

Name: Udandaraao Sai Sandeep

Roll Number: 180123063

Dept.: Mathematics and Computing

Q1.

Based on last month data (21 days) in `nsedata1(daily)` and `bsedata1(daily)`, the corresponding return values were calculated, and subsequently the **sigma value** corresponding to the return was then calculated. Then, **annualized sigma** was calculated by multiplying it with a factor of $\sqrt{252}$. The results are as follows:

For Stocks:

For BSE Stocks		For NSE Stocks	
Stock	Volatility (1 month)	Stock	Volatility (1 month)
SBI	0.207443326	HDFC	0.222725471
Titan	0.233721443	TCS	0.252313154
Reliance	0.245992607	Kotak Mahindra	0.382029924
ICICI	0.199392451	Bharti Airtel	0.444357870
Axis	0.234403849	Nestle	0.231639572
L&T	0.192081252	Housing Development	0.590019907
Ultratech	0.251830530	Maruti	0.263074037
ITC	0.193729183	Asian Paints	0.267932040
ONGC	0.239991359	HCL	0.322804330
Infosys	0.284310269	Coal India	0.203193255

For the market index values, the annualized sigma values are as follows:

For NIFTY			For SENSEX		
Stock	Volatility (1 month)		Stock	Volatility (1 month)	
NIFTY	0.138538412		SENSEX	0.142327696	

Q2.

Setting final price of the stock values as the starting value, and $T = 0.5$ (half year), we have:

BSE STOCKS:

Stock: SBI [BSE]

For $A=1.0$, Call Price = 20.883758232045693	Put Price = 13.613761527569181
For $A=0.5$, Call Price = 150.86000724923935	Put Price = 2.7970010876288143e-06
For $A=0.1$, Call Price = 265.73201065044765	Put Price = 0.0
For $A=1.5$, Call Price = 0.0778315067014872	Put Price = 136.3978425499867

Stock: Titan [BSE]

For $A=1.0$, Call Price = 71.20809629703524	Put Price = 48.70534155507744
For $A=0.5$, Call Price = 466.9557544366931	Put Price = 0.0001534157141804826
For $A=0.1$, Call Price = 822.5178780441958	Put Price = 0.0
For $A=1.5$, Call Price = 0.661079357764633	Put Price = 422.61117089482775

Stock: Reliance [BSE]

For $A=1.0$, Call Price = 90.91015493778798	Put Price = 63.36904897992133
For $A=0.5$, Call Price = 571.5071783789862	Put Price = 0.0005414000528389806
For $A=0.1$, Call Price = 1006.6790617957867	Put Price = 0.0
For $A=1.5$, Call Price = 1.1854122679131613	Put Price = 517.6098373311132

Stock: ICICI [BSE]

For $A=1.0$, Call Price = 24.691120770141254	Put Price = 15.820102061412001
For $A=0.5$, Call Price = 184.08287989231982	Put Price = 1.1379551949630695e-06
For $A=0.1$, Call Price = 324.25236679087294	Put Price = 0.0
For $A=1.5$, Call Price = 0.0651386255386257	Put Price = 166.40597996244475

Stock: Axis [BSE]

For $A=1.0$, Call Price = 48.907000269277034	Put Price = 33.48866873568278
For $A=0.5$, Call Price = 319.94655186042	Put Price = 0.00011194362286914838
For $A=0.1$, Call Price = 563.5689266233594	Put Price = 0.0
For $A=1.5$, Call Price = 0.4632731630691991	Put Price = 289.57305001267775

Stock: L&T [BSE]

For A=1.0, Call Price = 90.91117664202022
For A=0.5, Call Price = 698.0888864386002
For A=0.1, Call Price = 1229.6470738037108
For A=1.5, Call Price = 0.16933927052919007

Put Price = 57.27002760491189
Put Price = 1.4200460327629116e-06
Put Price = 0.0
Put Price = 630.9759262148664

Stock: Ultratech [BSE]

For A=1.0, Call Price = 330.9248421781458
For A=0.5, Call Price = 2040.2121700552989
For A=0.1, Call Price = 3593.721708170722
For A=1.5, Call Price = 4.99580703918744

Put Price = 232.60644647092204
Put Price = 0.003045201686973087
Put Price = 0.0
Put Price = 1848.5681404783516

Stock: ITC [BSE]

For A=1.0, Call Price = 17.26373337949201
For A=0.5, Call Price = 131.67591318693462
For A=0.1, Call Price = 231.9402362478473
For A=1.5, Call Price = 0.034889565312497206

Put Price = 10.918224801018766
Put Price = 3.476980054983869e-07
Put Price = 0.0
Put Price = 119.01978524760263

Stock: ONGC [BSE]

For A=1.0, Call Price = 10.4738926595399
For A=0.5, Call Price = 67.20323482878231
For A=0.1, Call Price = 118.37491659740773
For A=1.5, Call Price = 0.11633131731556334

Put Price = 7.235346985462712
Put Price = 3.8641743714151744e-05
Put Price = 0.0
Put Price = 60.84243615619979

Stock: Infosys [BSE]

For A=1.0, Call Price = 56.61598755134196
For A=0.5, Call Price = 315.1841502532091
For A=0.1, Call Price = 555.1737725638296
For A=1.5, Call Price = 1.6794618623309603

Put Price = 41.42733381304595
Put Price = 0.0037638340610897103
Put Price = 0.0
Put Price = 286.48254080488687

NSE STOCKS:

Stock: HDFC [NSE]

For A=1.0, Call Price = 143.0344555015422
For A=0.5, Call Price = 975.6399127024449
For A=0.1, Call Price = 1718.5385081534166
For A=1.5, Call Price = 0.9384520408587989

Put Price = 96.01802996737479
Put Price = 0.00010793536125675018
Put Price = 0.0
Put Price = 882.5454057396076

Stock: TCS [NSE]

For A=1.0, Call Price = 149.64944548532867
For A=0.5, Call Price = 921.1463425745363
For A=0.1, Call Price = 1622.5486121708059
For A=1.5, Call Price = 2.2858023818274518

Put Price = 105.25914777726871
Put Price = 0.0014257205064041045
Put Price = 0.0
Put Price = 834.6501238197374

Stock: Kotak Mahindra [NSE]

For A=1.0, Call Price = 147.53170054597422
For A=0.5, Call Price = 635.9386604767046
For A=0.1, Call Price = 1119.676289478767
For A=1.5, Call Price = 14.496856516881934

Put Price = 116.89917375830464
Put Price = 0.2818210828697829
Put Price = 0.0
Put Price = 588.8886423353777

Stock: Bharti Airtel [NSE]

For A=1.0, Call Price = 39.39500105400839
For A=0.5, Call Price = 148.6201996131952
For A=0.1, Call Price = 261.3634855946172
For A=1.5, Call Price = 5.98837183004494

Put Price = 32.24452010783875
Put Price = 0.24027164011039304
Put Price = 2.2737367544323206e-13
Put Price = 140.06733791079054

Stock: Nestle [NSE]

For A=1.0, Call Price = 834.7417987485796

For A=0.5, Call Price = 5514.24861524083

For A=0.1, Call Price = 9713.05801694886

For A=1.5, Call Price = 7.2808990616724

Put Price = 569.0082892599721

Put Price = 0.0014904965264577186

Put Price = 0.0

Put Price = 4990.061004828762

Stock: Housing Development [NSE]

For A=1.0, Call Price = 4.404692826455099

For A=0.5, Call Price = 12.958870947137353

For A=0.1, Call Price = 22.606847991038528

For A=1.5, Call Price = 1.2254940804645793

Put Price = 3.7862061415292967

Put Price = 0.12462798467445246

Put Price = 6.545949560177178e-09

Put Price = 12.822763673075869

Stock: Maruti [NSE]

For A=1.0, Call Price = 632.339951431793

For A=0.5, Call Price = 3758.7343222649038

For A=0.1, Call Price = 6620.792025867069

For A=1.5, Call Price = 12.361305671361663

Put Price = 451.20582276110736

Put Price = 0.012472929560772172

Put Price = 0.0

Put Price = 3408.8148976653342

Stock: Asian Paints [NSE]

For A=1.0, Call Price = 117.94337795919444

For A=0.5, Call Price = 690.3787115120776

For A=0.1, Call Price = 1216.0604642441622

For A=1.5, Call Price = 2.555730436457033

Put Price = 84.67393651757345

Put Price = 0.003146291267171364

Put Price = 0.0

Put Price = 626.3924127740254

Stock: HCL [NSE]

For A=1.0, Call Price = 47.94969358596012

For A=0.5, Call Price = 239.4058820758153

For A=0.1, Call Price = 421.67148362987894

For A=1.5, Call Price = 2.5442014394825243

Put Price = 36.41344588717055

Put Price = 0.01672552642051528

Put Price = 0.0

Put Price = 218.86086259129817

Stock: Coal India [NSE]

For A=1.0, Call Price = 14.237678285229052

For A=0.5, Call Price = 104.56549994606293

For A=0.1, Call Price = 184.1866593687464

For A=1.5, Call Price = 0.04441897140365325

Put Price = 9.198630097764962

Put Price = 1.102330884350522e-06

Put Price = 0.0

Put Price = 94.53182144020751

SENSEX AND NIFTY

SENSEX [BSE]

For A=1.0, Call Price = 1896.5111444730428
For A=0.5, Call Price = 18265.070799799003
For A=0.1, Call Price = 32172.967287959767
For A=1.5, Call Price = 0.08018264074010029

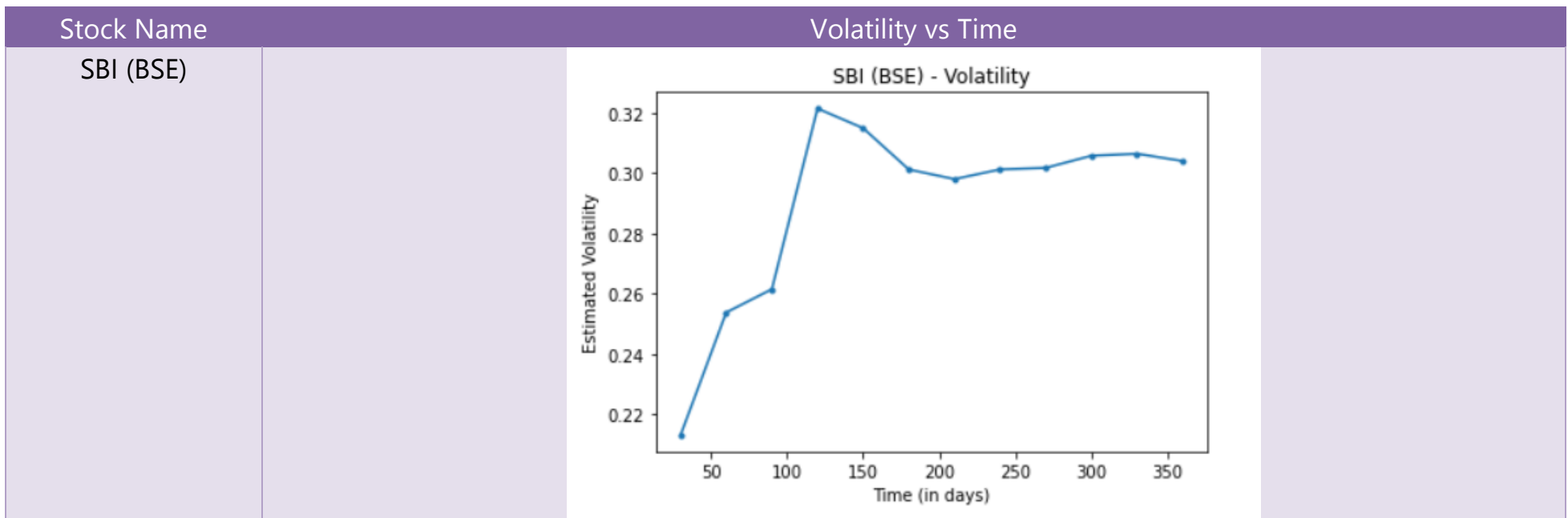
Put Price = 1016.3109548753564
Put Price = 1.6007106751203537e-10
Put Price = 0.0
Put Price = 16504.75060324421

NIFTY [NSE]

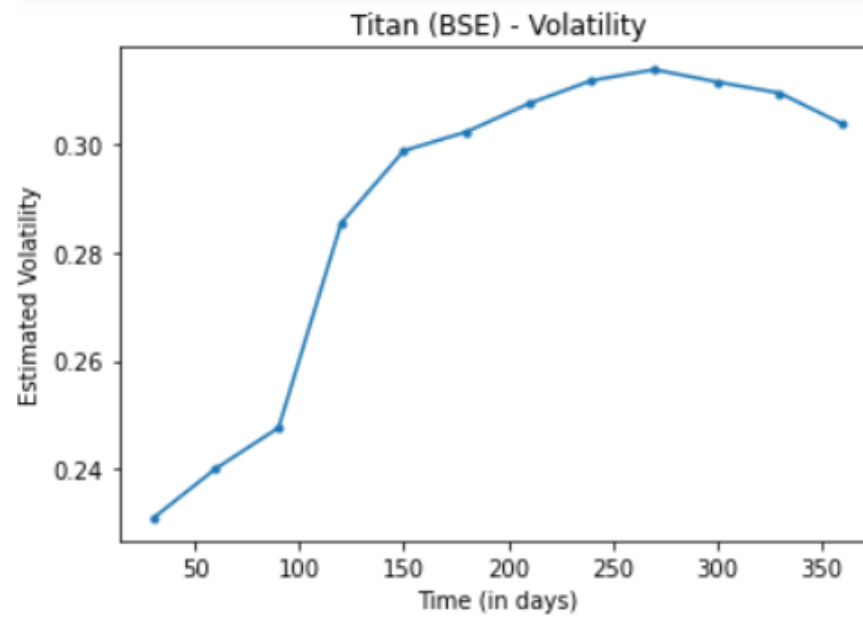
For A=1.0, Call Price = 562.4543116794548
For A=0.5, Call Price = 5522.977002689493
For A=0.1, Call Price = 9728.435240537896
For A=1.5, Call Price = 0.01516290225842476

Put Price = 296.3001063004931
Put Price = 1.1823431123048067e-11
Put Price = 0.0
Put Price = 4990.683754833815

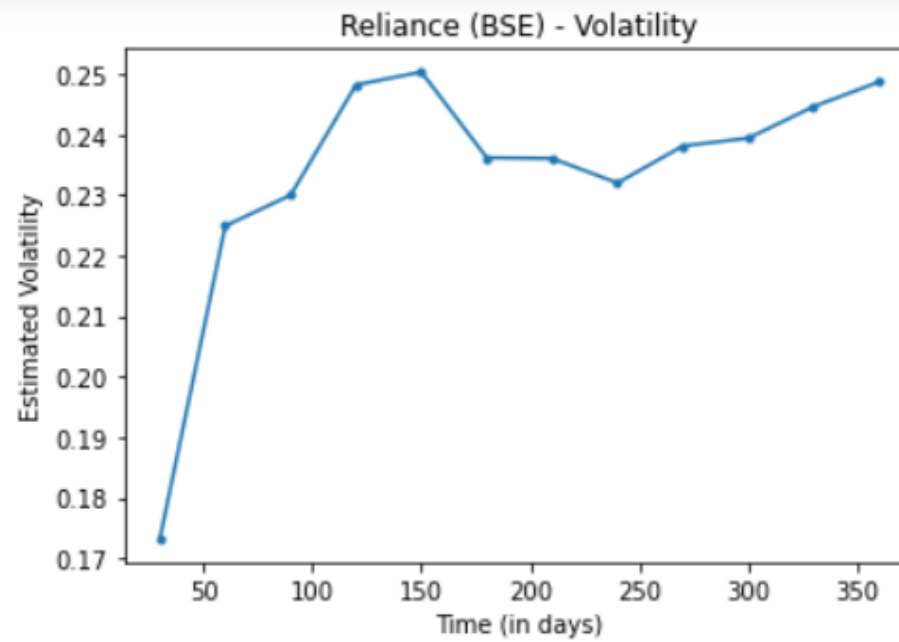
Q3. Going one month back (21 days) at a time (for 1 year), Volatility vs Time was plotted out.



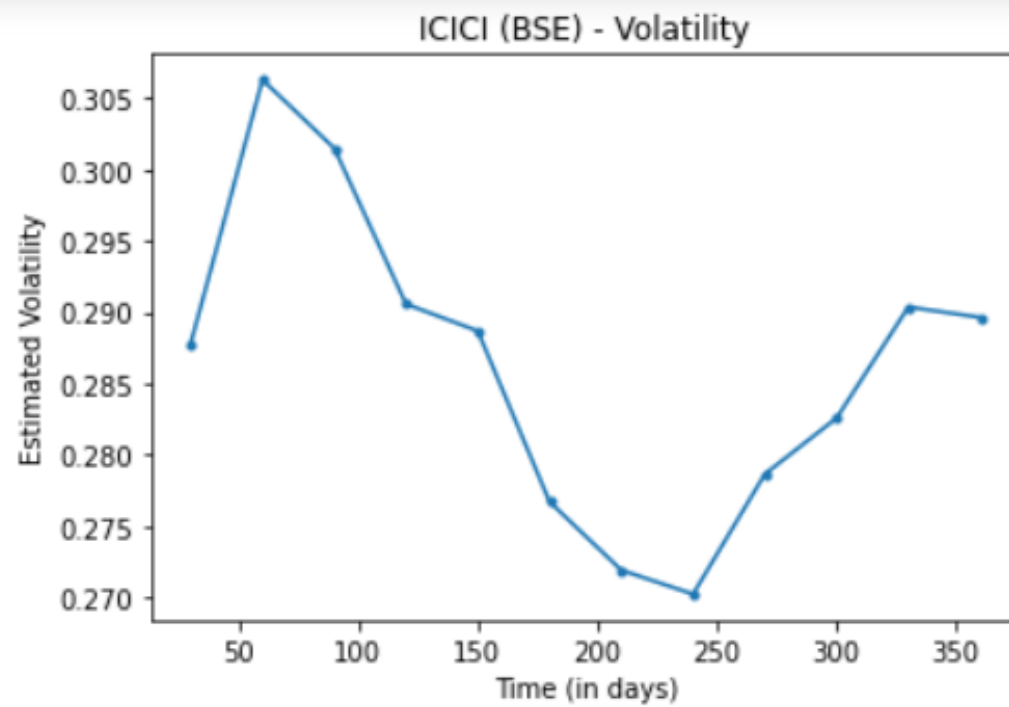
Titan (BSE)



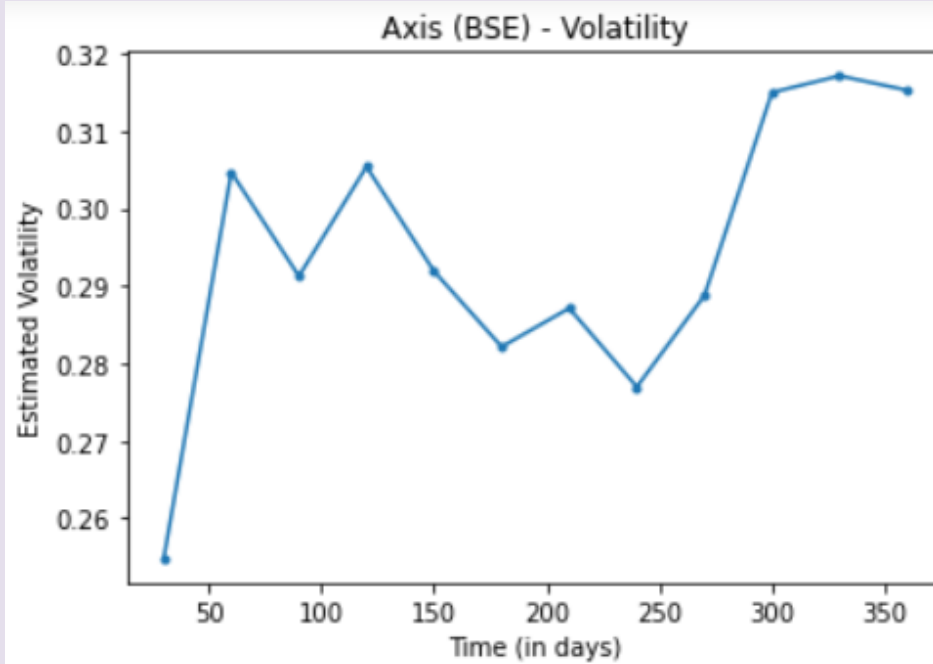
Reliance (BSE)



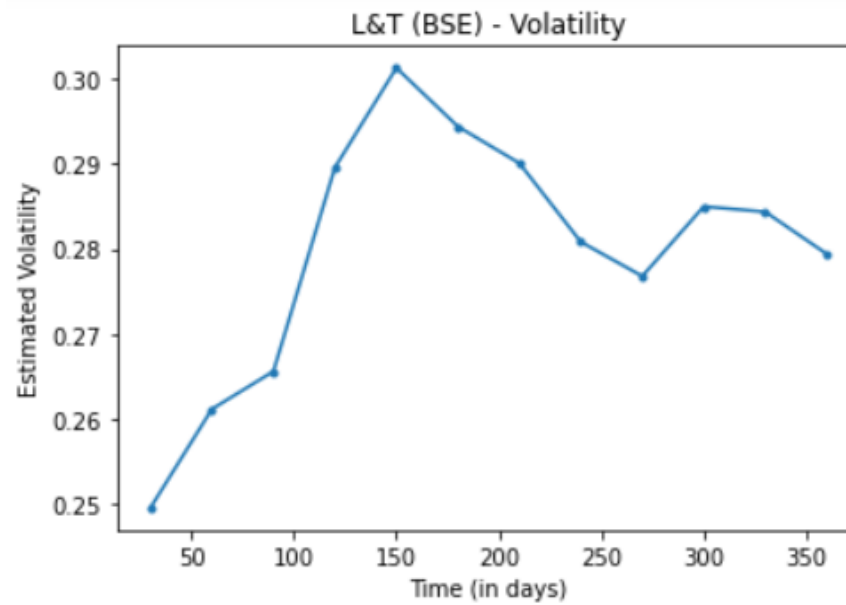
ICICI (BSE)



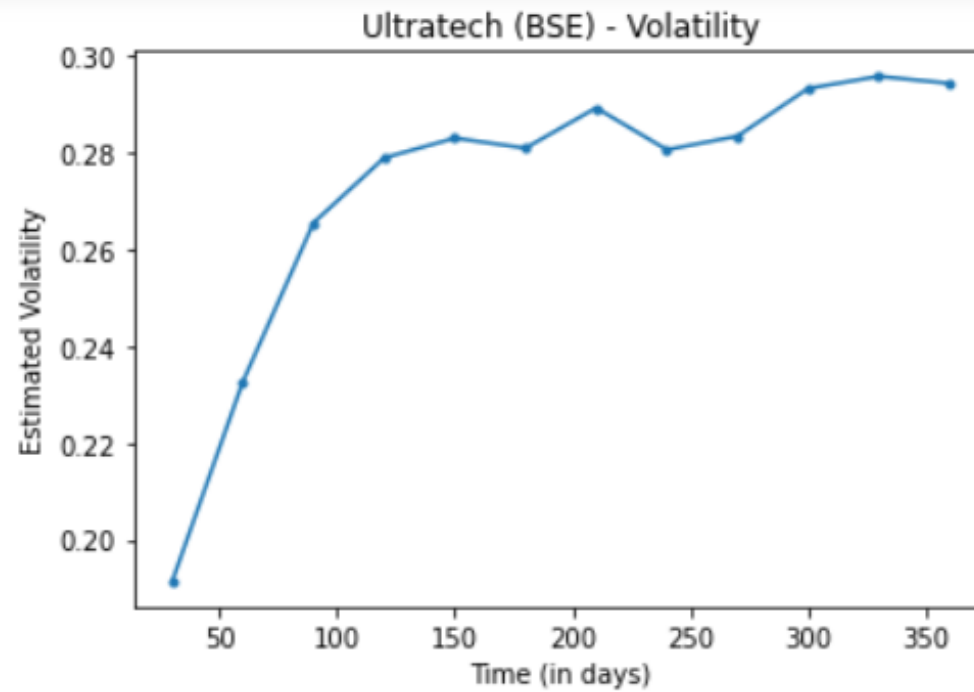
Axis (BSE)



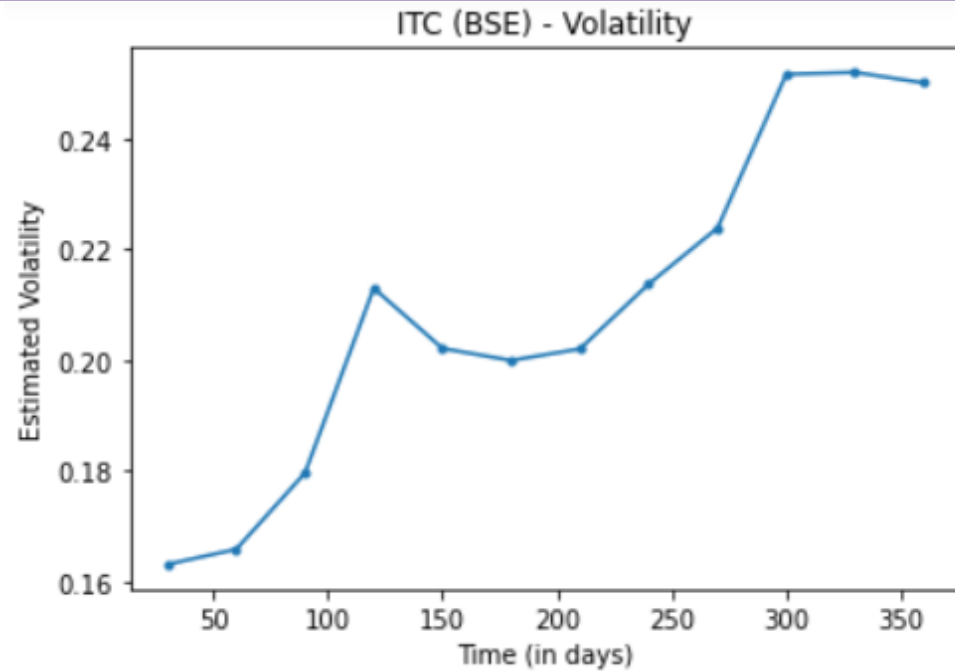
L&T (BSE)



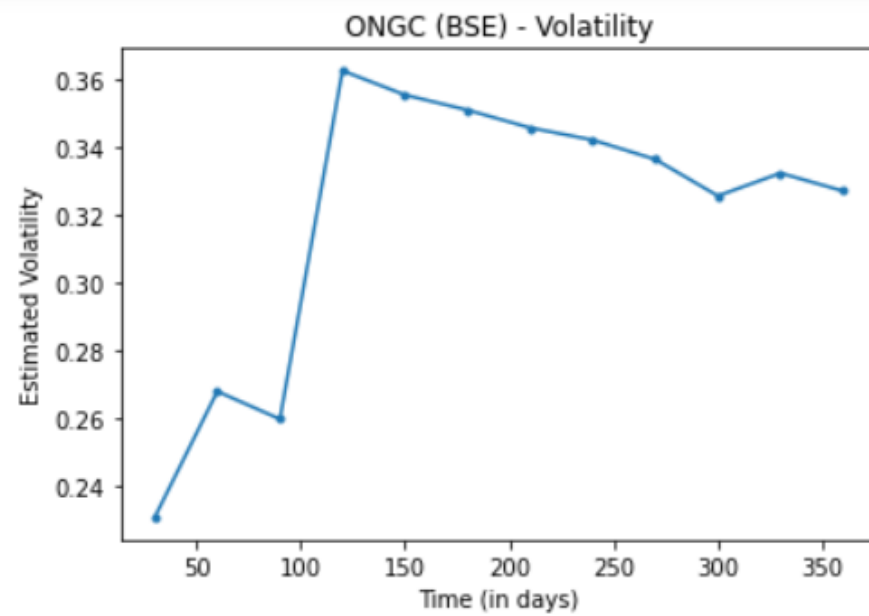
Ultratech (BSE)



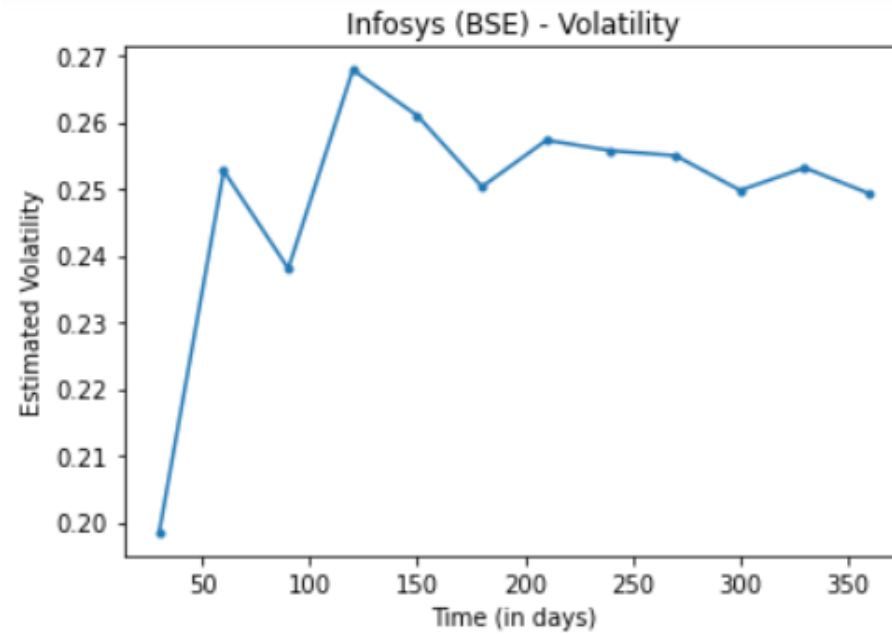
ITC (BSE)



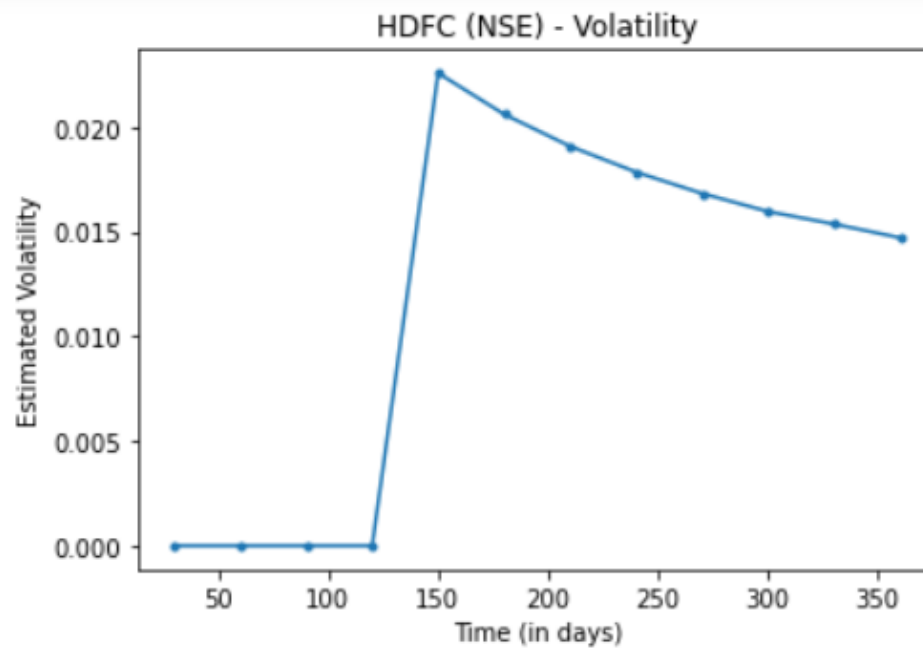
ONGC (BSE)



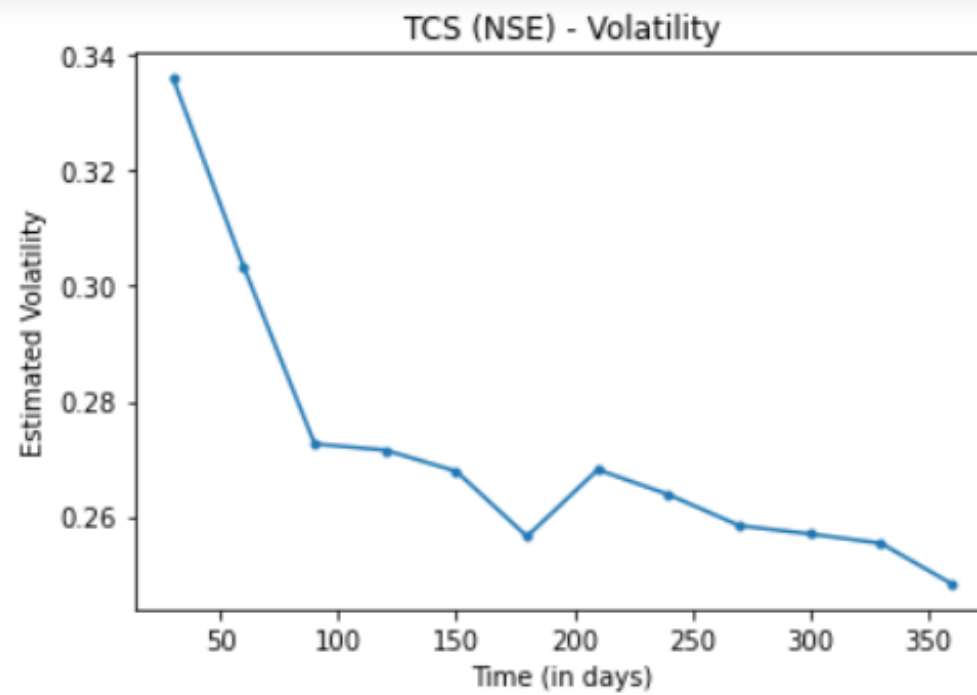
Infosys (BSE)



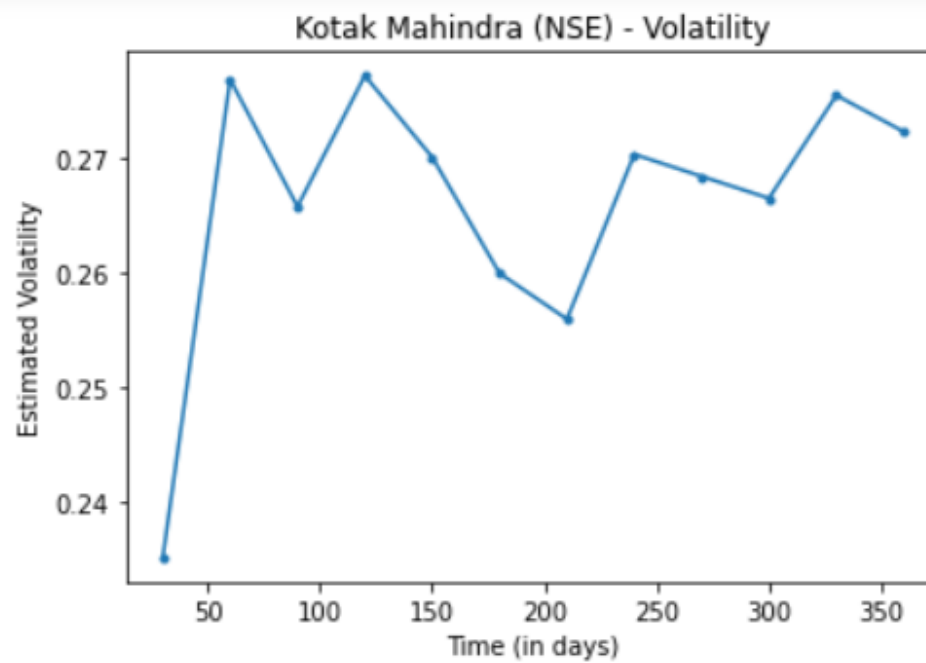
HDFC (NSE)



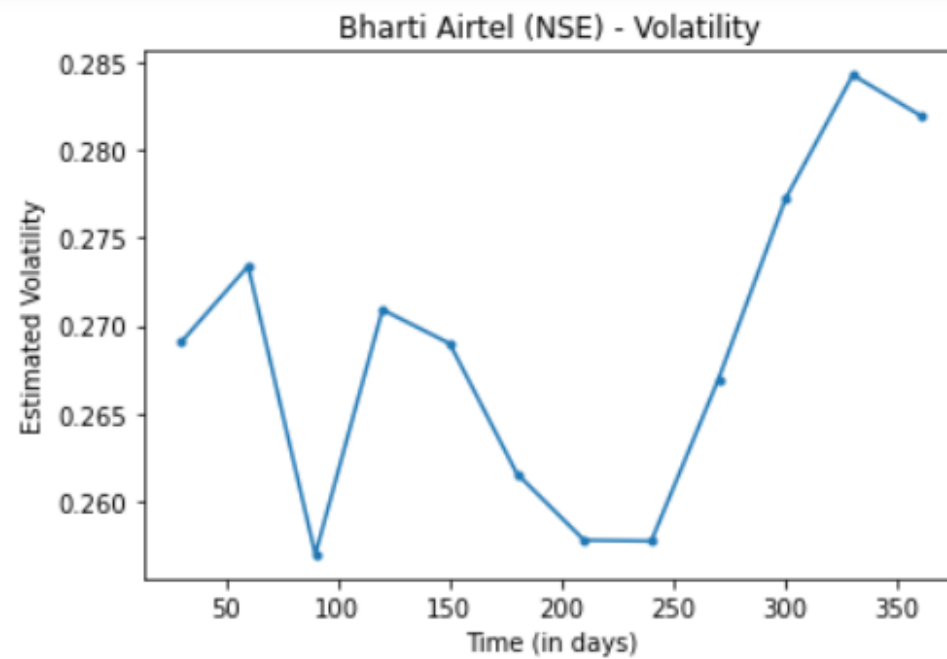
TCS (NSE)



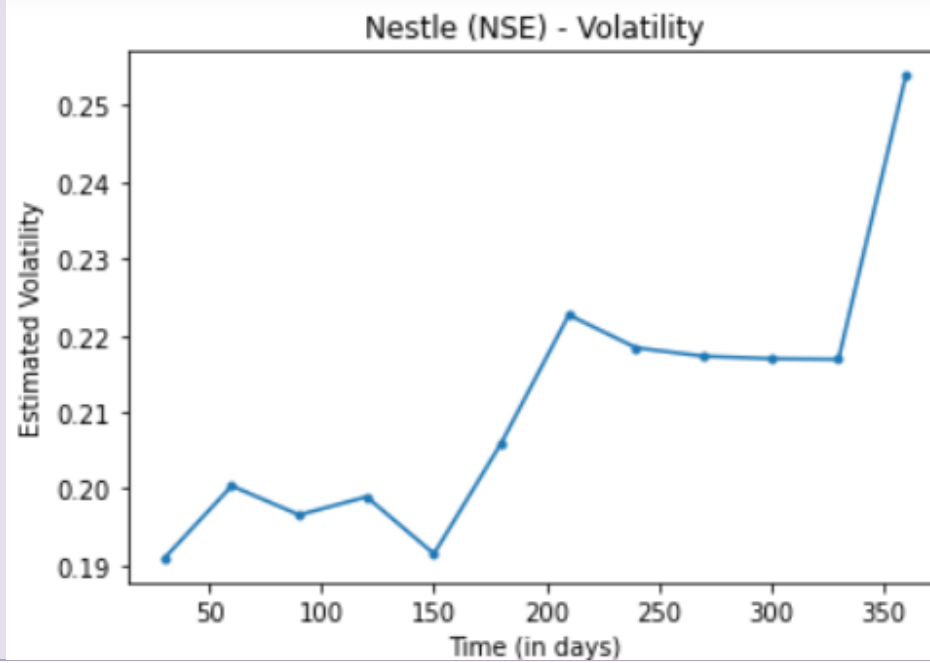
Kotak (NSE)



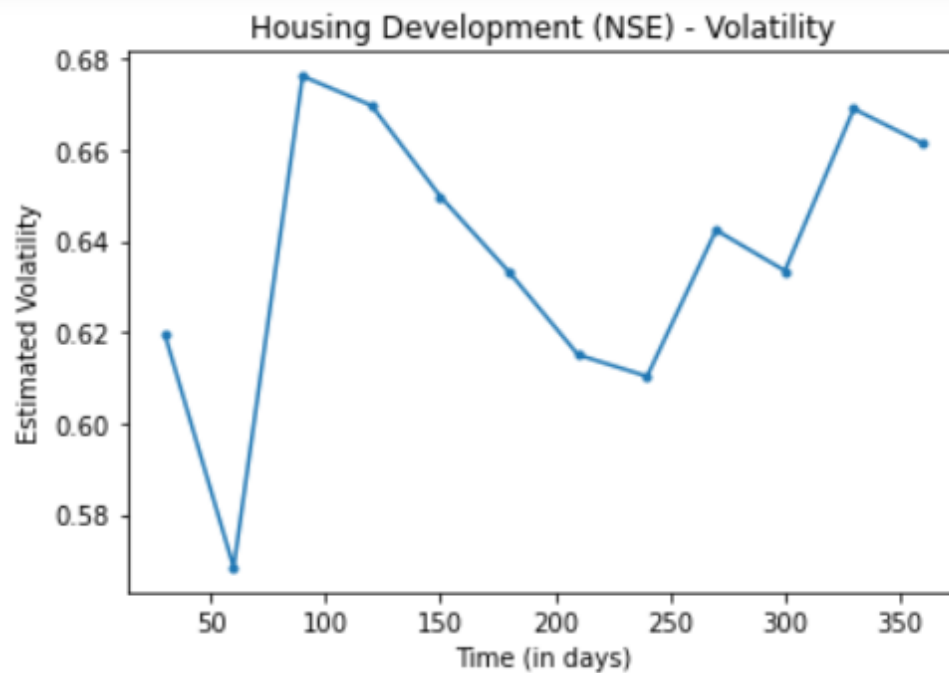
Bharti Airtel (NSE)



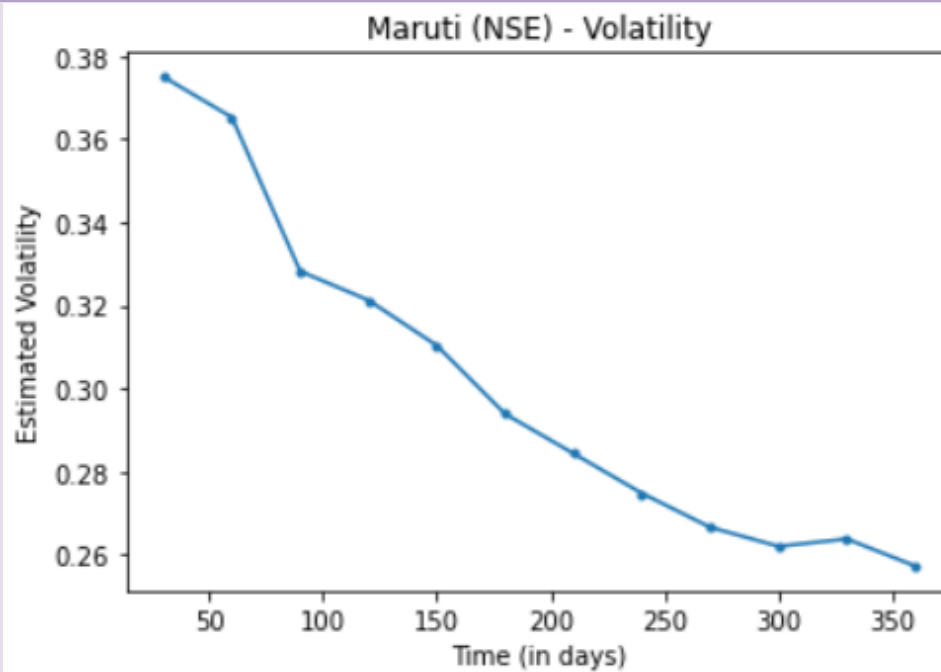
Nestle (NSE)



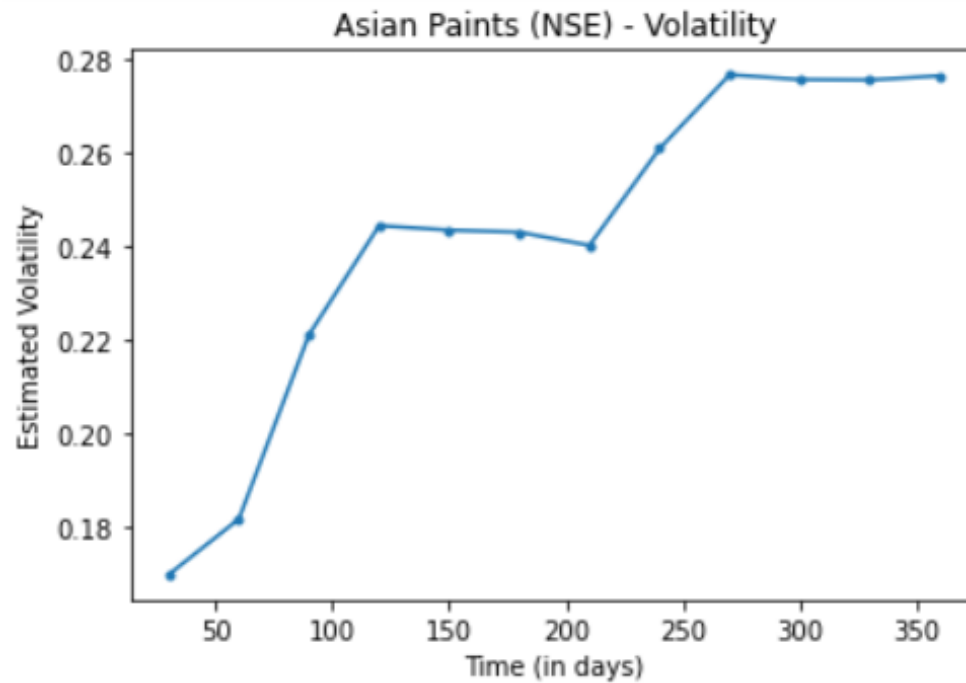
Housing
Development
(NSE)



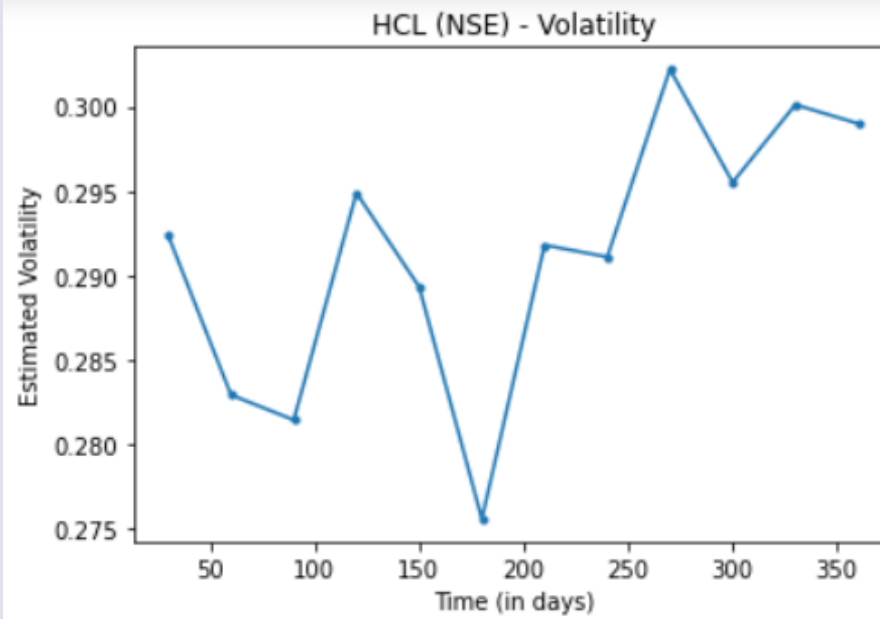
Maruti (NSE)



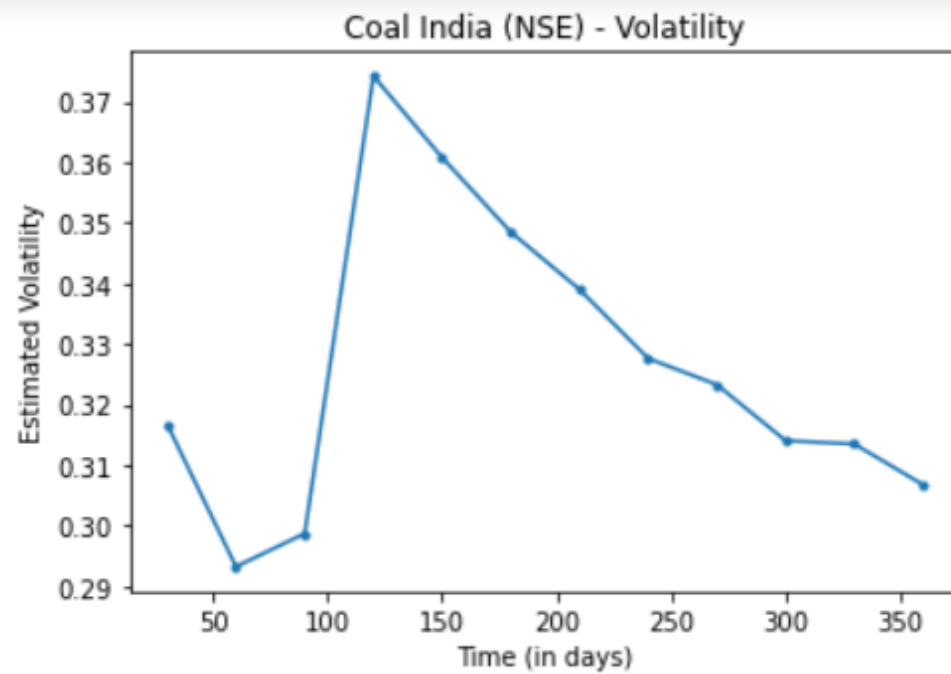
Asian Paints (NSE)



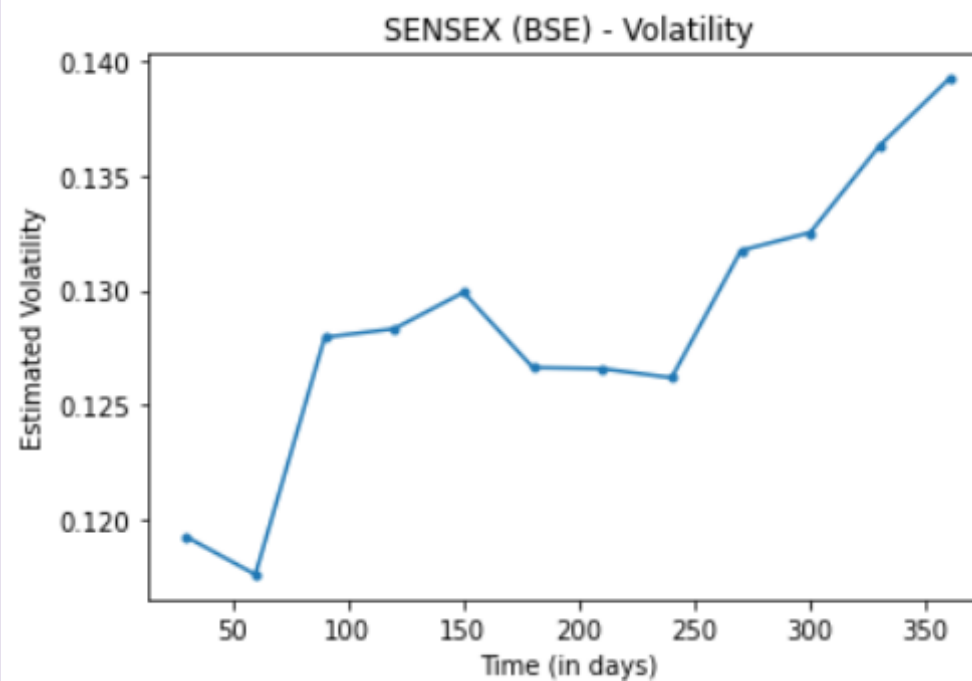
HCL (NSE)



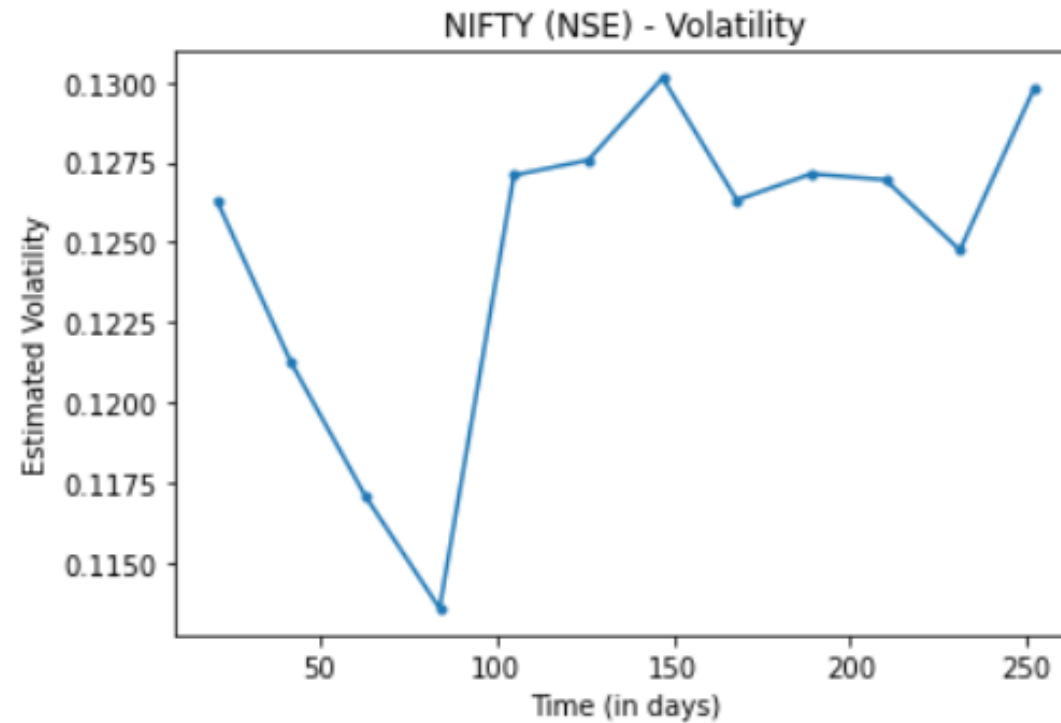
Coal India (NSE)



SENSEX



NIFTY



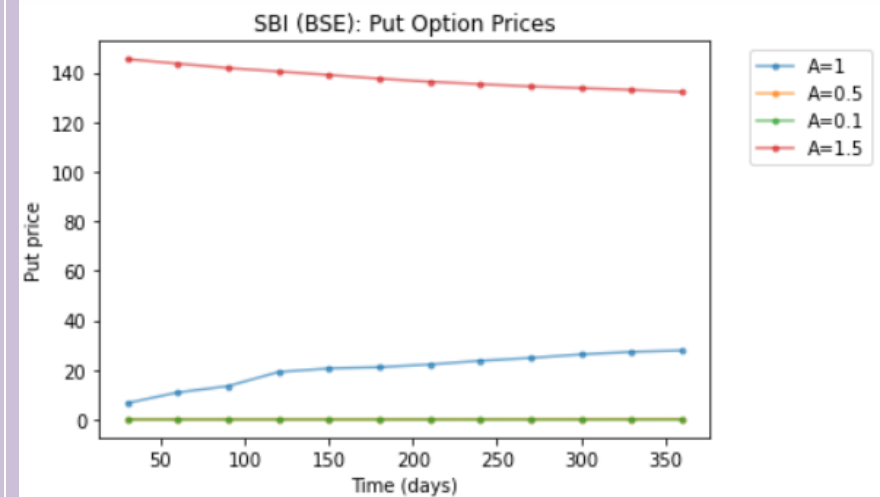
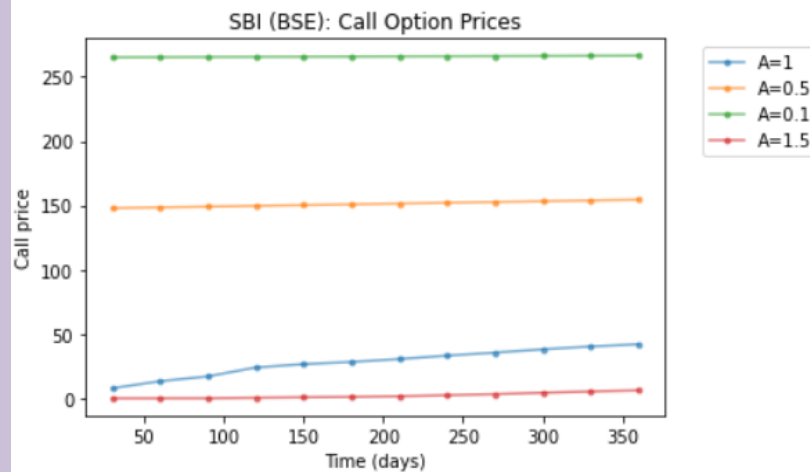
The **put** and **call** option prices (for various values of **A**) are as follows:

Stock Name

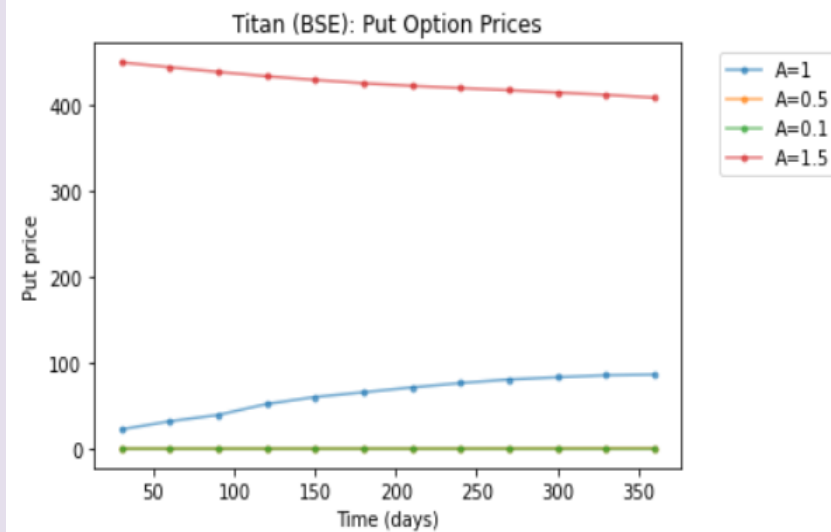
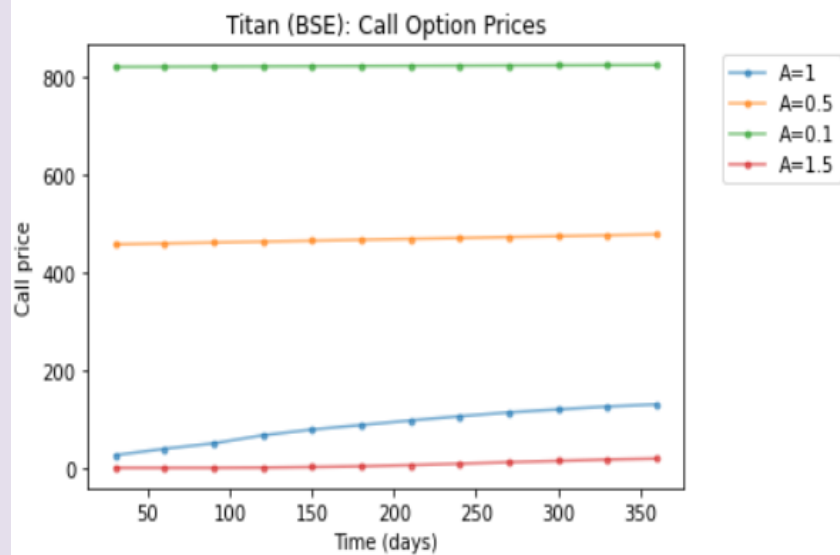
Call Option Prices

Put Option Prices

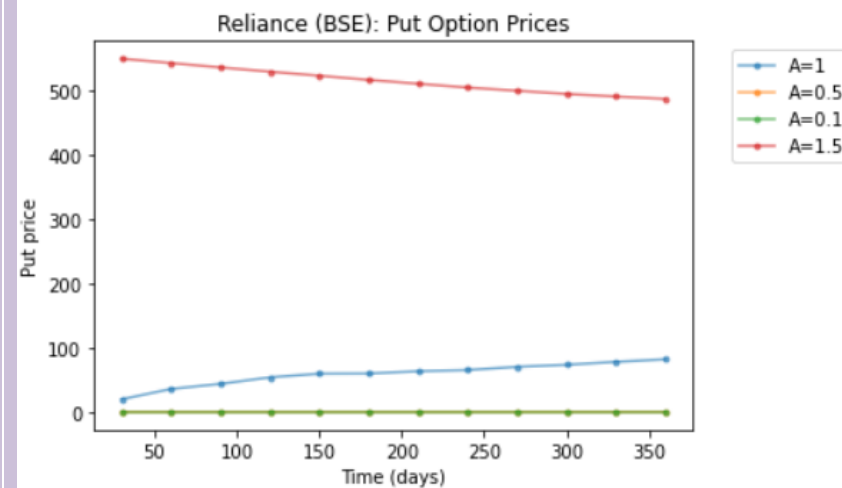
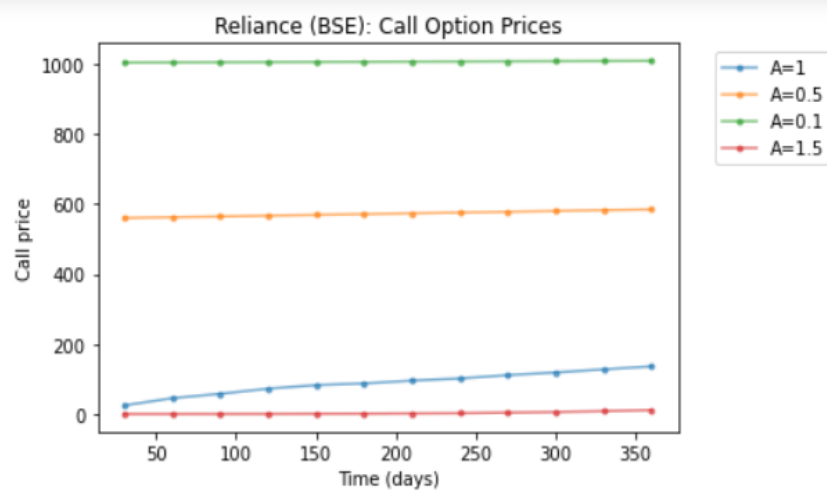
SBI (BSE)



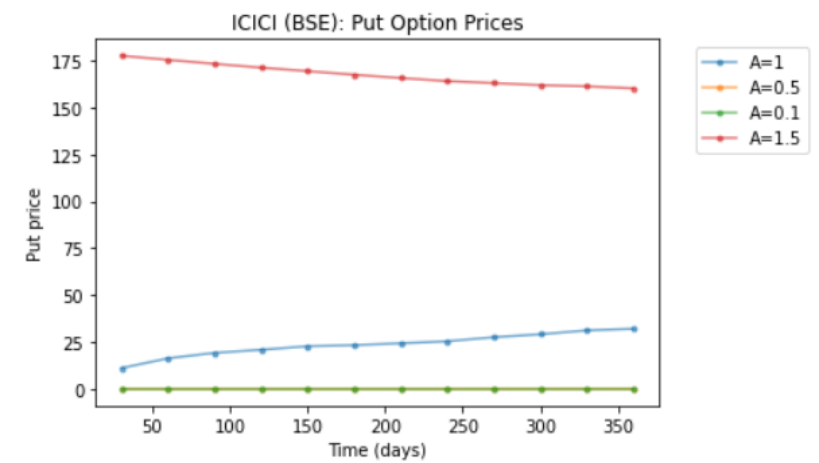
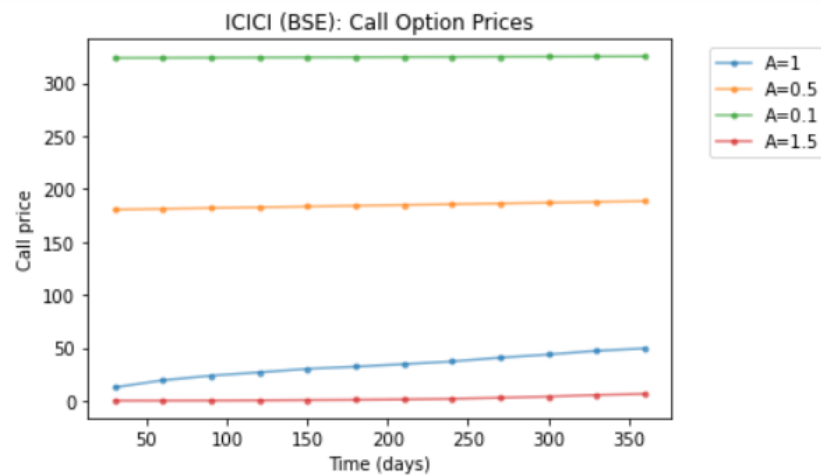
Titan (BSE)



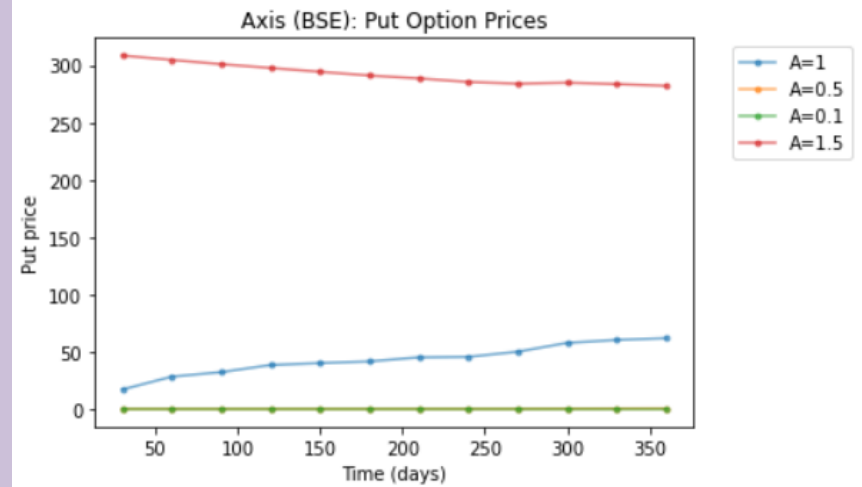
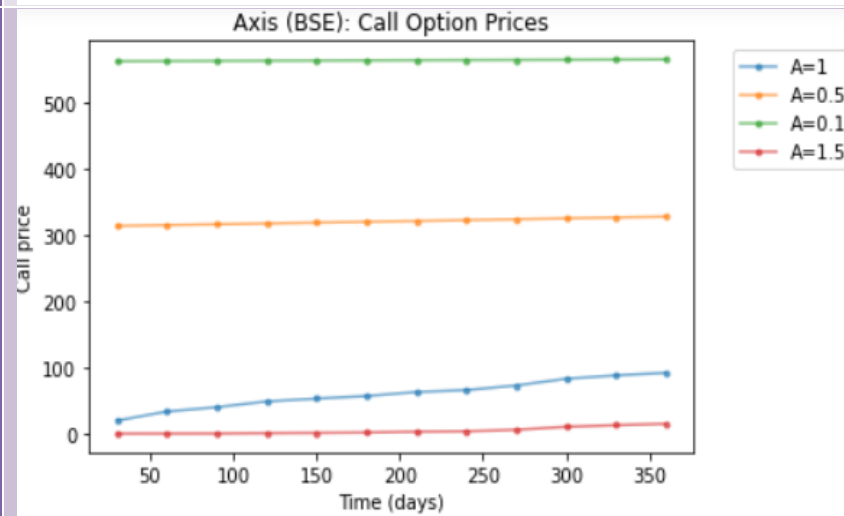
Reliance (BSE)



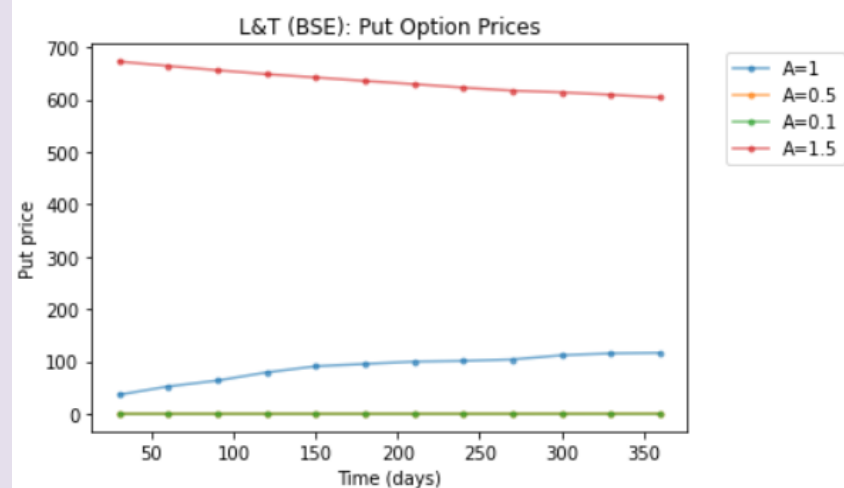
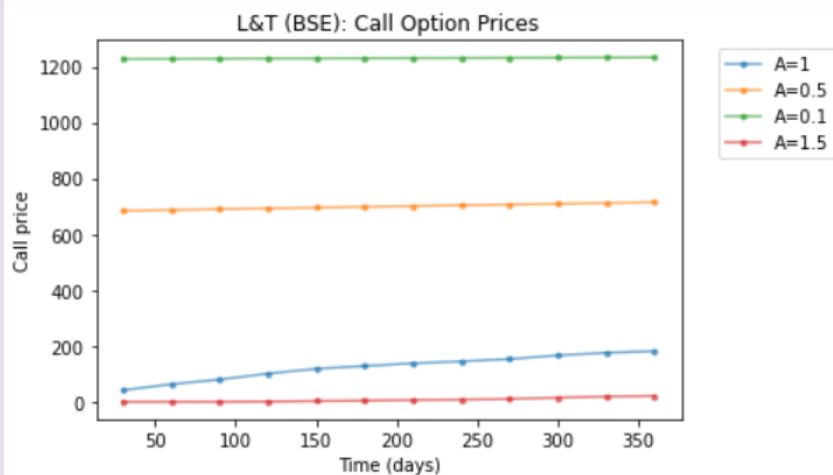
ICICI (BSE)



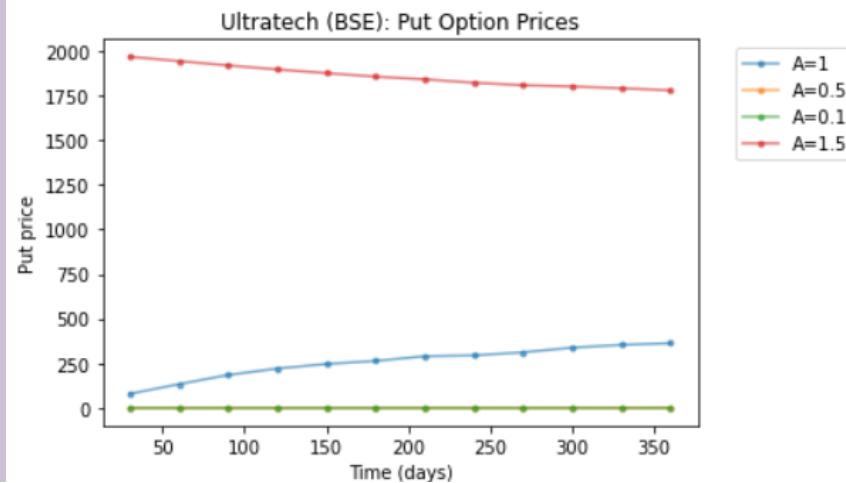
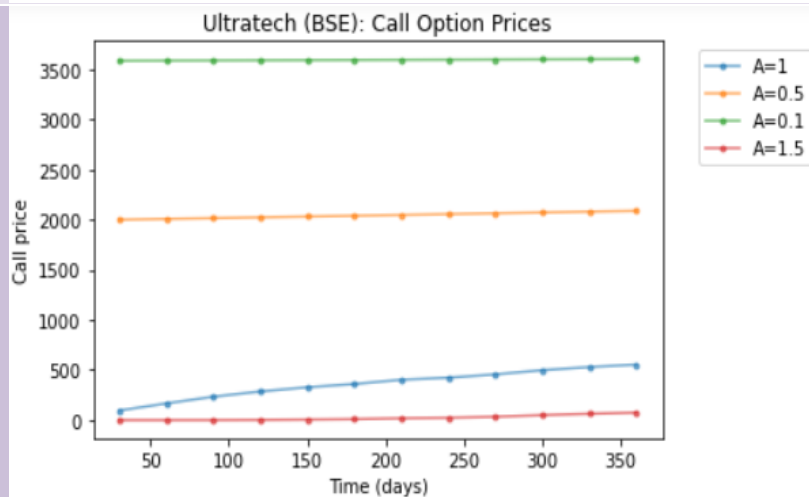
Axis (BSE)



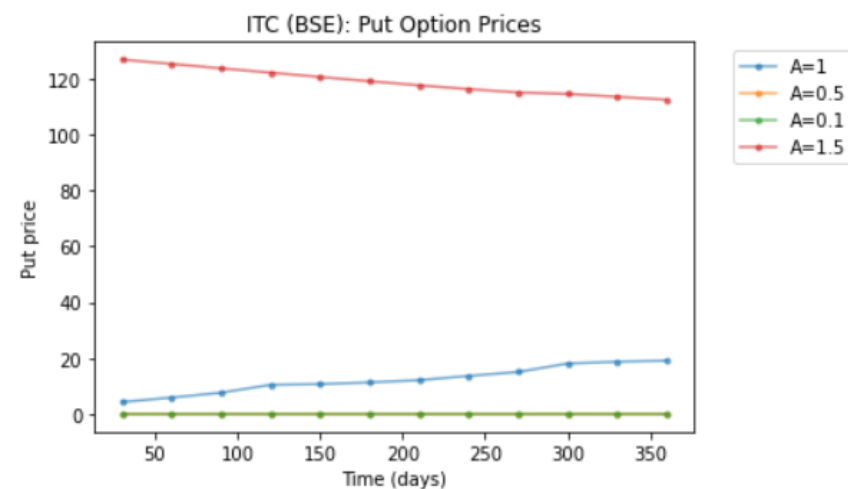
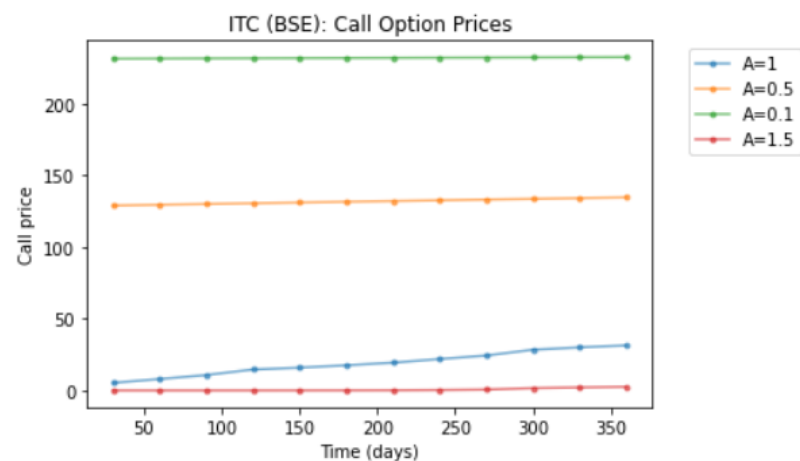
L&T (BSE)



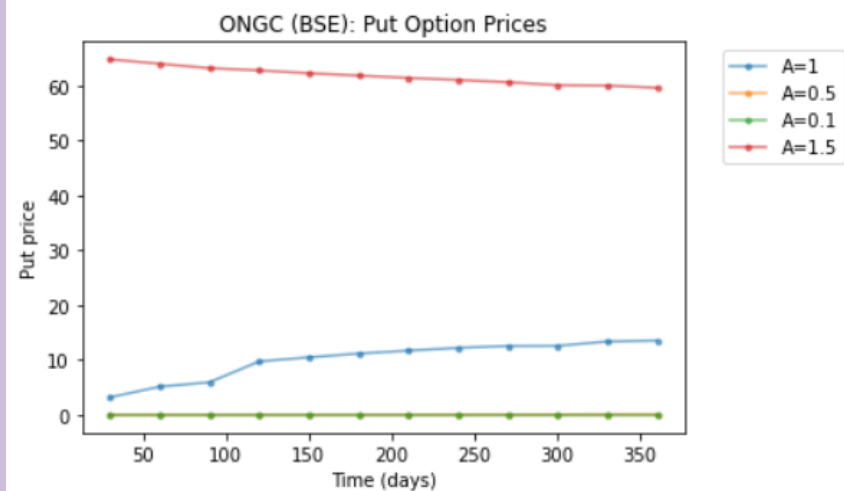
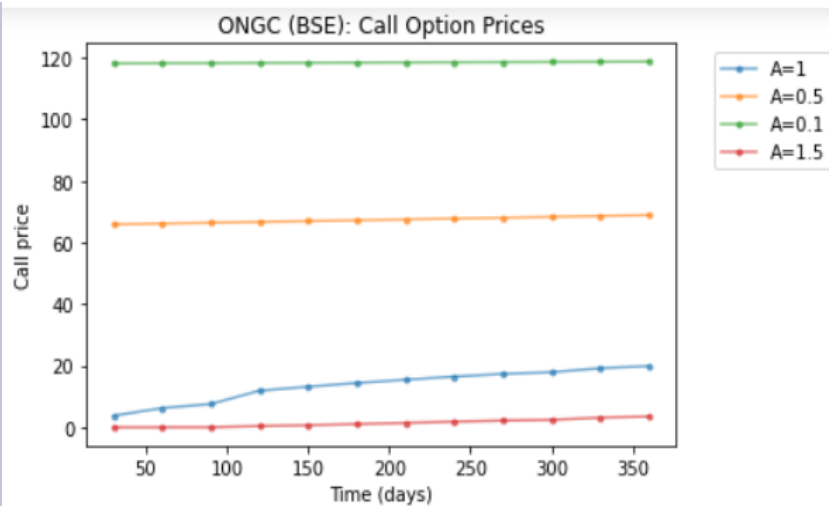
Ultratech (BSE)



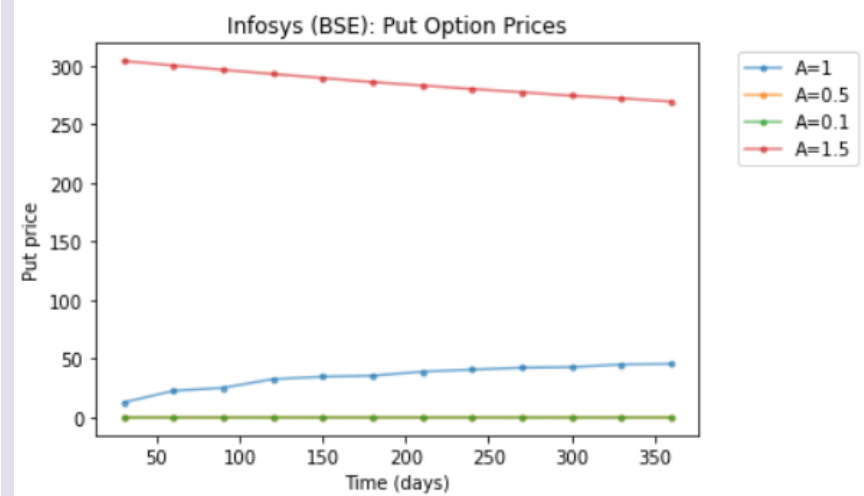
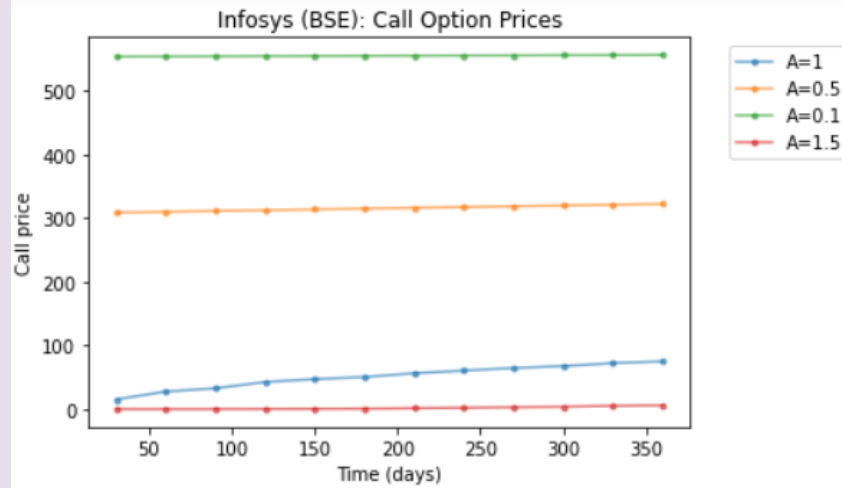
ITC (BSE)



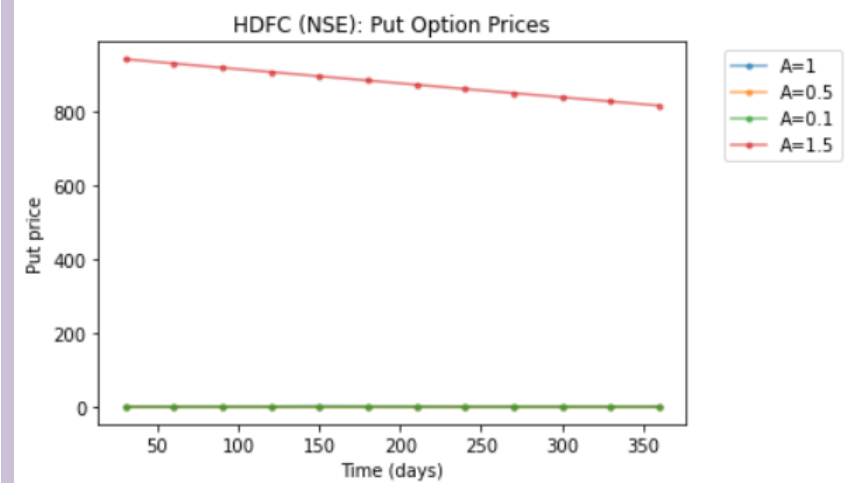
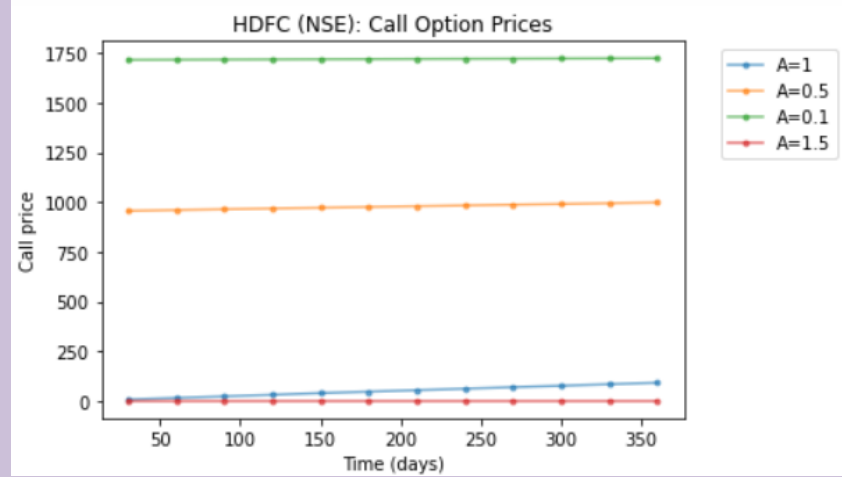
ONGC (BSE)



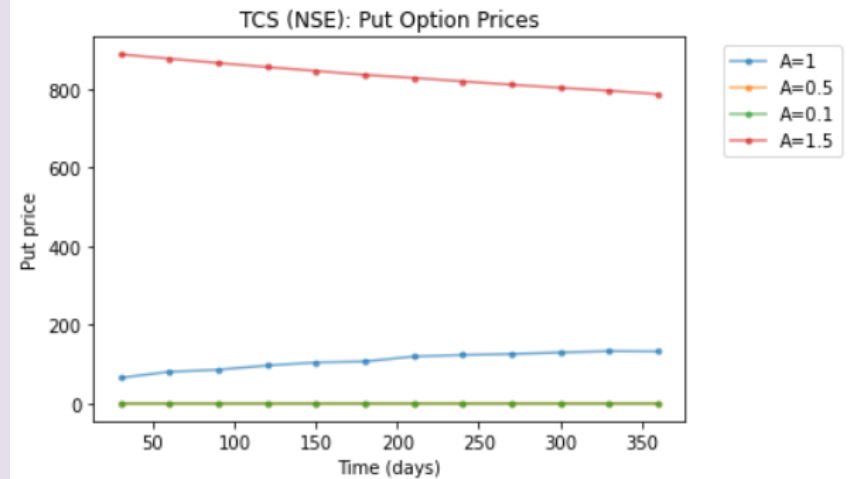
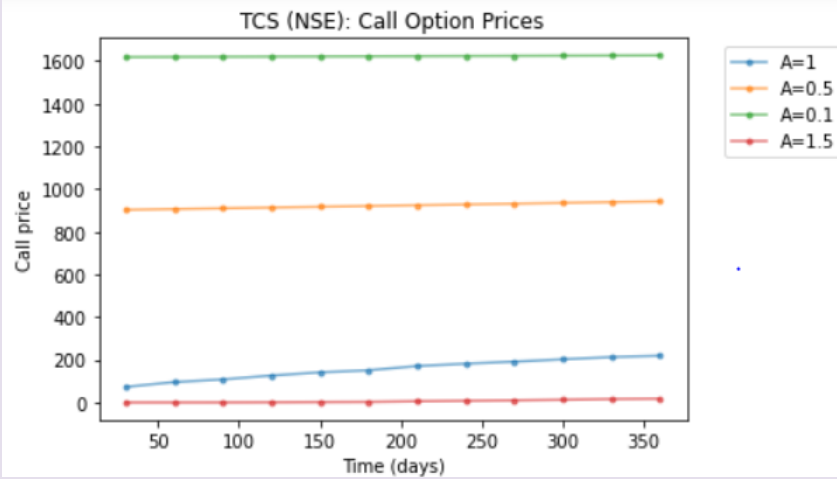
Infosys (BSE)



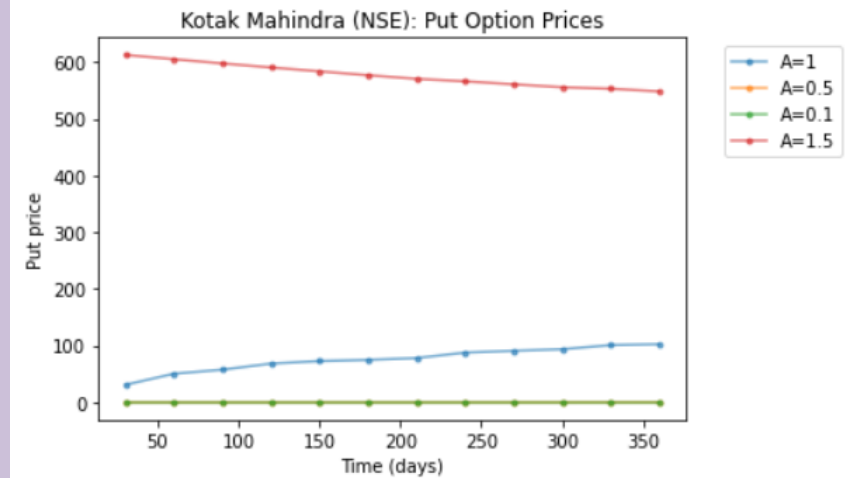
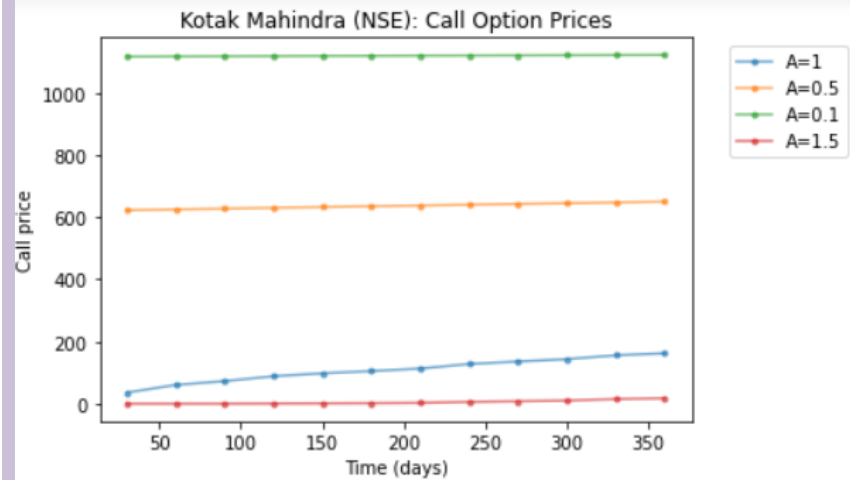
HDFC (NSE)



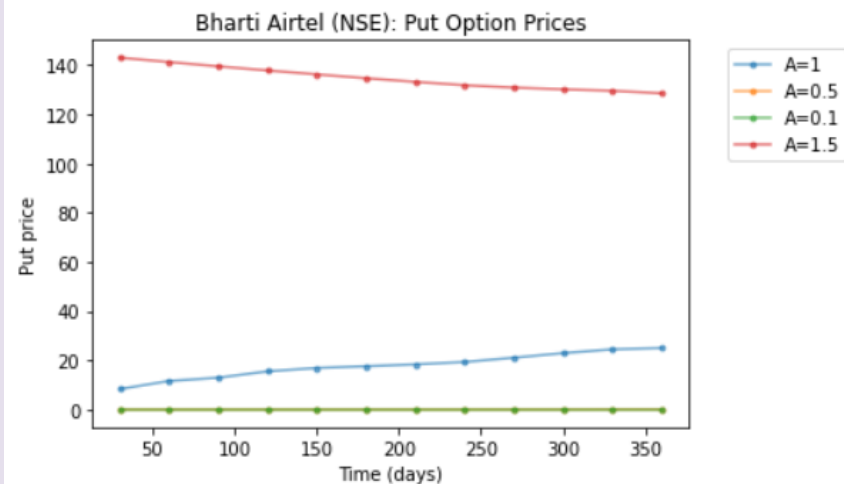
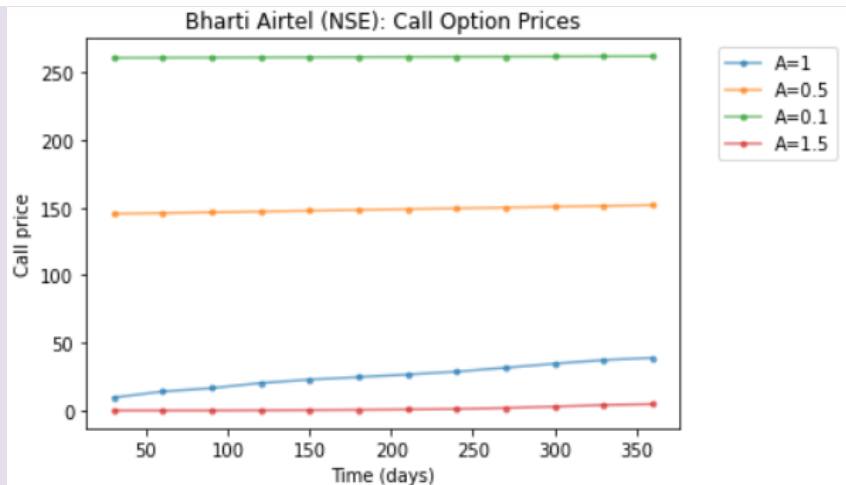
TCS (NSE)



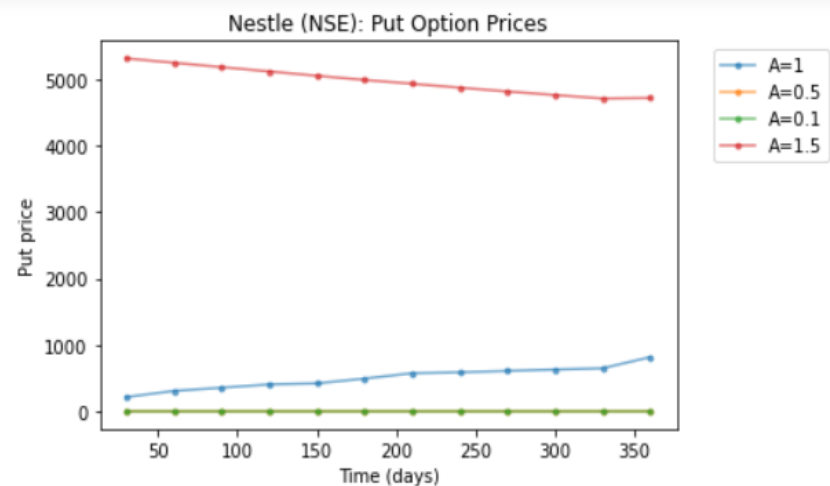
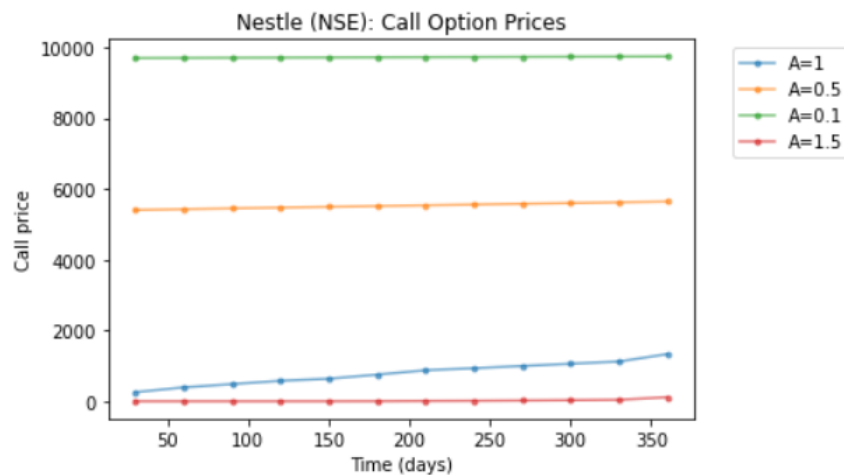
Kotak (NSE)



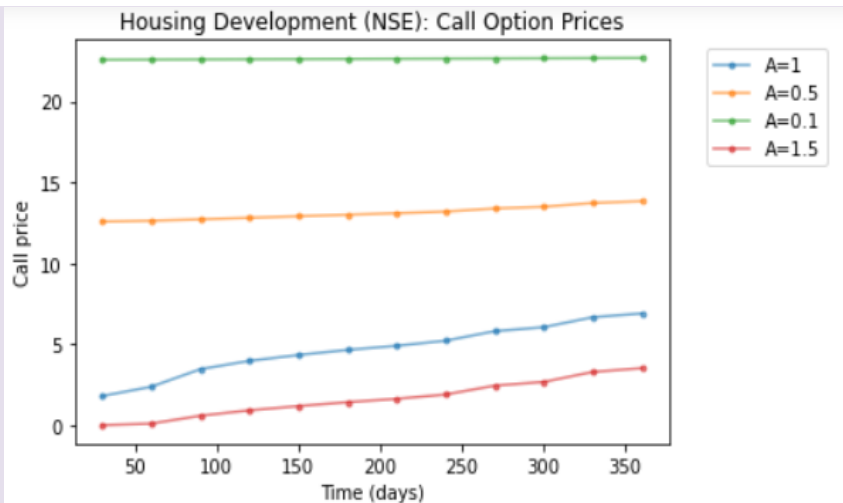
Bharti Airtel (NSE)



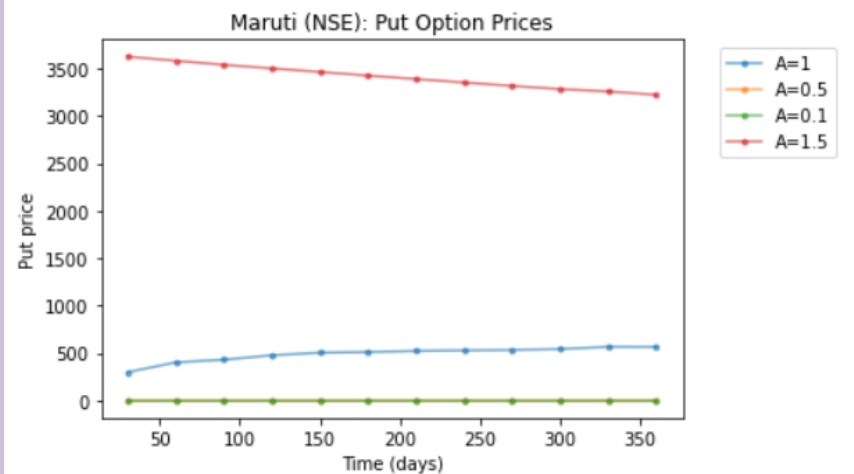
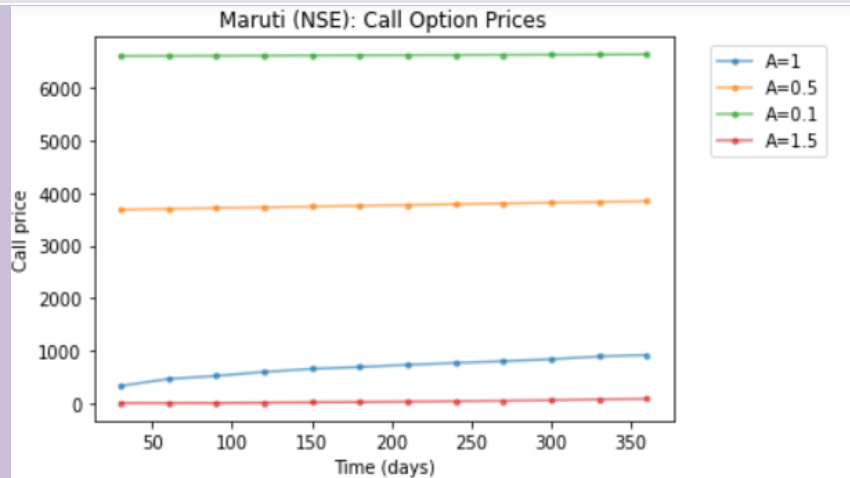
Nestle (NSE)



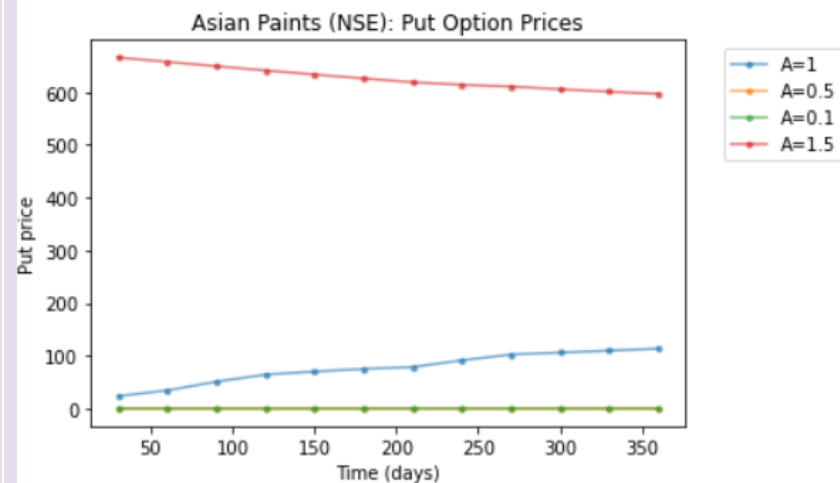
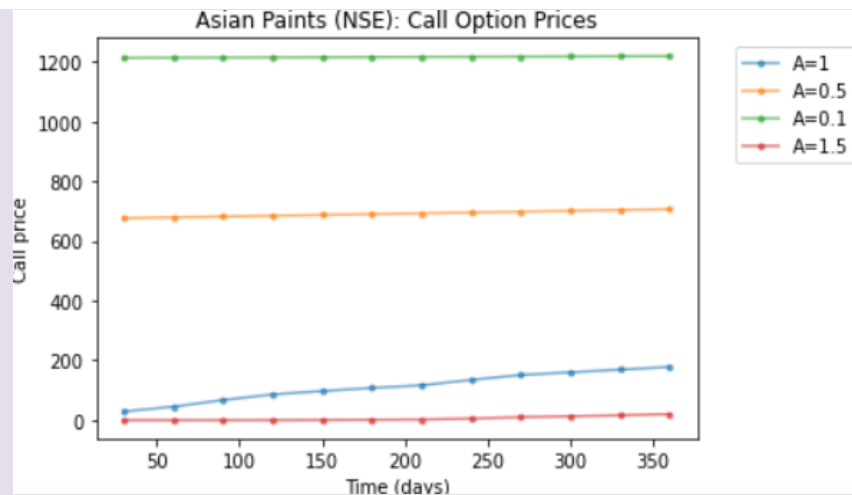
Housing Development (NSE)



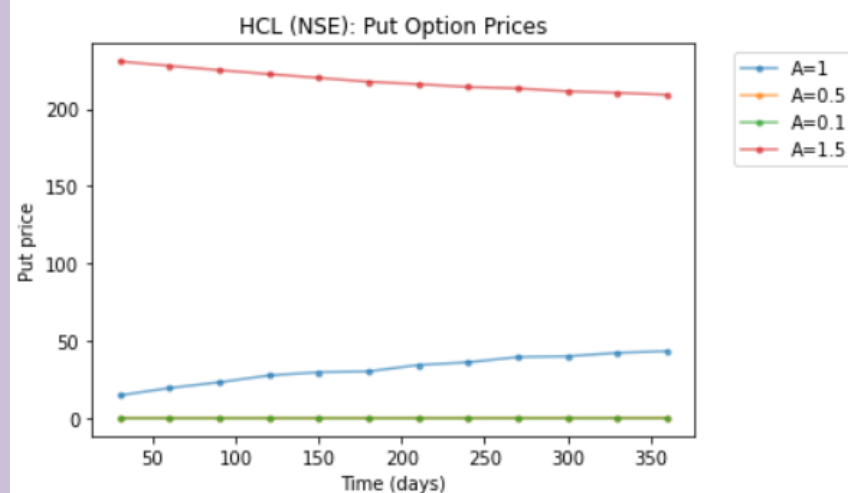
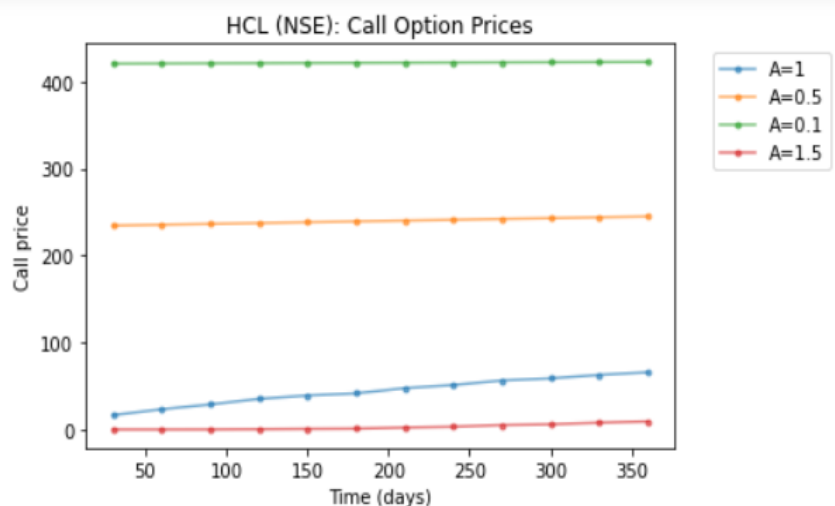
Maruti (NSE)



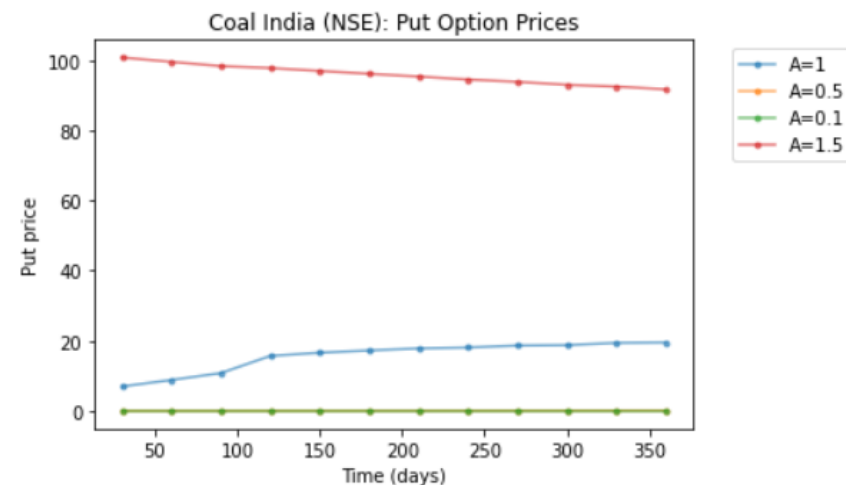
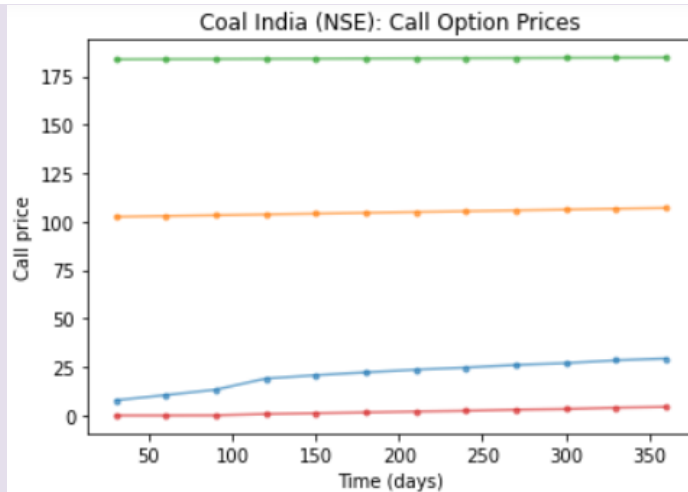
Asian Paints (NSE)



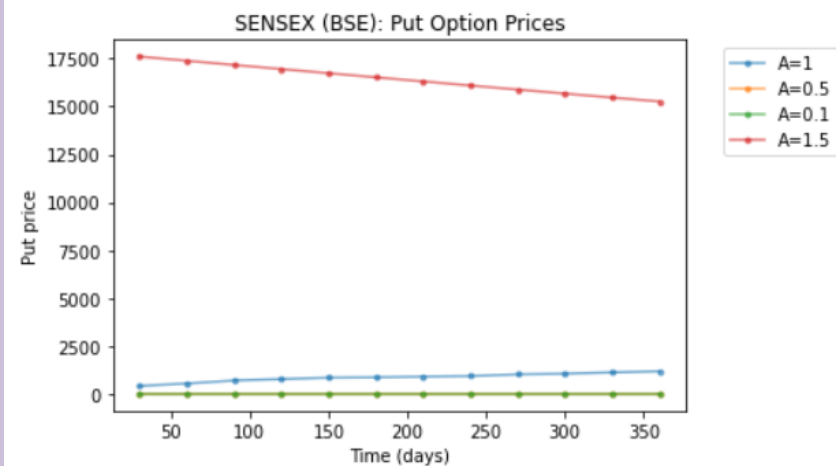
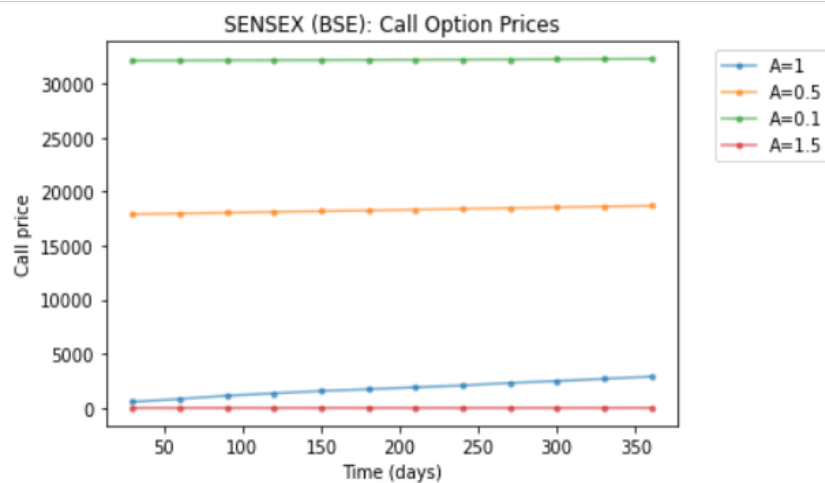
HCL (NSE)



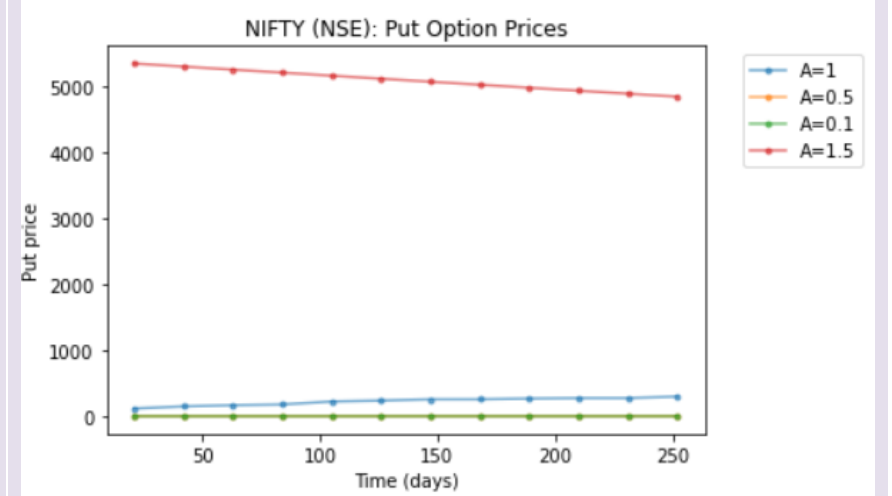
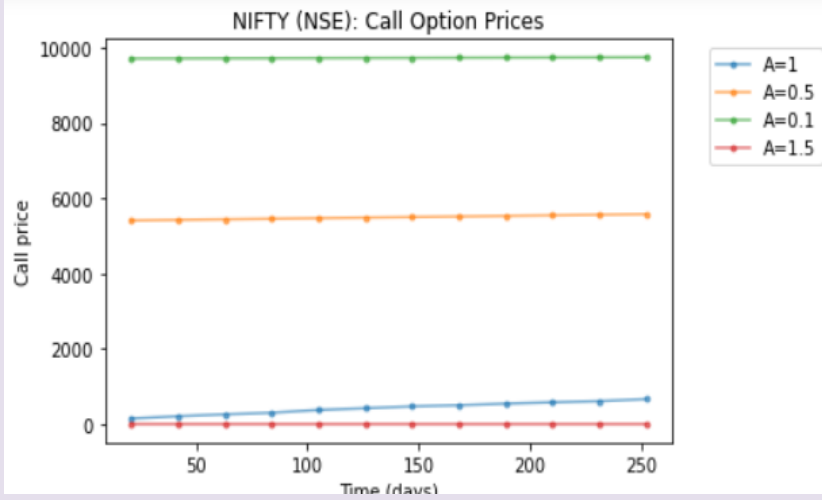
Coal India (NSE)



SENSEX (BSE)



NIFTY



Q4. Submitted as a CSV file.