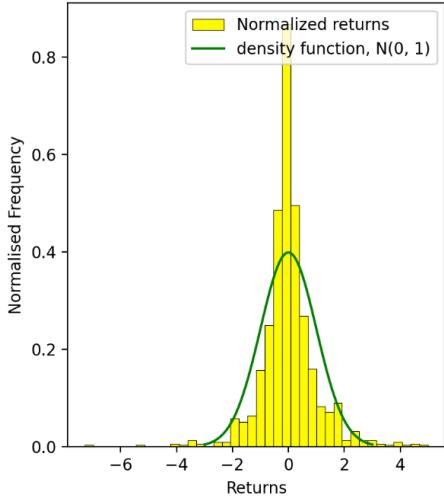
Normalized log returns with $N(0, 1)$ for PIDILITIND.BO on weekly basis



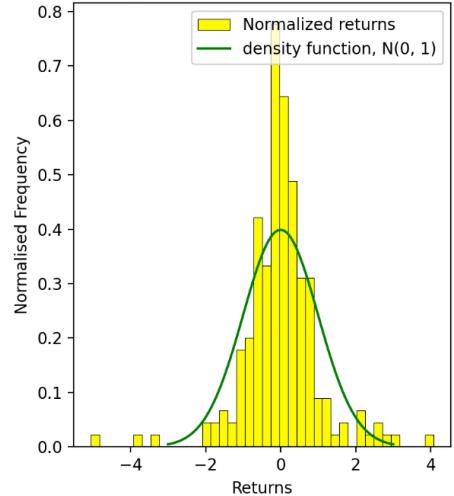
Normalized log returns with $N(0, 1)$ for PIDILITIND.BO on monthly basis



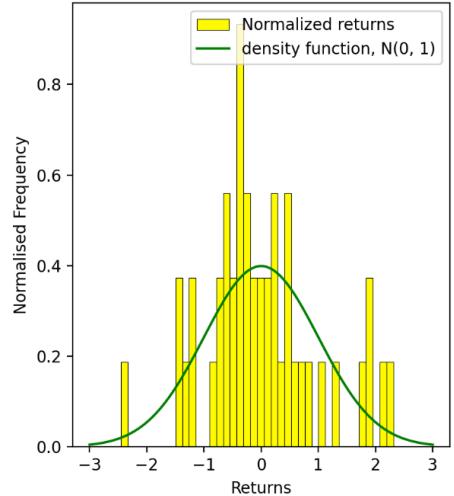
Normalized log returns with $N(0, 1)$ for IRCTC.BO on daily basis



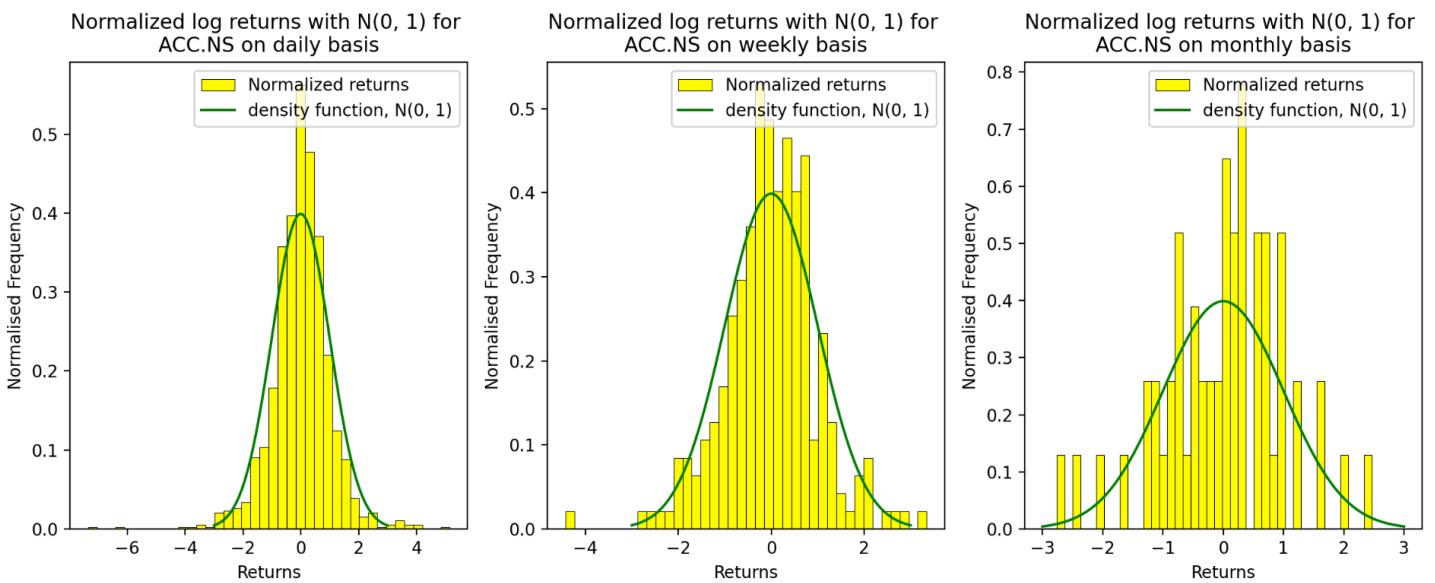
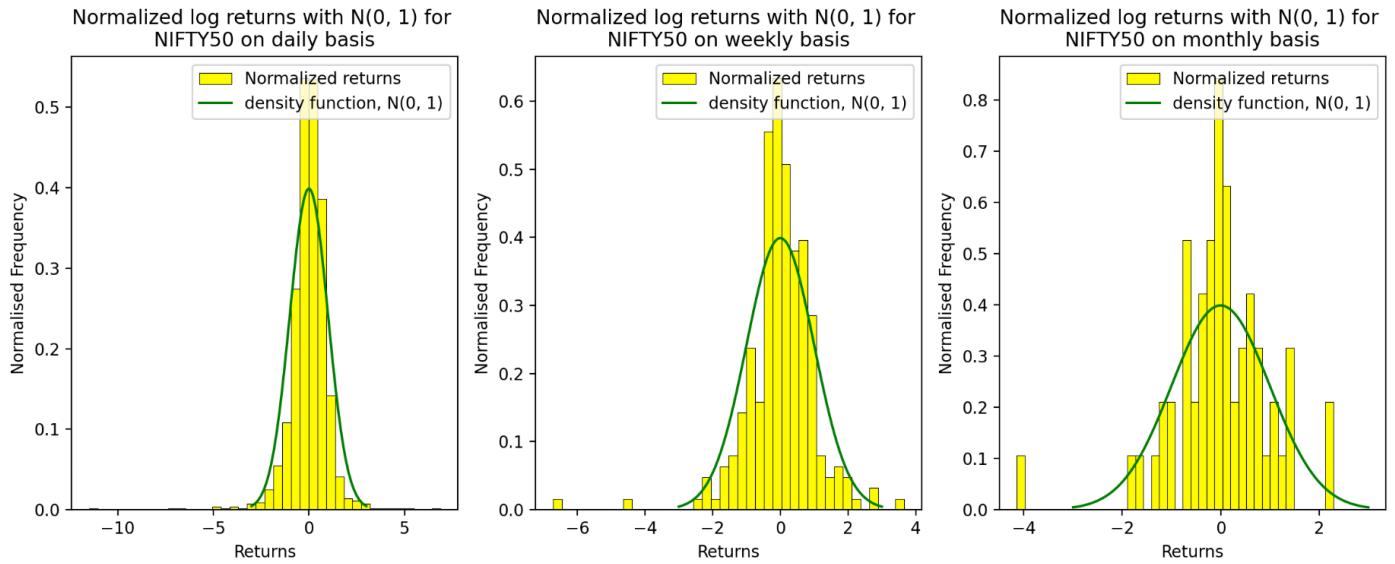
Normalized log returns with $N(0, 1)$ for IRCTC.BO on weekly basis

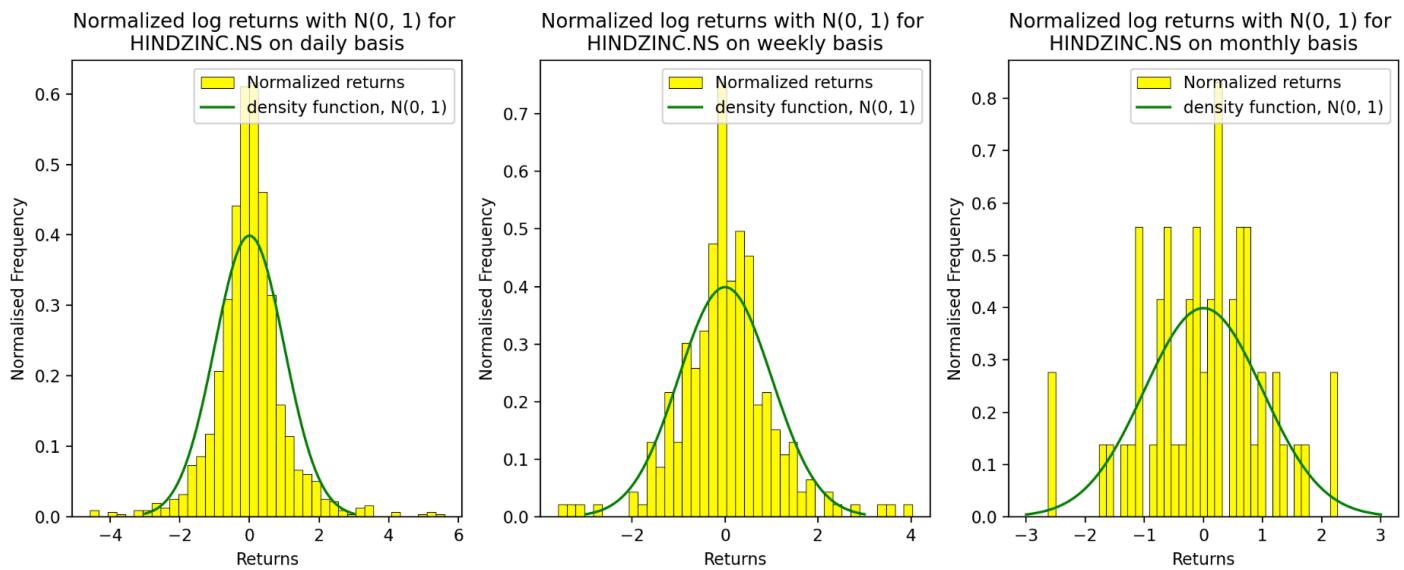
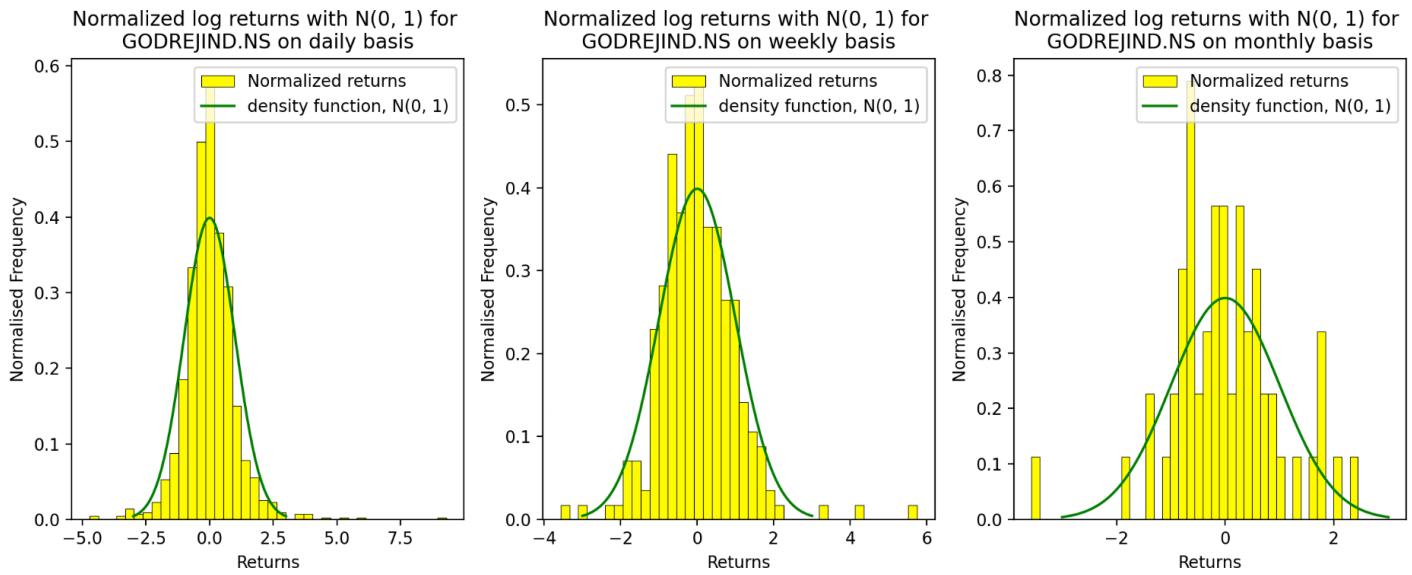


Normalized log returns with $N(0, 1)$ for IRCTC.BO on monthly basis



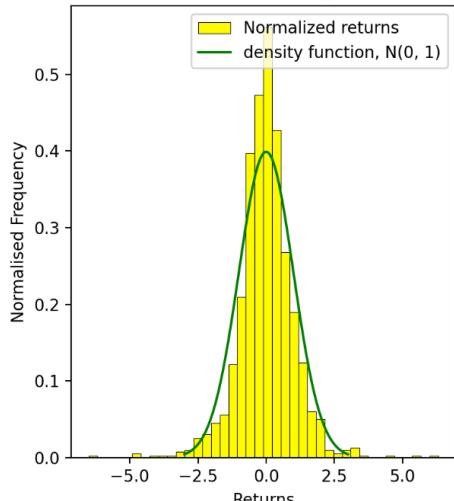
The similar plots for the log returns for the data in nse index are:



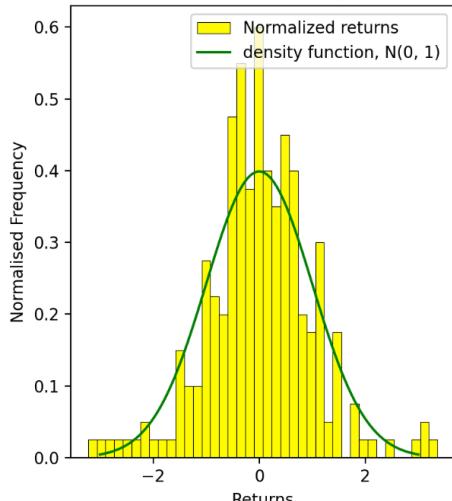


The similar plots for the log returns for the data NOT in nse index are:

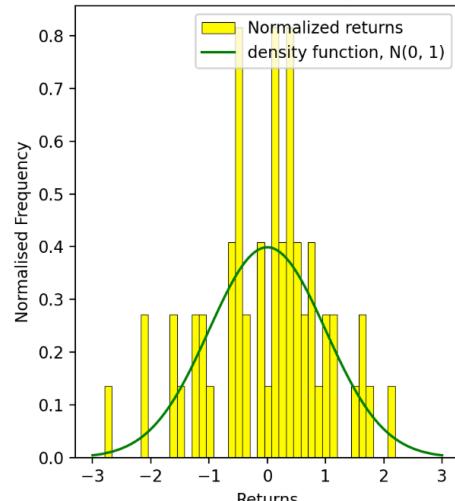
Normalized log returns with $N(0, 1)$ for HAVELLS.NS on daily basis



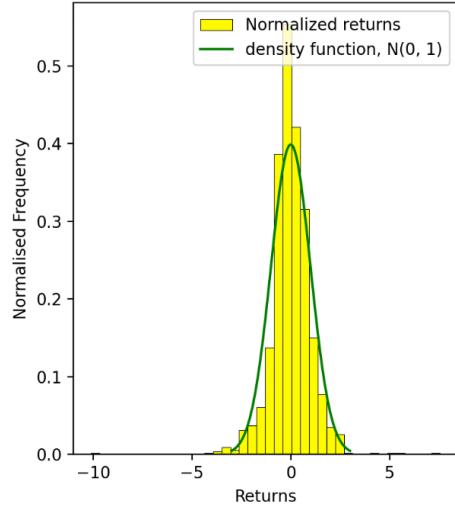
Normalized log returns with $N(0, 1)$ for HAVELLS.NS on weekly basis



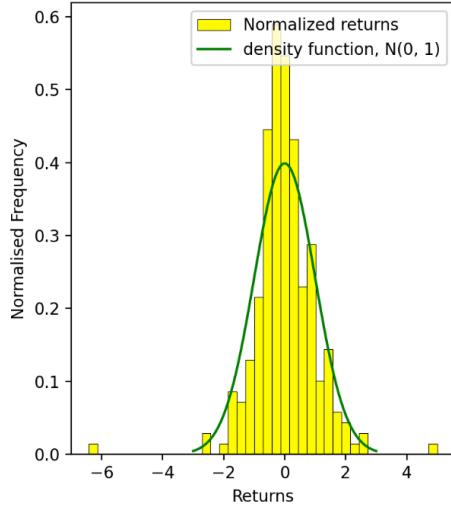
Normalized log returns with $N(0, 1)$ for HAVELLS.NS on monthly basis



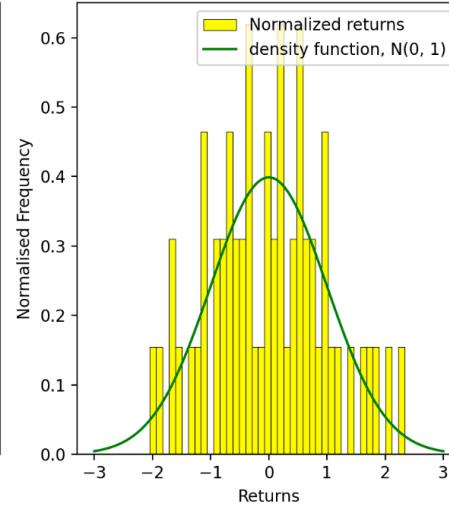
Normalized log returns with $N(0, 1)$ for ICICIGI.NS on daily basis



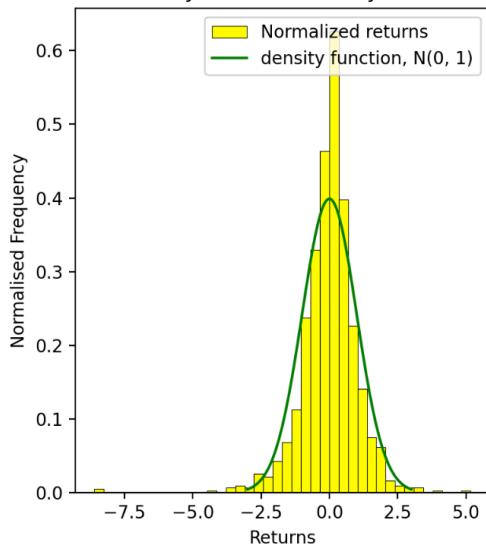
Normalized log returns with $N(0, 1)$ for ICICIGI.NS on weekly basis



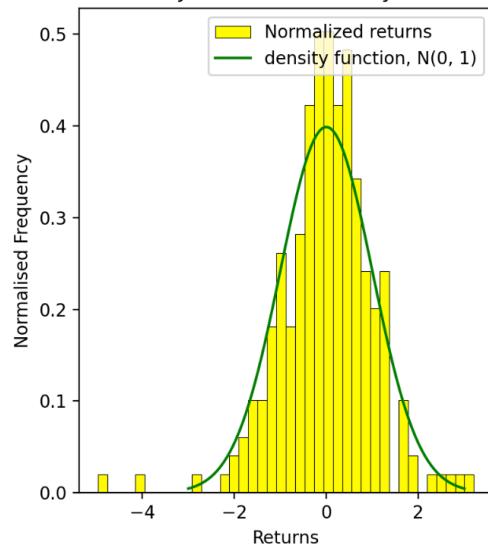
Normalized log returns with $N(0, 1)$ for ICICIGI.NS on monthly basis



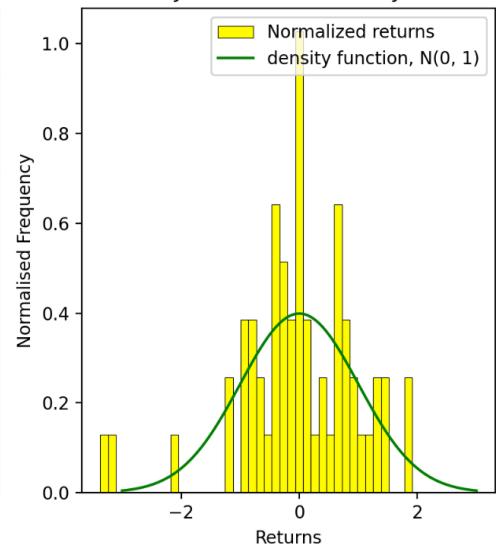
Normalized log returns with $N(0, 1)$ for AMBUJACEM.NS on daily basis



Normalized log returns with $N(0, 1)$ for AMBUJACEM.NS on weekly basis



Normalized log returns with $N(0, 1)$ for AMBUJACEM.NS on monthly basis



Question 4 and 5:

Formulae used – • Geometric Brownian motion is used to model the scenario since stock prices behave like a stochastic process:

$$S(t_{i+1}) = S(t_i) \exp((\mu - 0.5 \sigma^2)(t_{i+1} - t_i) + \sigma \sqrt{t_{i+1} - t_i} Z_{i+1})$$

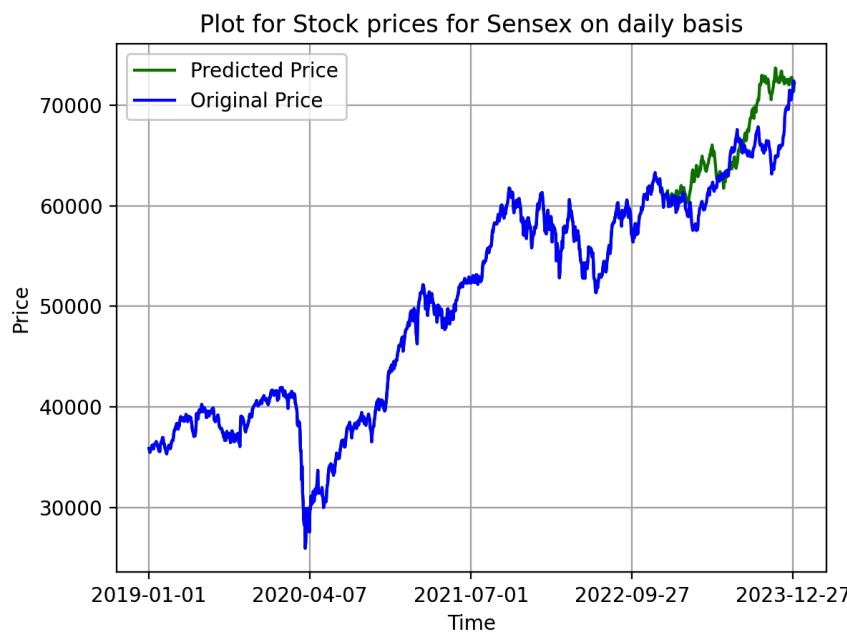
- μ and σ^2 can be found by solving following equations:

$$\mu - \frac{\sigma^2}{2} = \frac{1}{n} \sum_{i=1}^n u_i = E(u)$$
$$\sigma^2 = \frac{1}{n-1} \sum_{i=1}^n (u_i - E(u))^2$$
$$u_i = \ln\left(\frac{s_i}{s_{i-1}}\right)$$

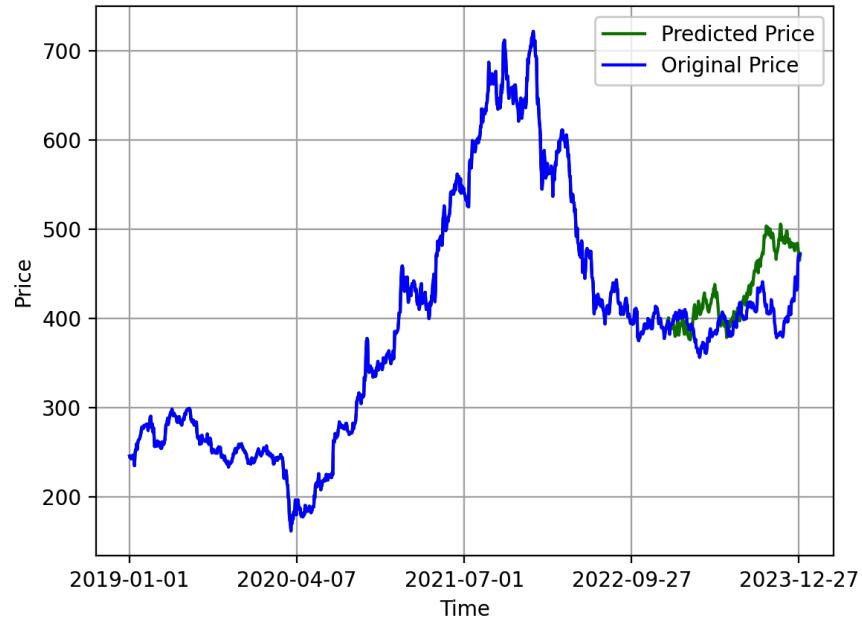
where,

Z_1, Z_2, \dots, Z_n are independent $N(0, 1)$ variables, u_i is the log return of day i , and s_i and s_{i-1} are adjacent closing stock prices of day $i - 1$ and day i respectively

For daily stock data: The generated stock prices path along with the actual path for stocks in bse index are:



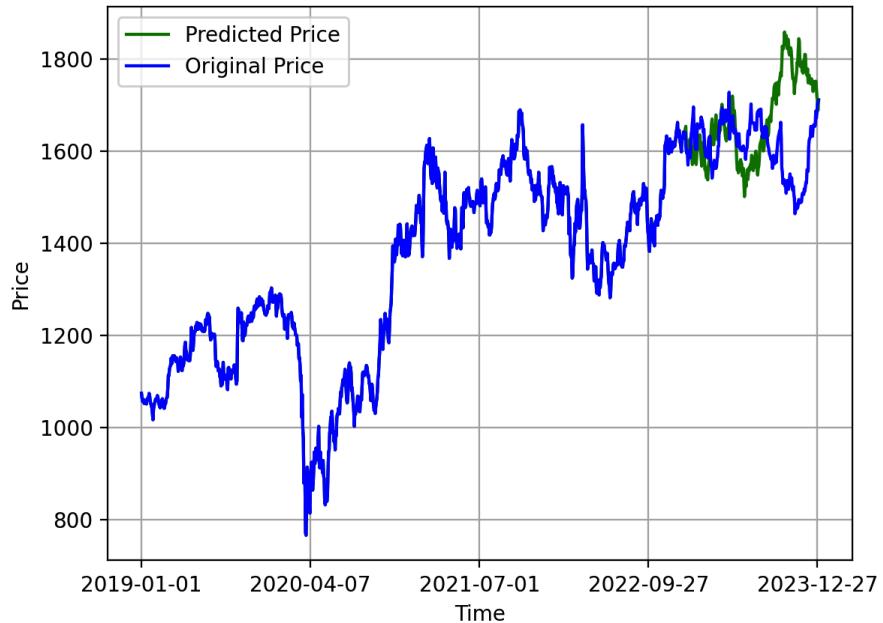
Plot for Stock prices for WIPRO.BO on daily basis



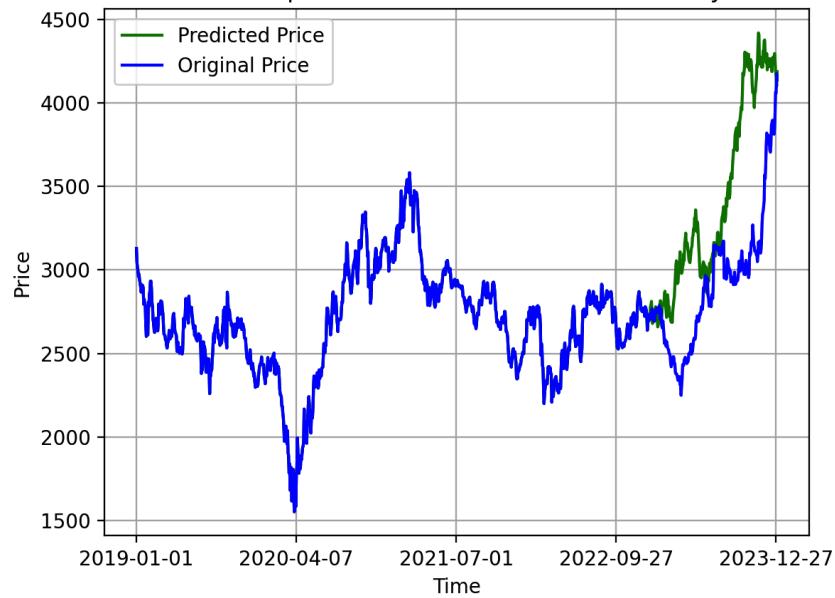
Plot for Stock prices for BAJAJ-AUTO.BO on daily basis



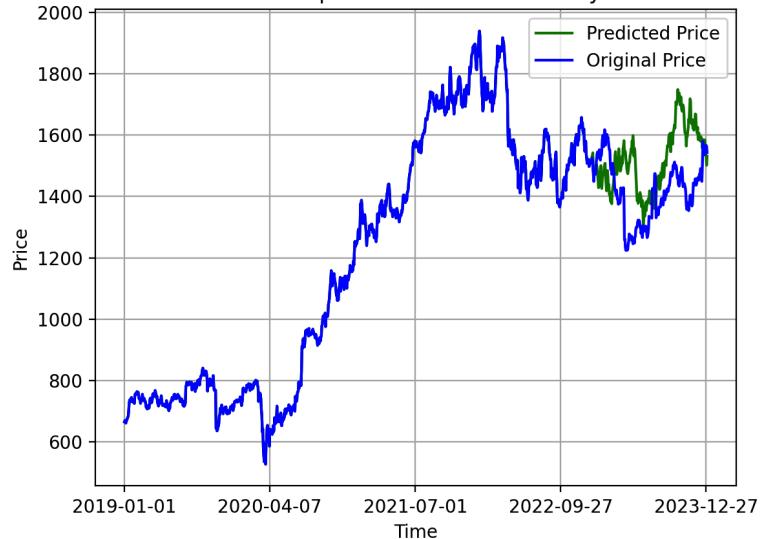
Plot for Stock prices for HDFCBANK.BO on daily basis



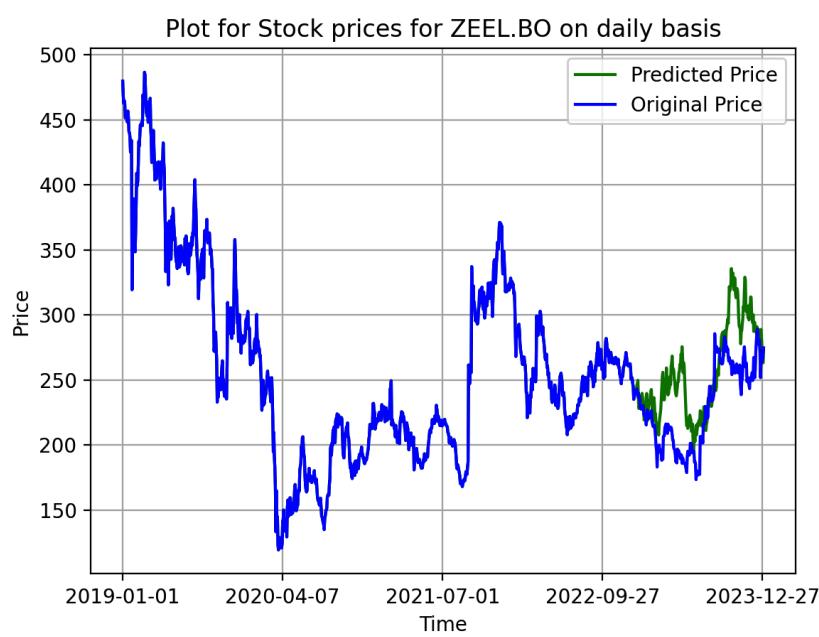
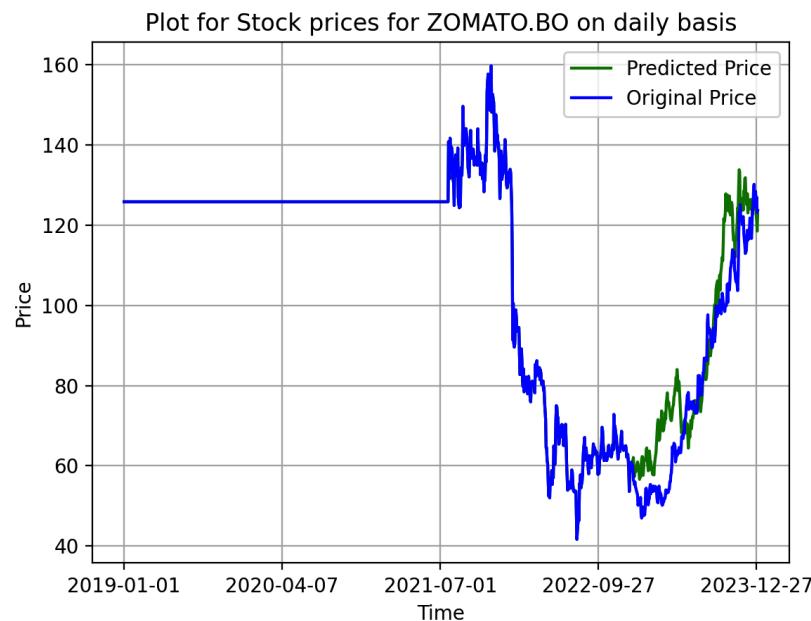
Plot for Stock prices for HEROMOTOCO.BO on daily basis

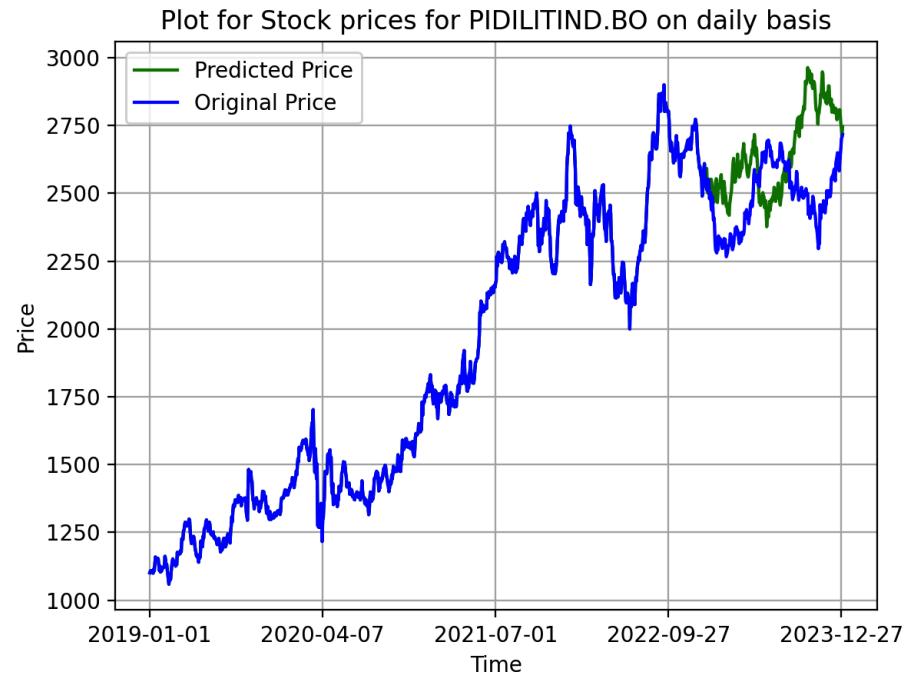


Plot for Stock prices for INFY.BO on daily basis

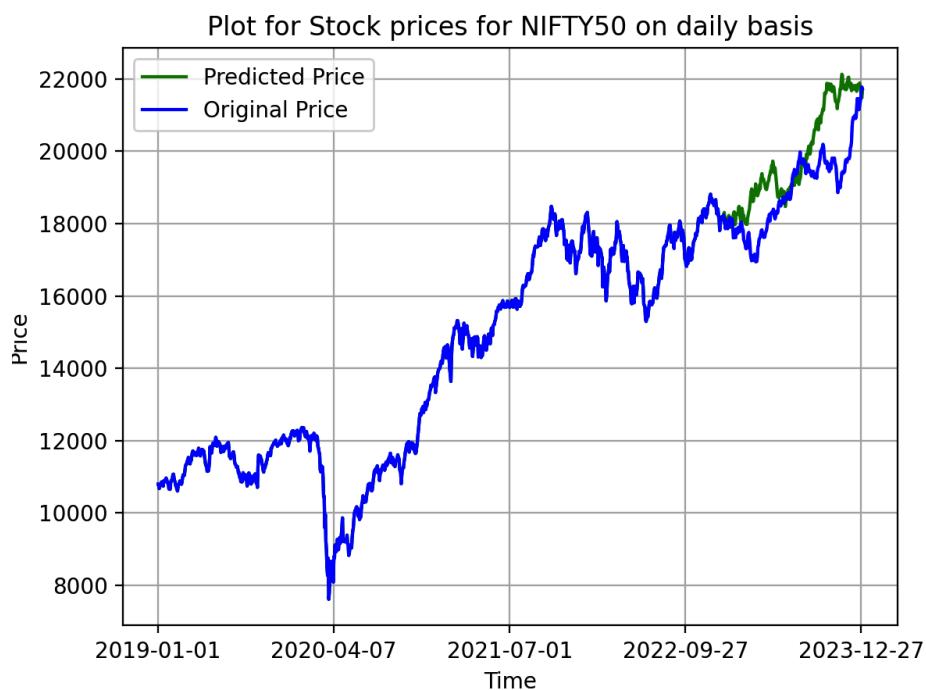


For daily stock data: The generated stock prices path along with the actual path for stocks NOT in bse index are:

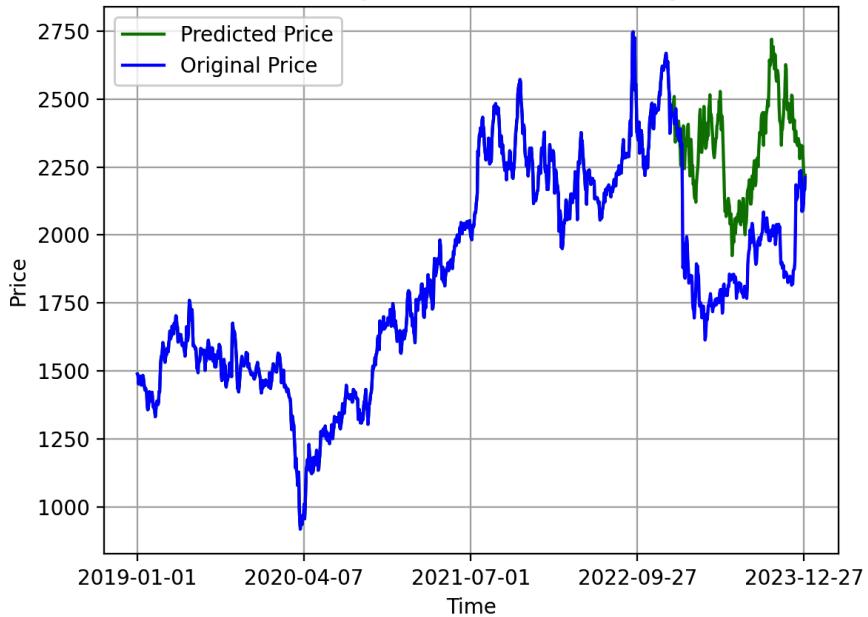




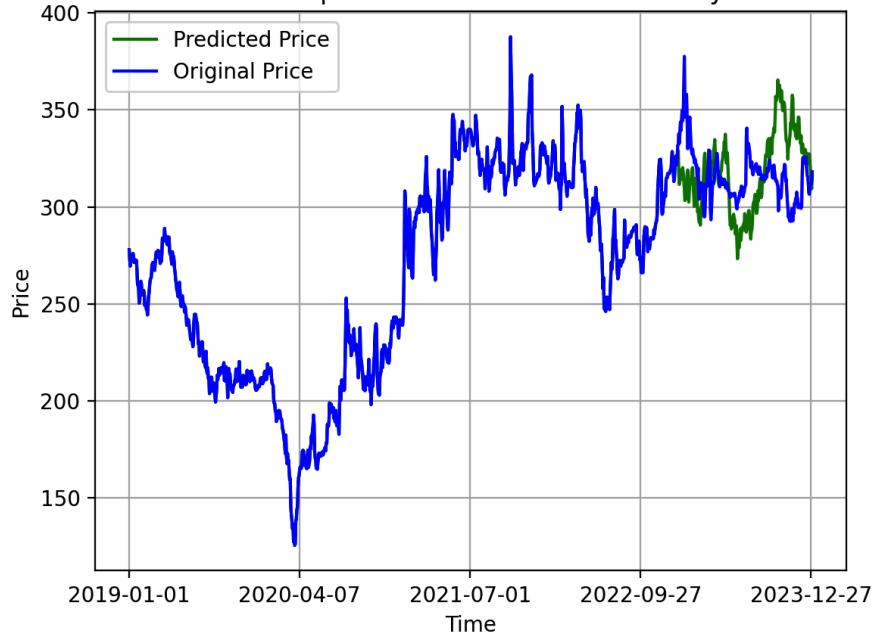
For daily stock data: The generated stock prices path along with the actual path for stocks in nse index are:

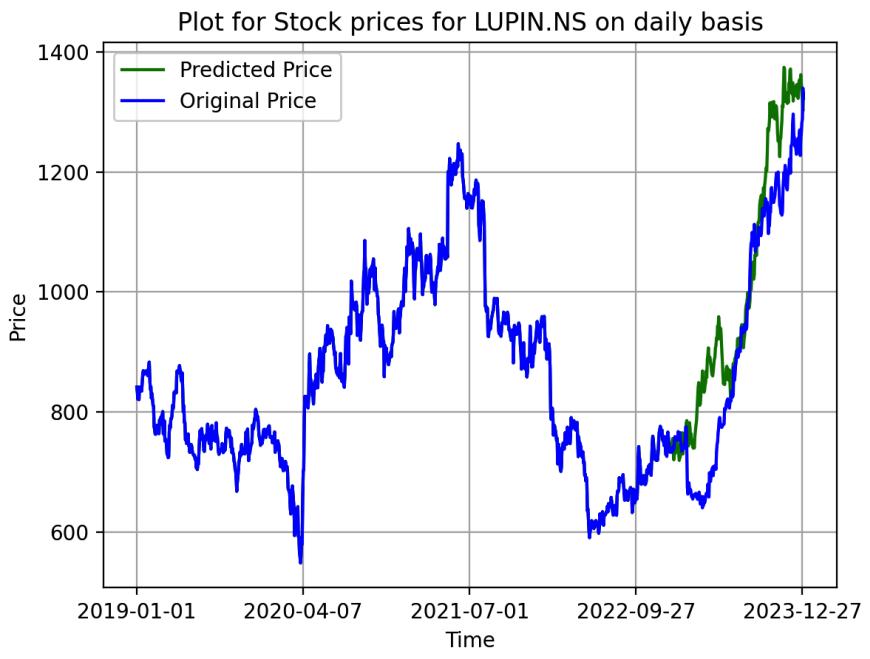


Plot for Stock prices for ACC.NS on daily basis

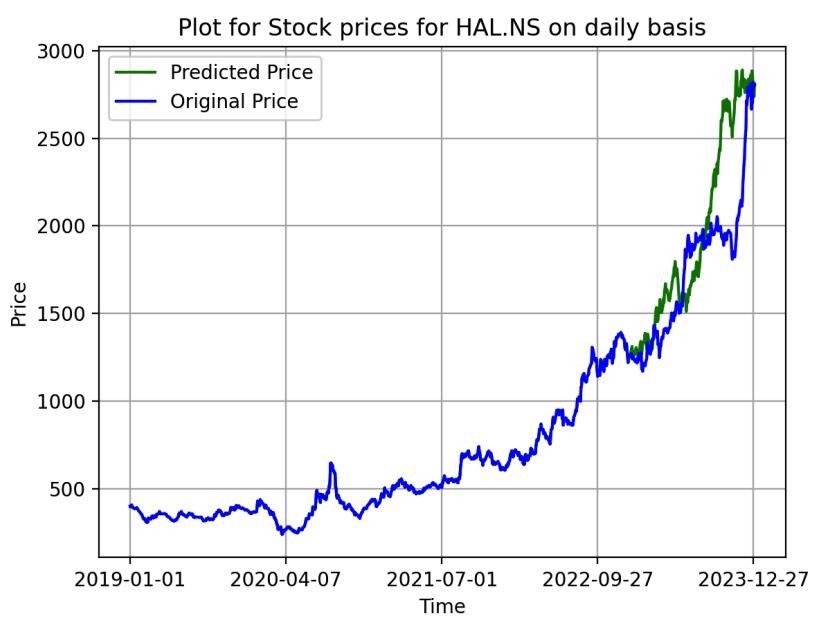


Plot for Stock prices for HINDZINC.NS on daily basis

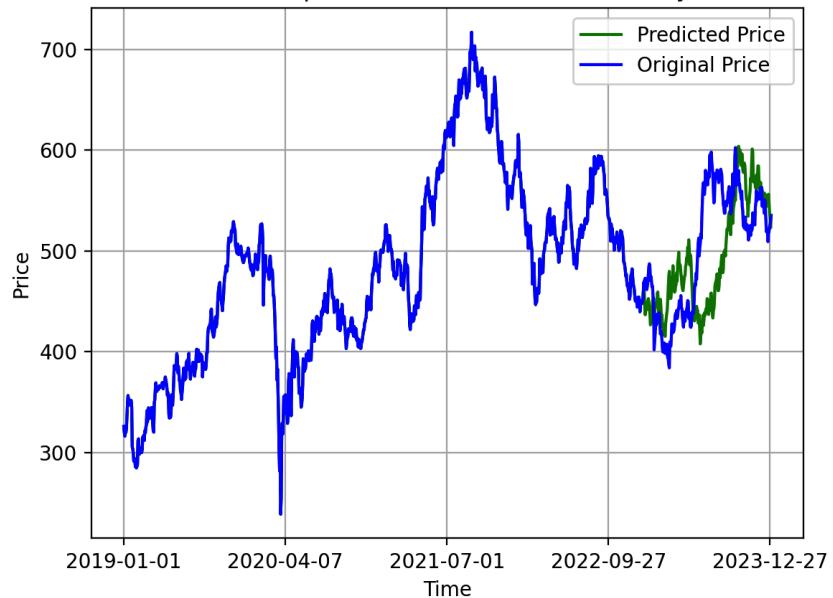




For daily stock data: The generated stock prices path along with the actual path for stocks NOT in nse index are:

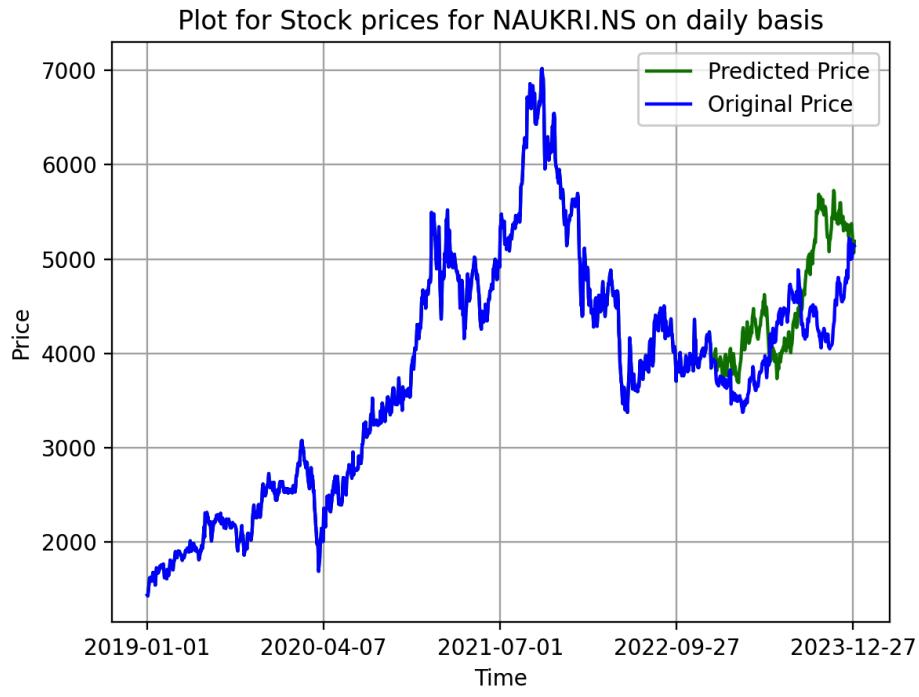


Plot for Stock prices for ICICIPRULI.NS on daily basis

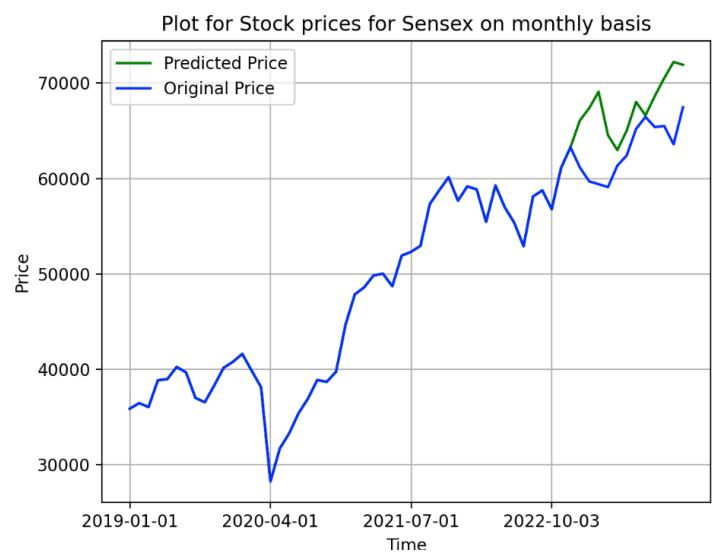
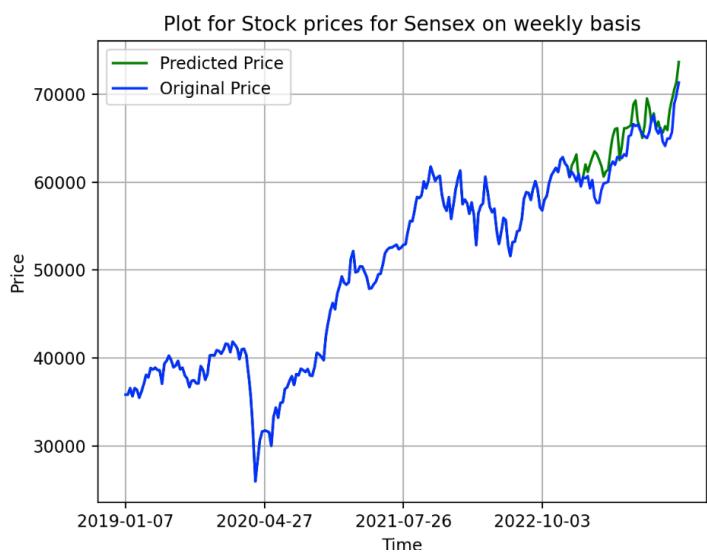


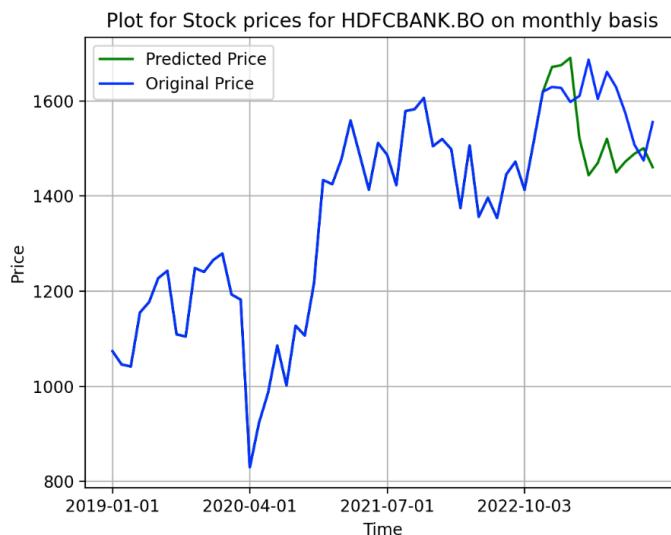
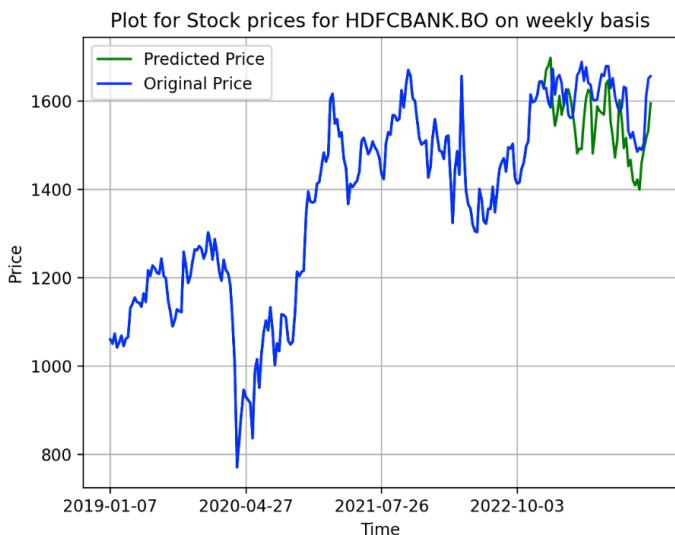
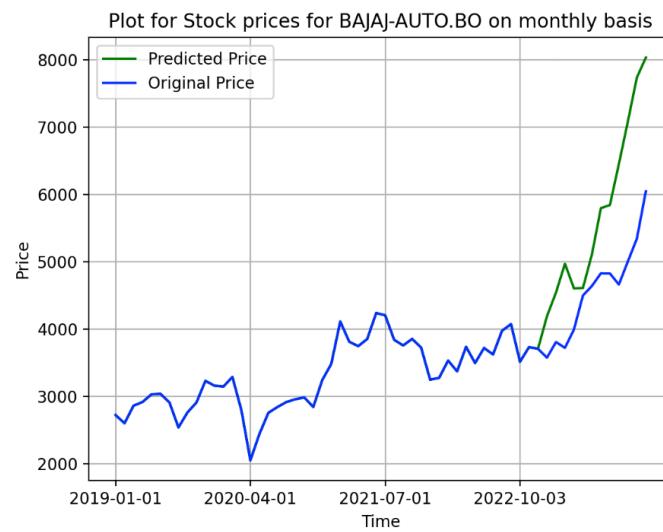
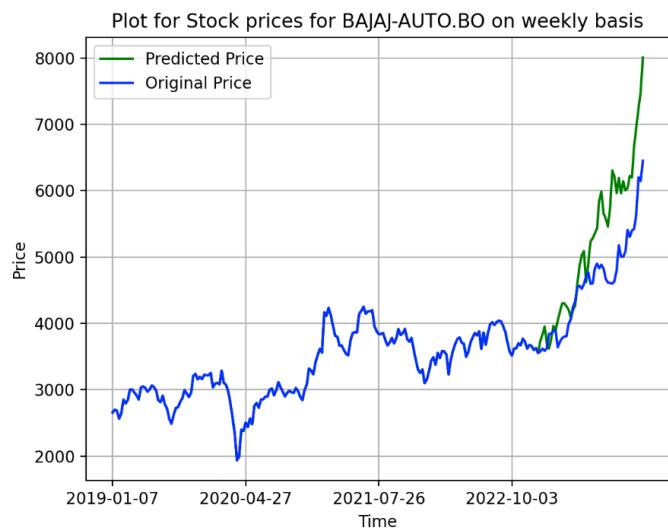
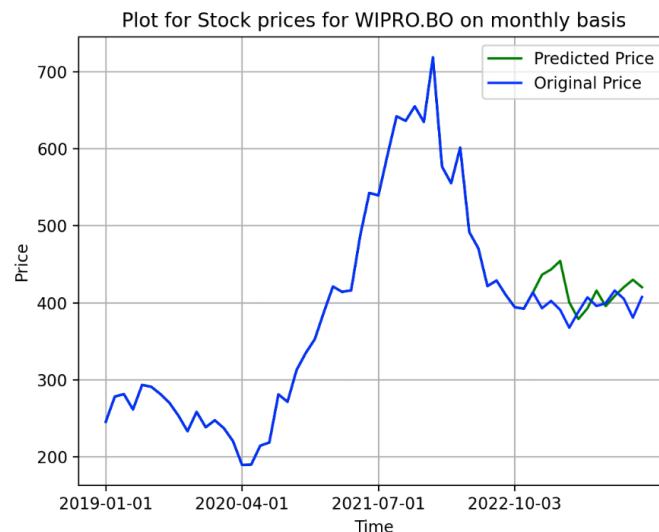
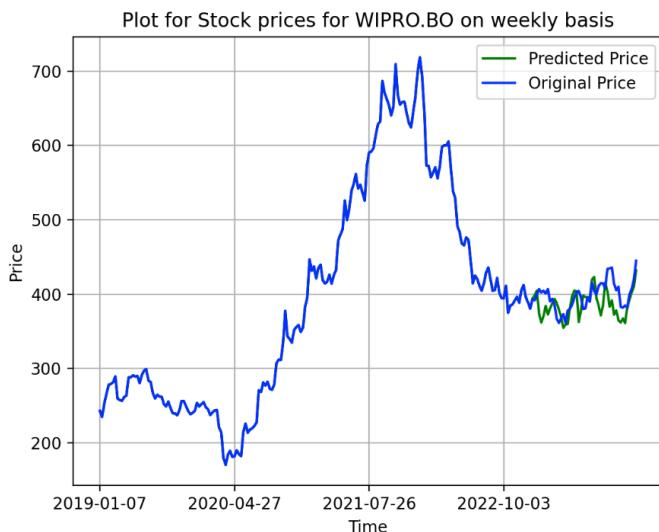
Plot for Stock prices for AMBUJACEM.NS on daily basis

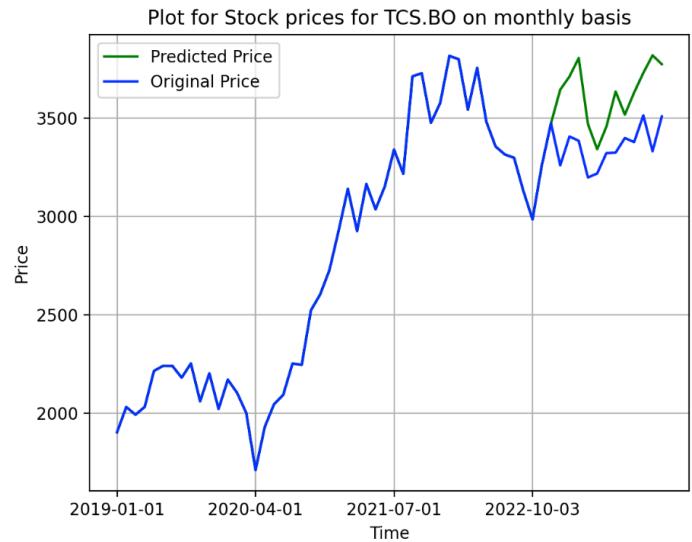
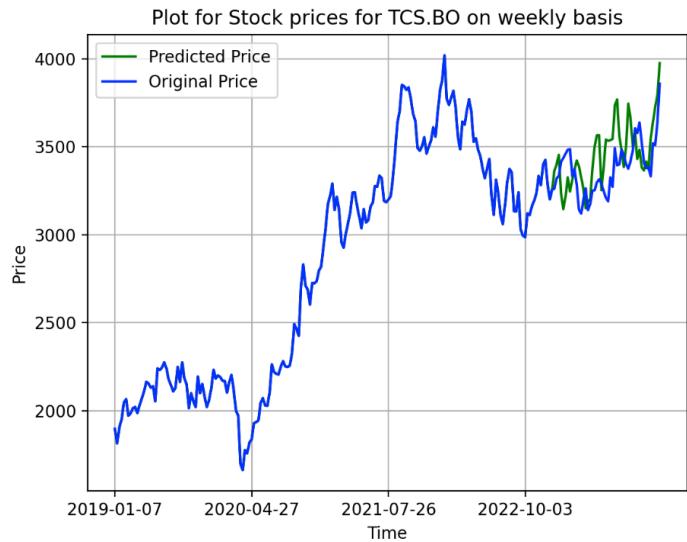




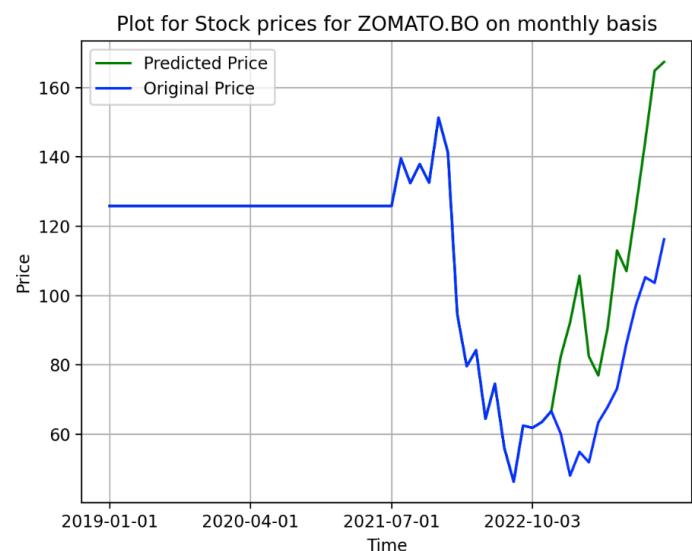
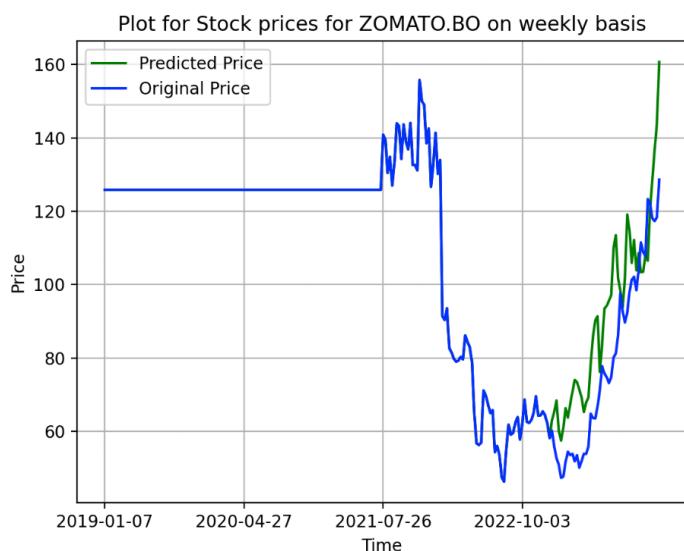
For Weekly and Monthly stock data: The generated stock prices path along with the actual path for stocks in bse index are:



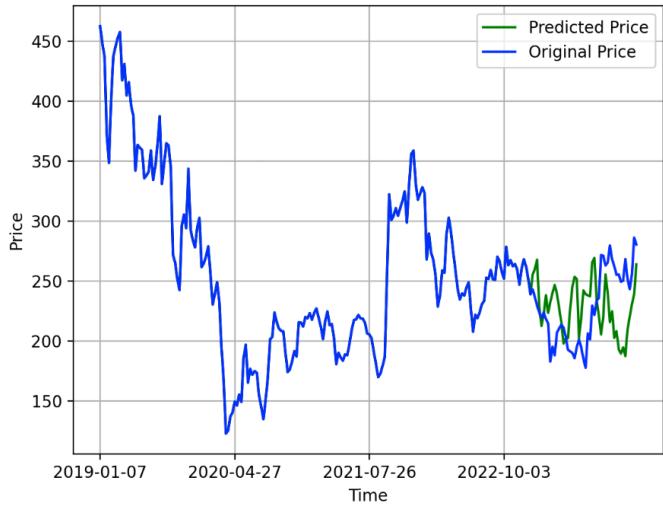




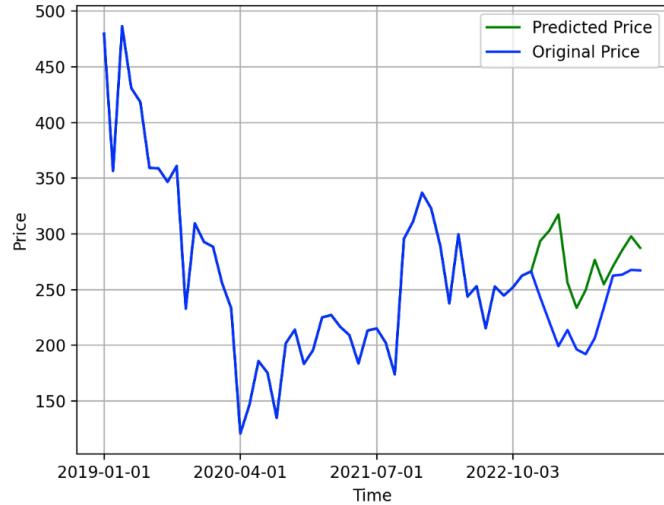
For Weekly and Monthly stock data: The generated stock prices path along with the actual path for stocks NOT in bse index are:



Plot for Stock prices for ZEEL.BO on weekly basis



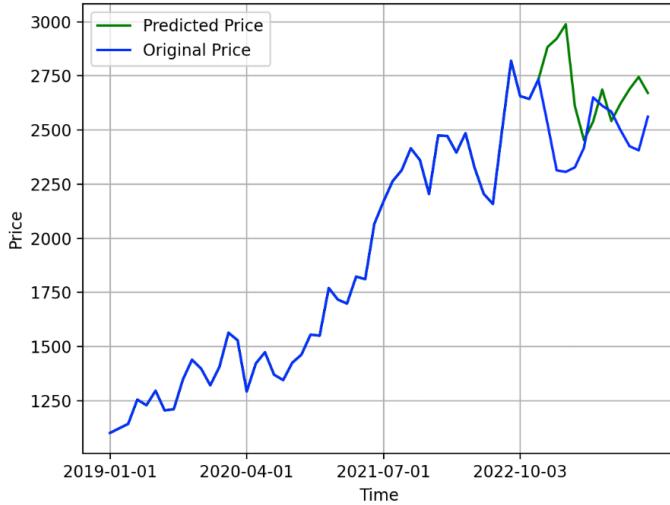
Plot for Stock prices for ZEEL.BO on monthly basis



Plot for Stock prices for PIDILITIND.BO on weekly basis



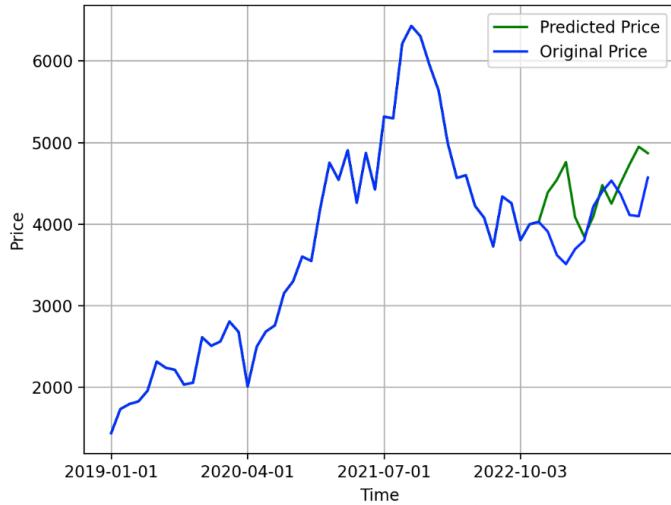
Plot for Stock prices for PIDILITIND.BO on monthly basis



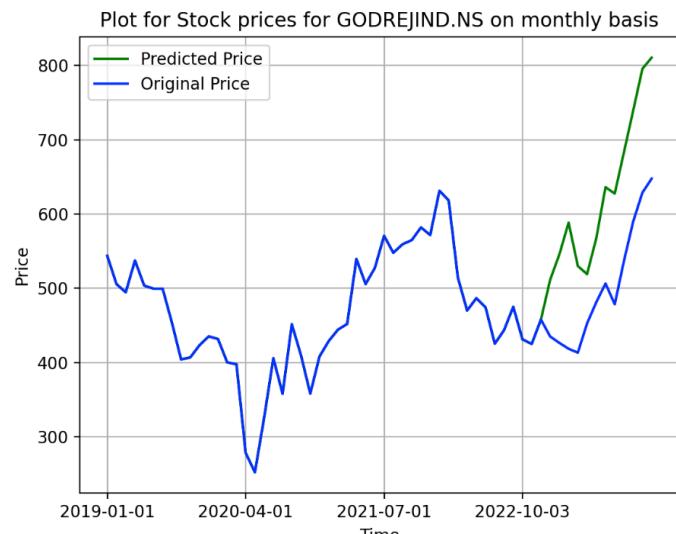
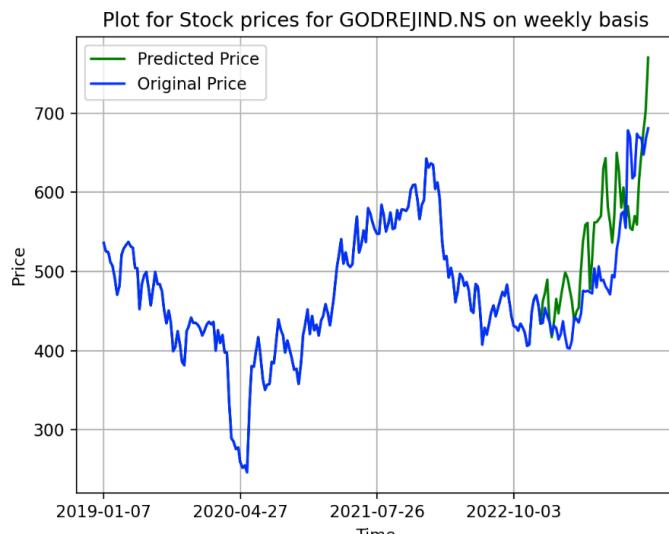
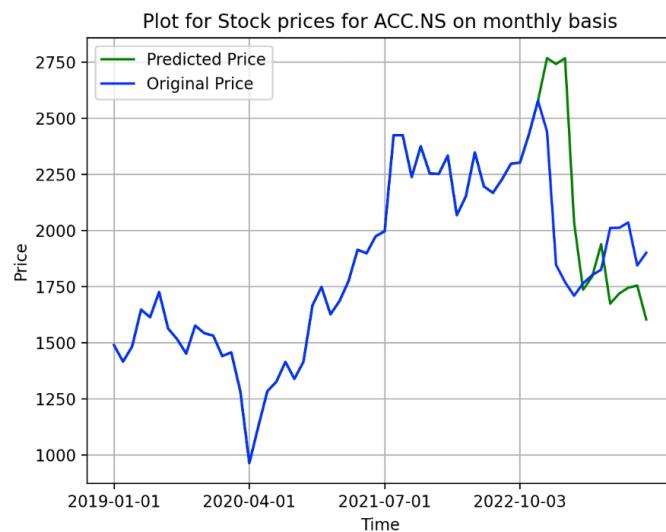
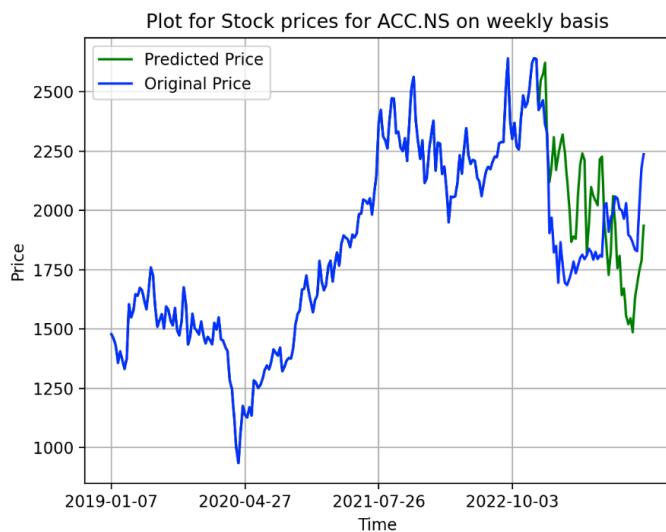
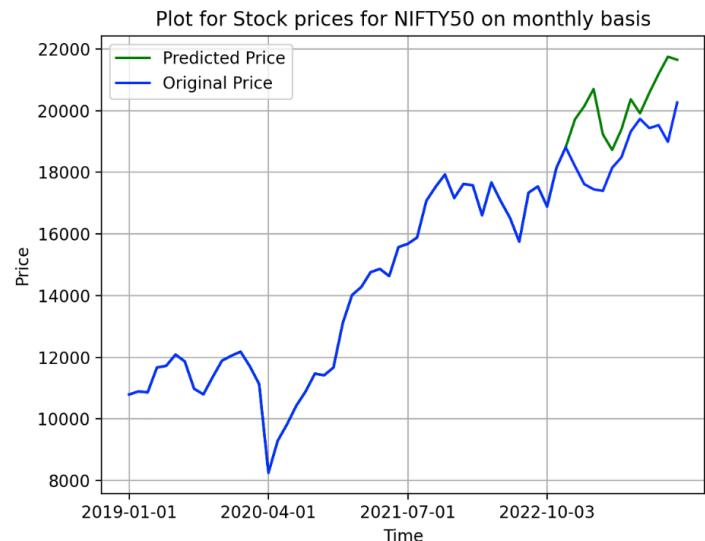
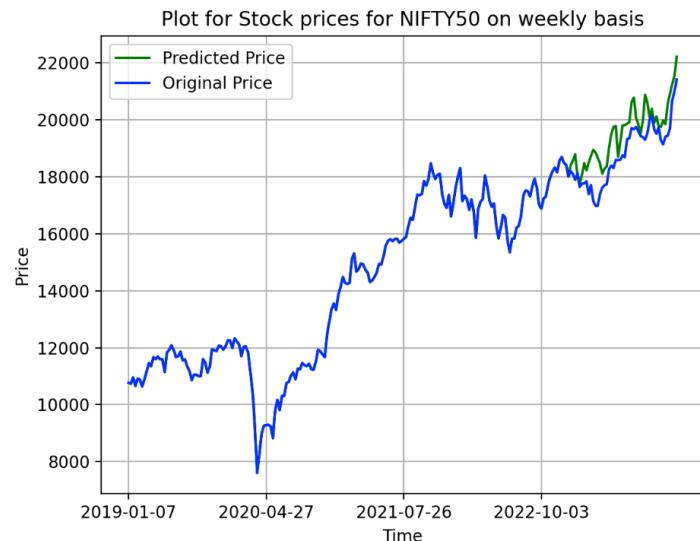
Plot for Stock prices for NAUKRI.BO on weekly basis

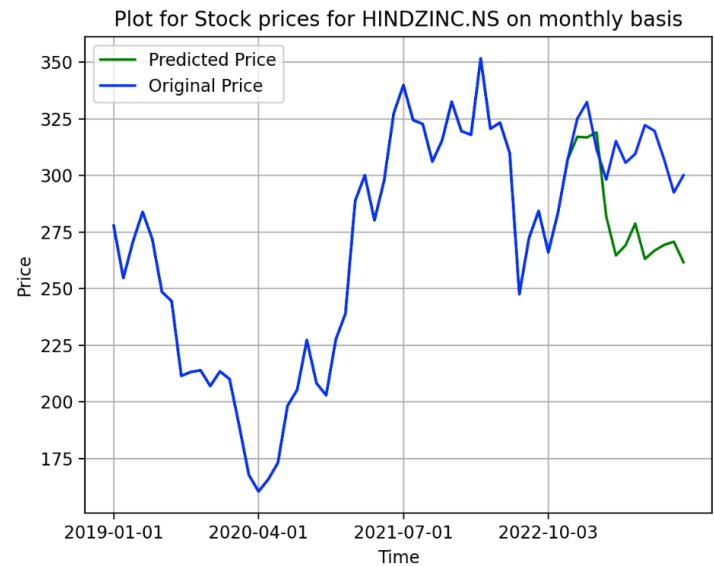
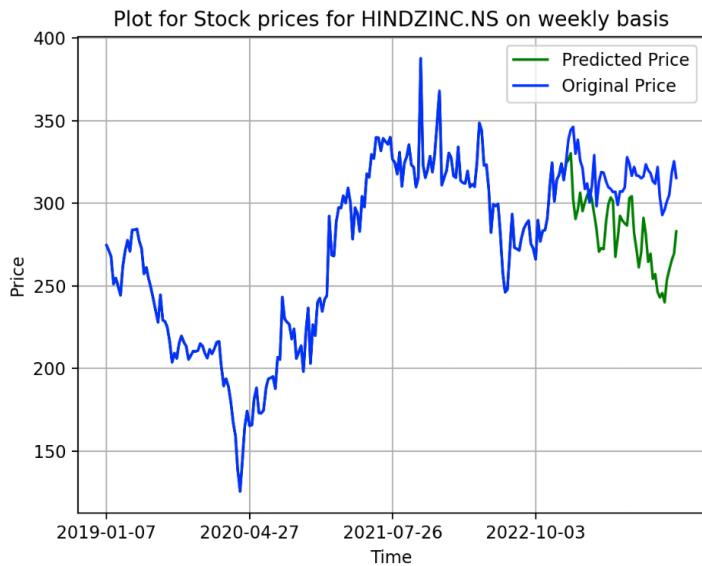


Plot for Stock prices for NAUKRI.BO on monthly basis

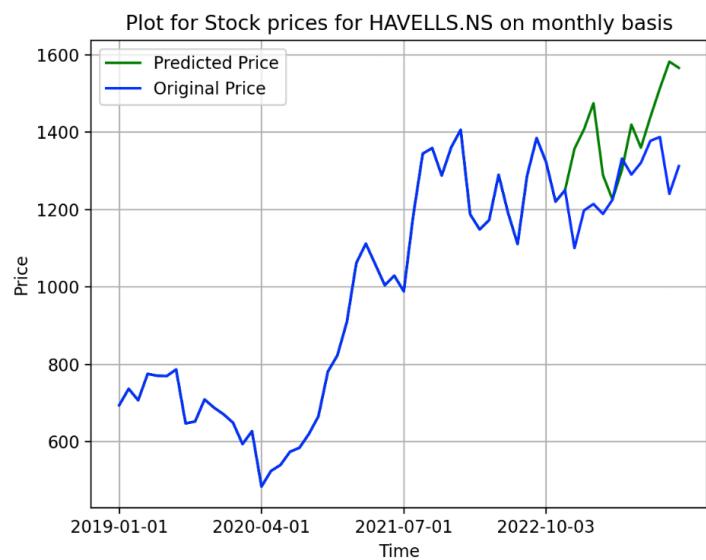
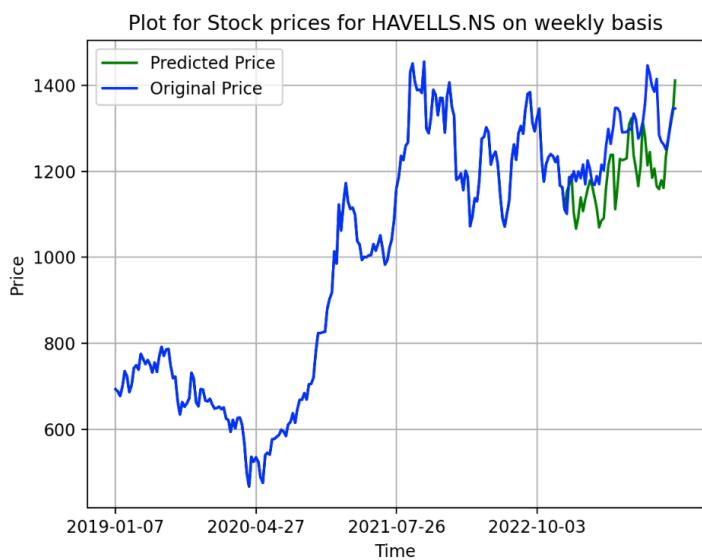


For Weekly and Monthly stock data: The generated stock prices path along with the actual path for stocks in nse index are:

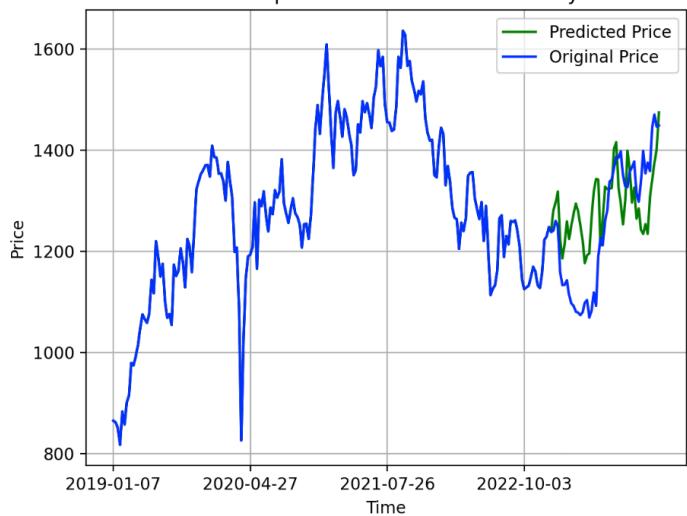




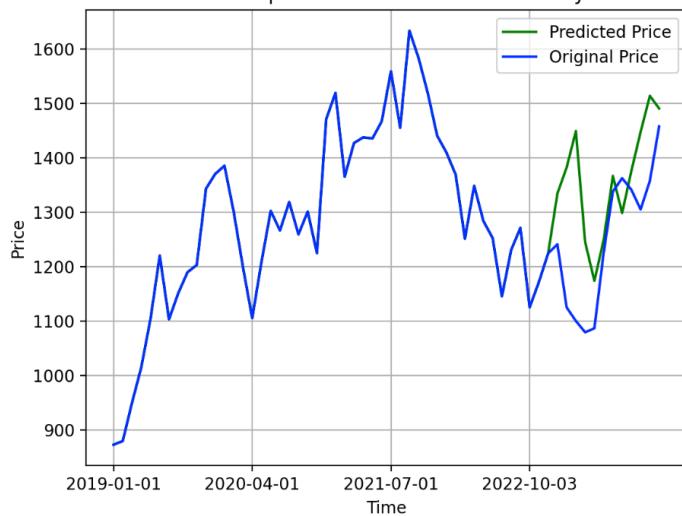
For Weekly and Monthly stock data: The generated stock prices path along with the actual path for stocks NOT in nse index are:



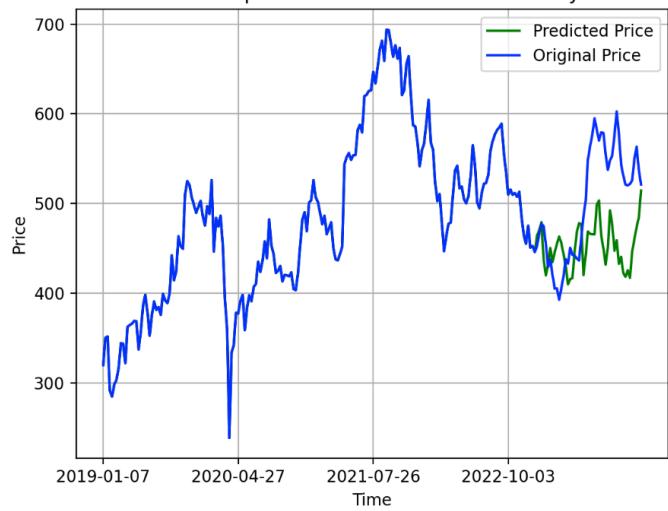
Plot for Stock prices for ICICIGI.NS on weekly basis



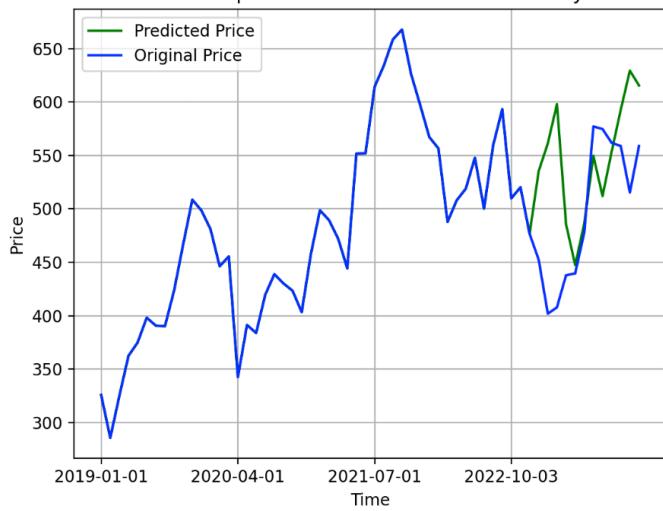
Plot for Stock prices for ICICIGI.NS on monthly basis



Plot for Stock prices for ICICIPRULI.NS on weekly basis



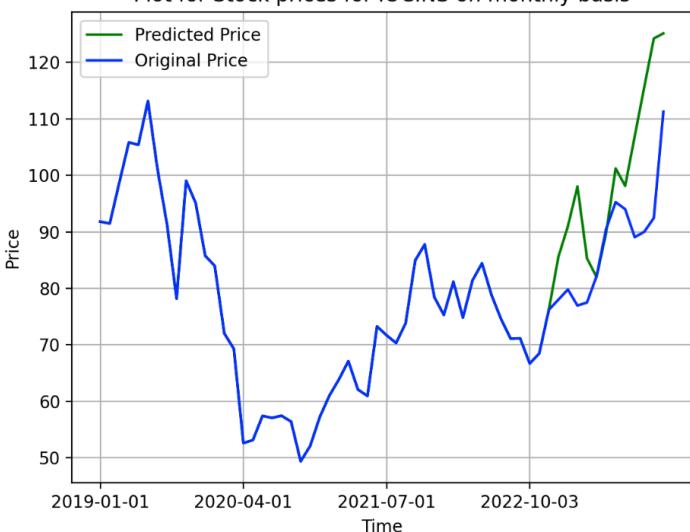
Plot for Stock prices for ICICIPRULI.NS on monthly basis



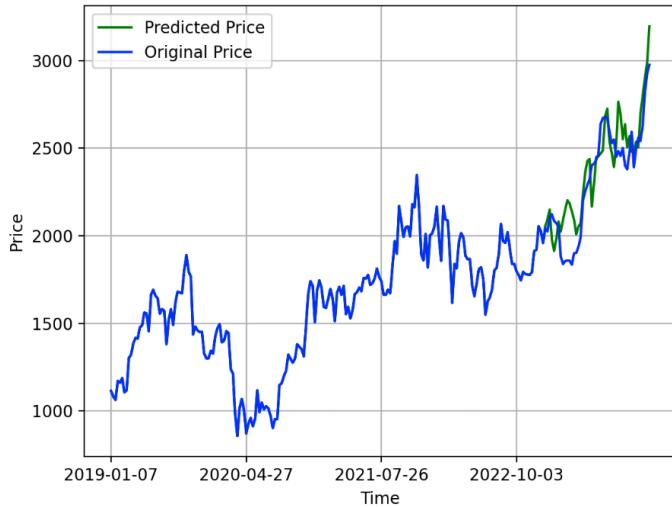
Plot for Stock prices for IOC.NS on weekly basis



Plot for Stock prices for IOC.NS on monthly basis



Plot for Stock prices for INDIGO.NS on weekly basis



Plot for Stock prices for INDIGO.NS on monthly basis

