Ma374-LAB 09

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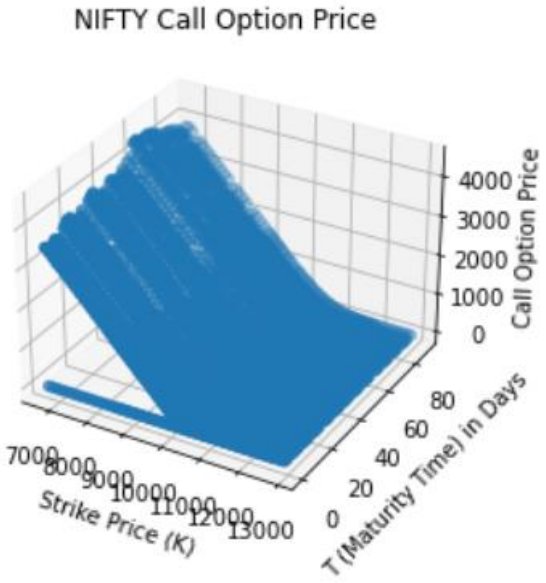
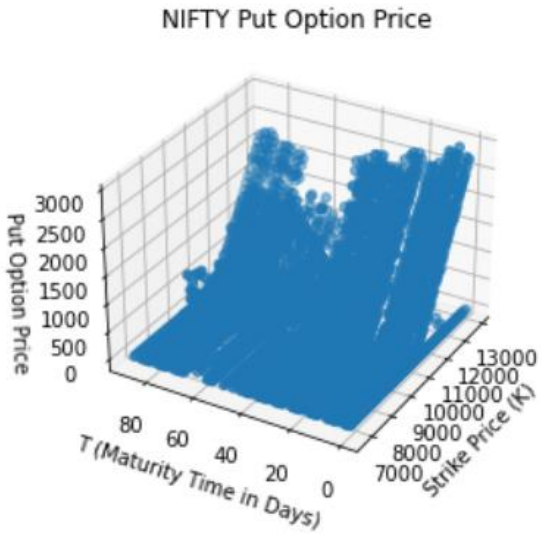
Question 1.

Source for data is nseindia.com. Put and Call option prices of **NTPC**, **COAL INDIA**, and **GRASIM** industries have been collected. **NIFTY** option data has also been obtained from the same site. They have been put in the folder named **stockoptiondata**.

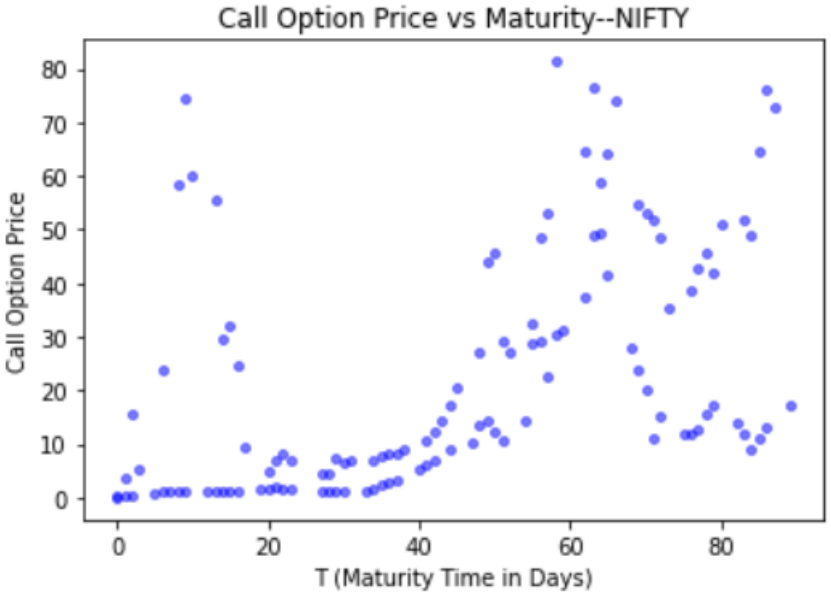
Question 2.

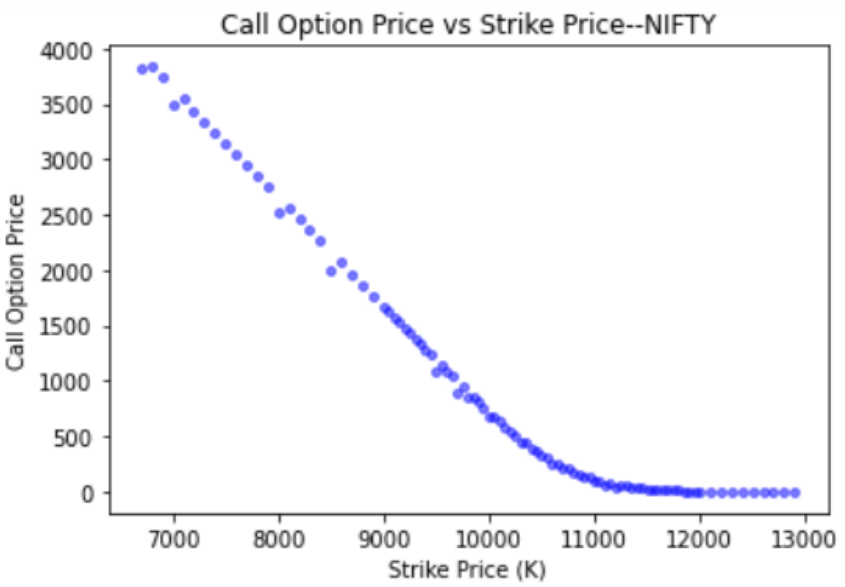
For Nifty Option Data (3D Graphs):

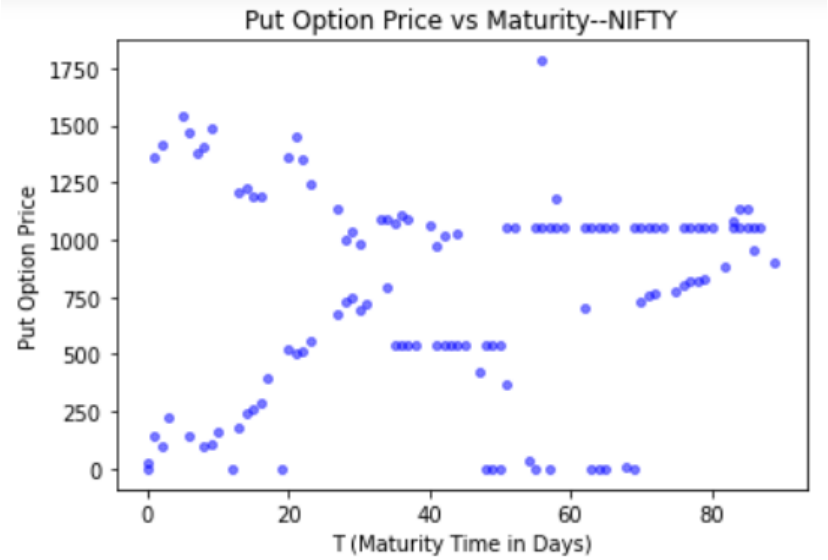


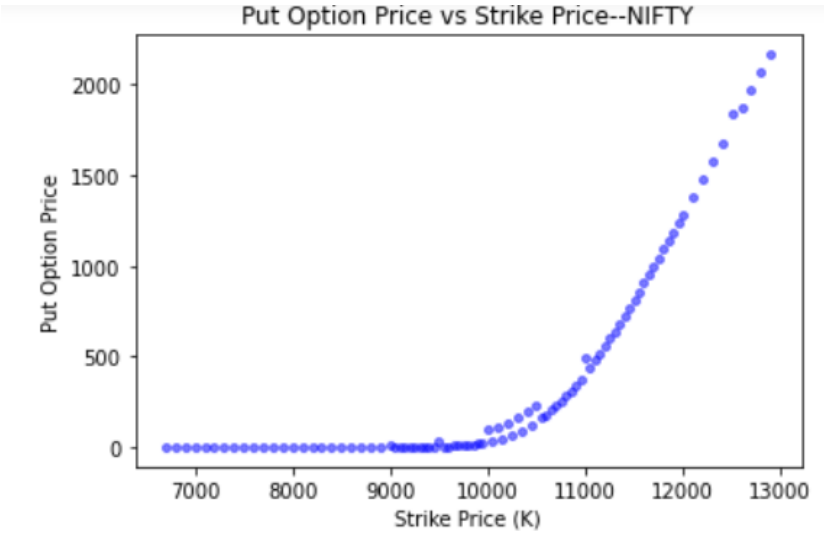


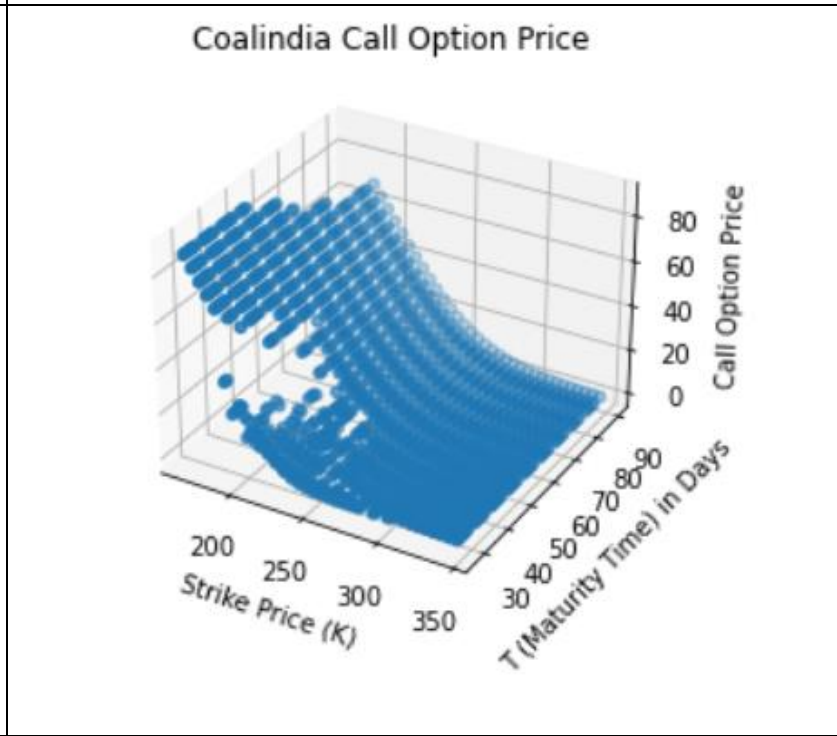
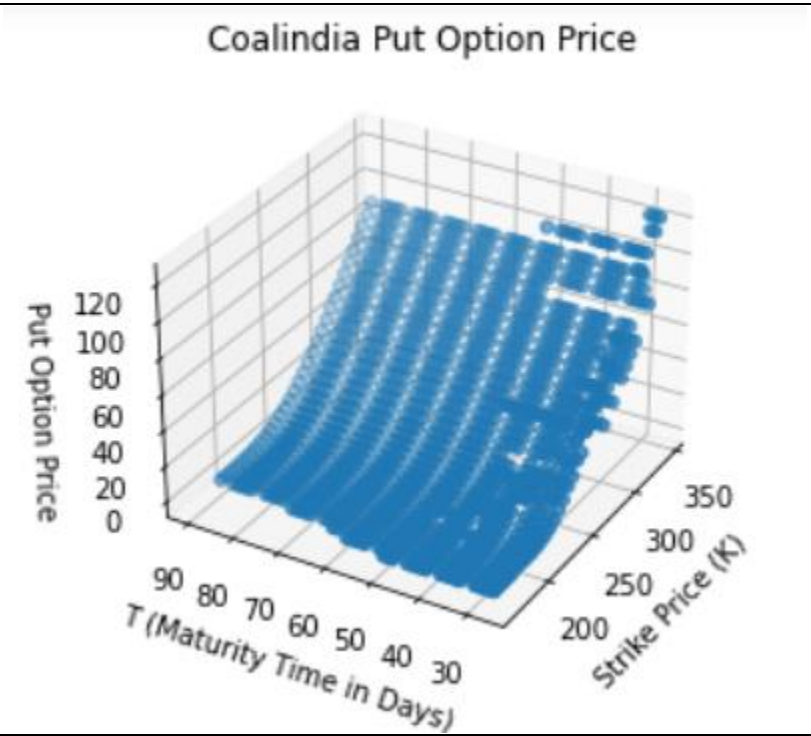
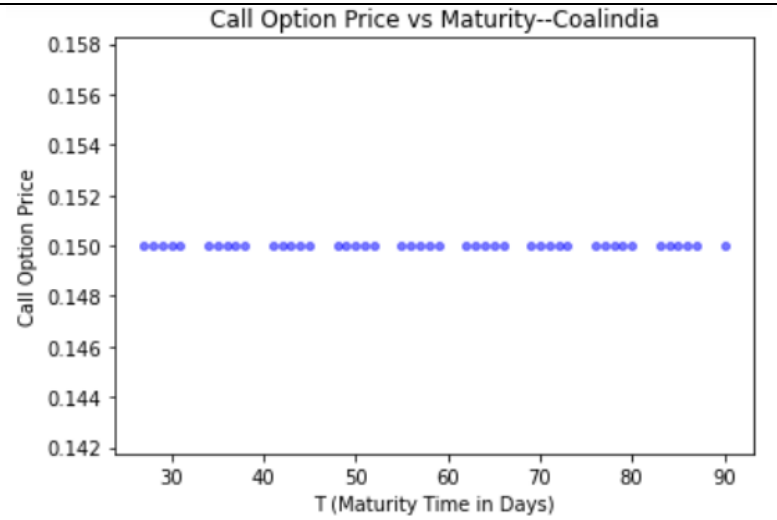
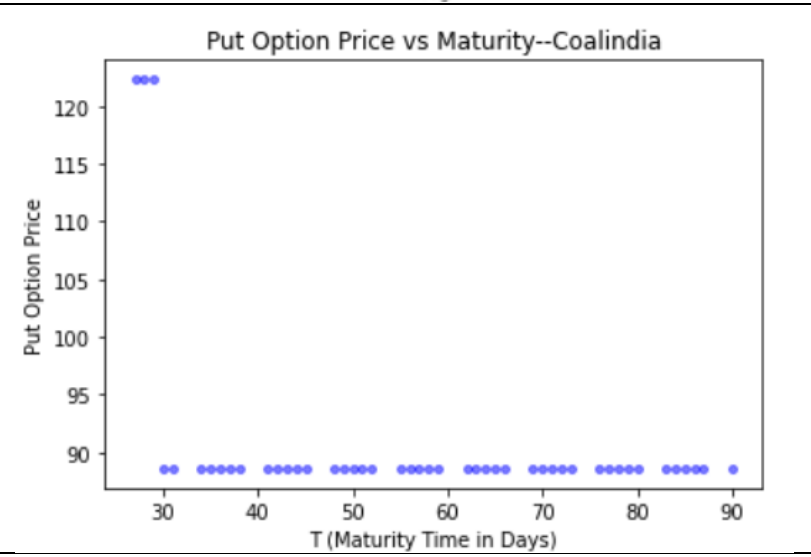
For Nifty Option Data (2D Graphs):

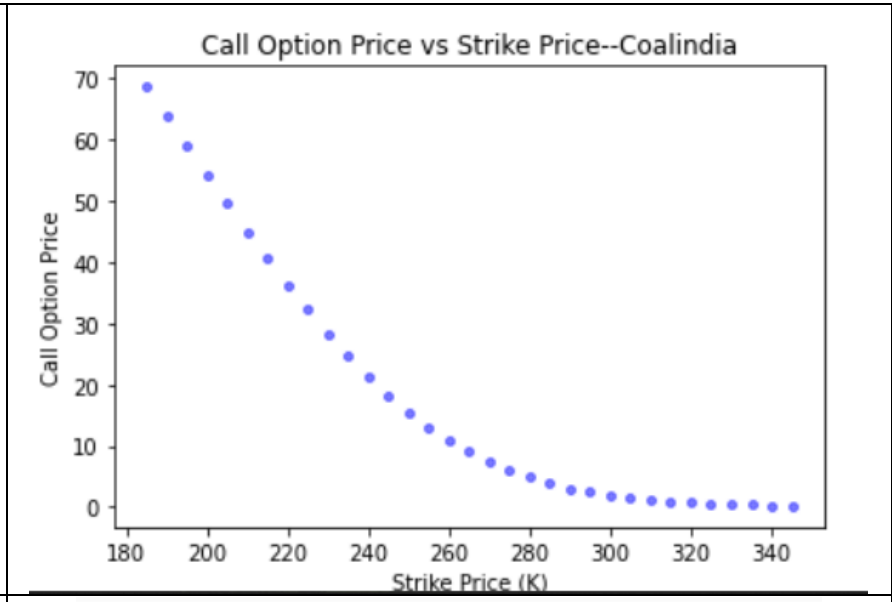
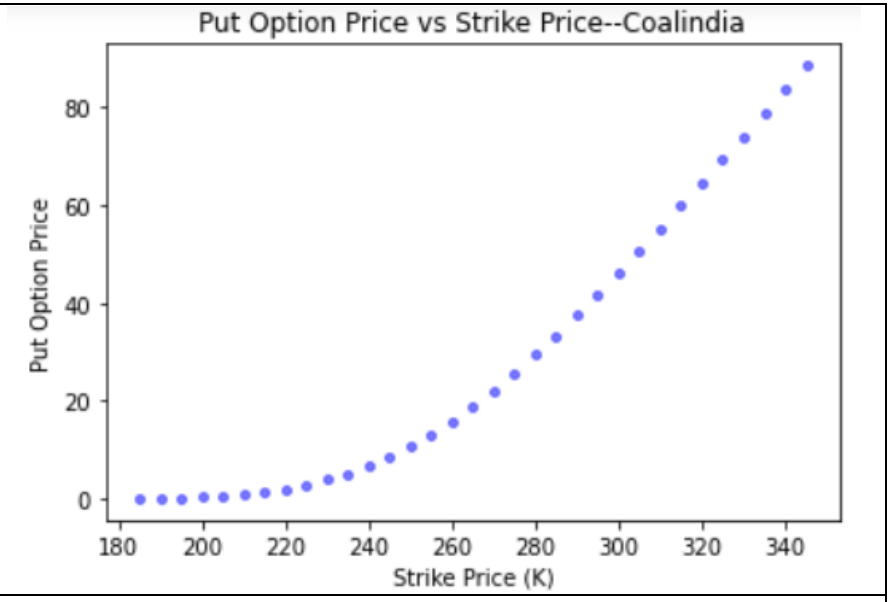
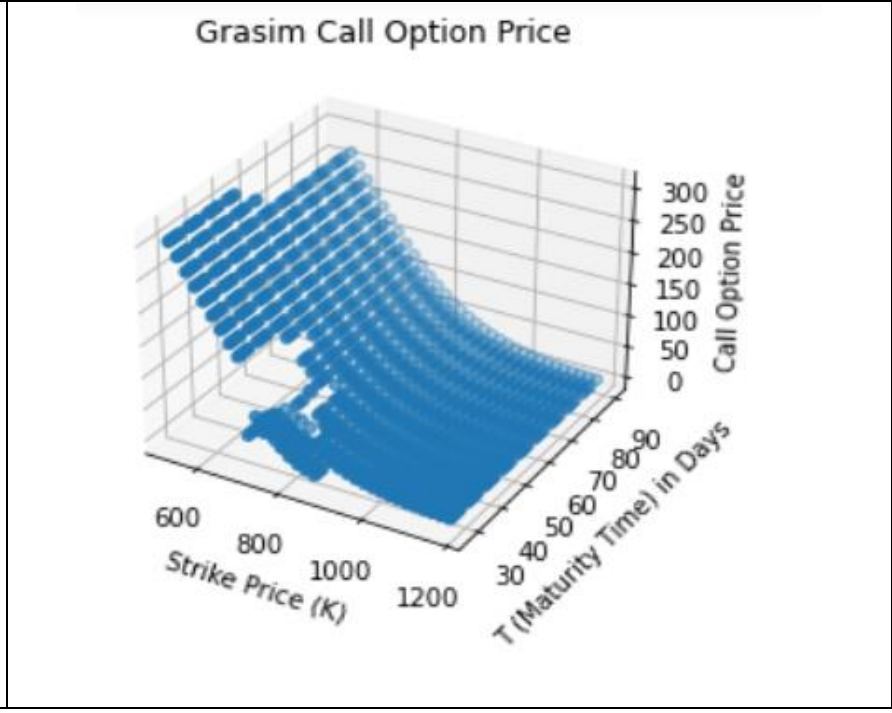
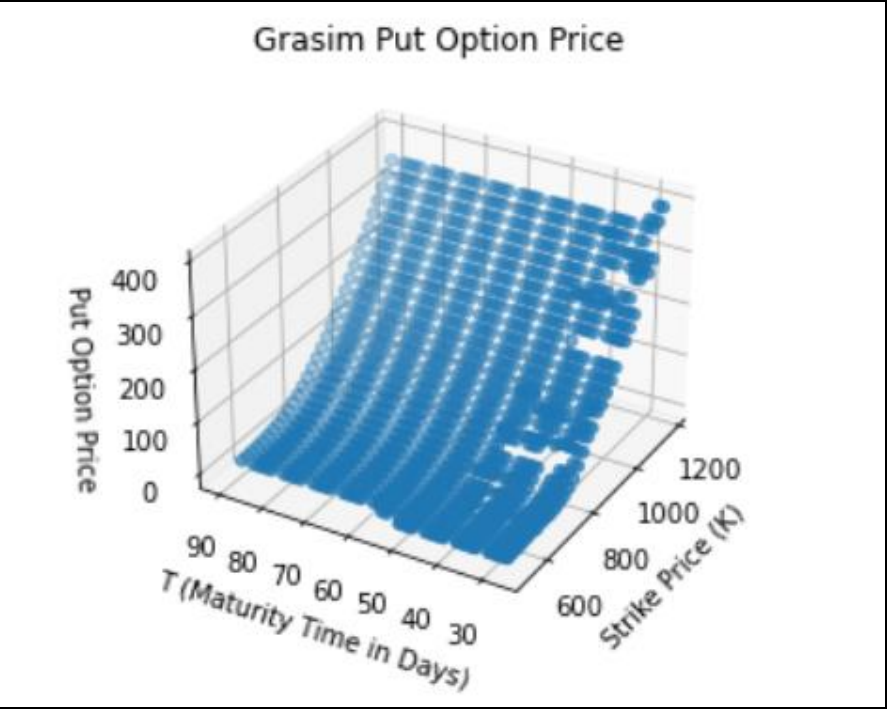

Call Option Price vs Maturity--NIFTY
Call Option Price
T (Maturity Time in Days)
0
10
20
30
40
50
60
70
80
0
20
40
60
80

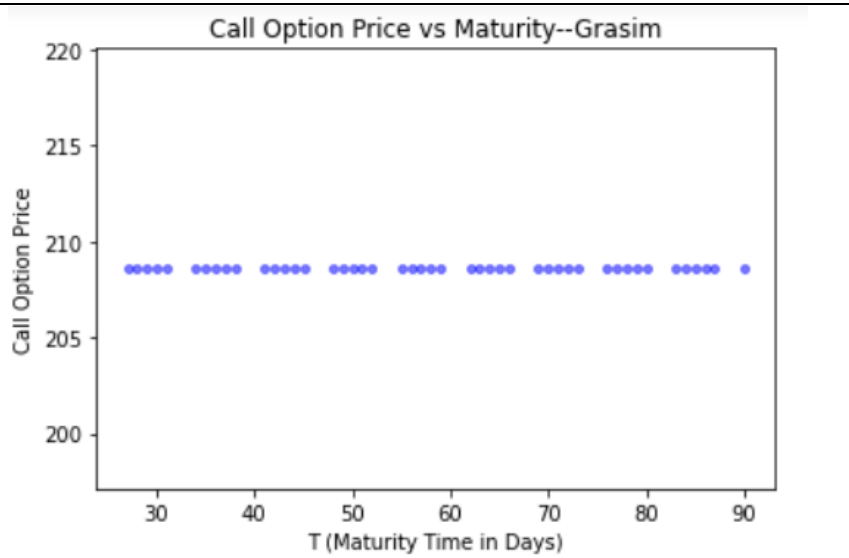
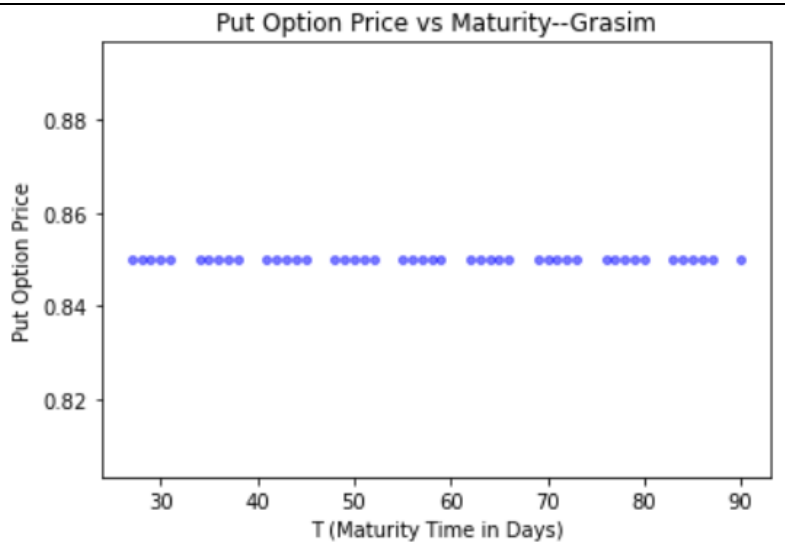
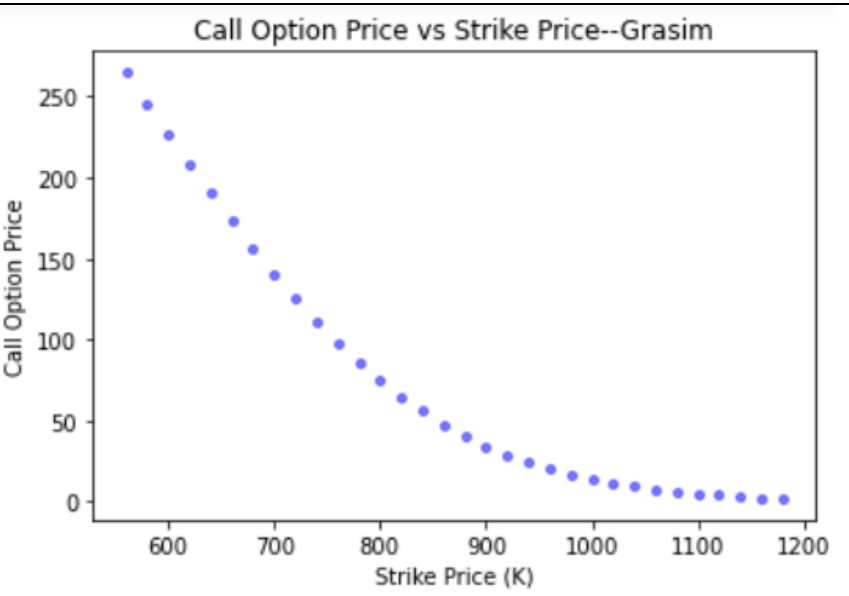
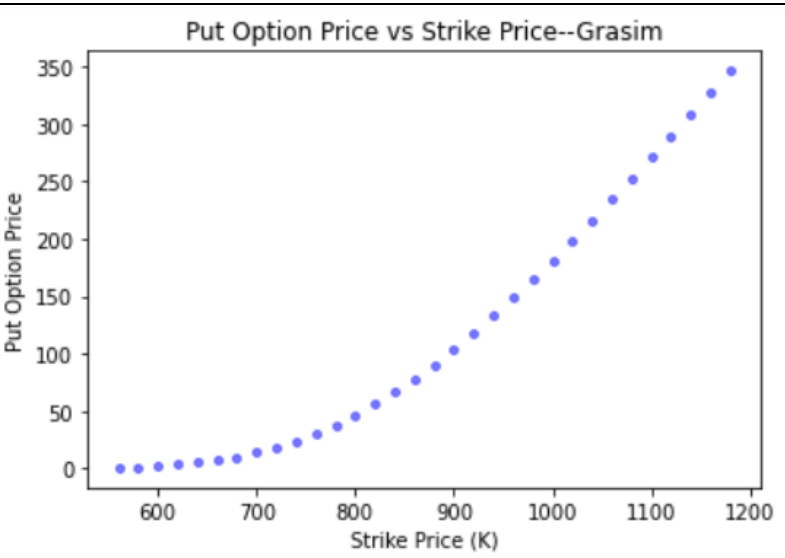

Call Option Price vs Strike Price--NIFTY
Call Option Price
Strike Price (K)
0
500
1000
1500
2000
2500
3000
3500
4000
7000
8000
9000
10000
11000
12000
13000

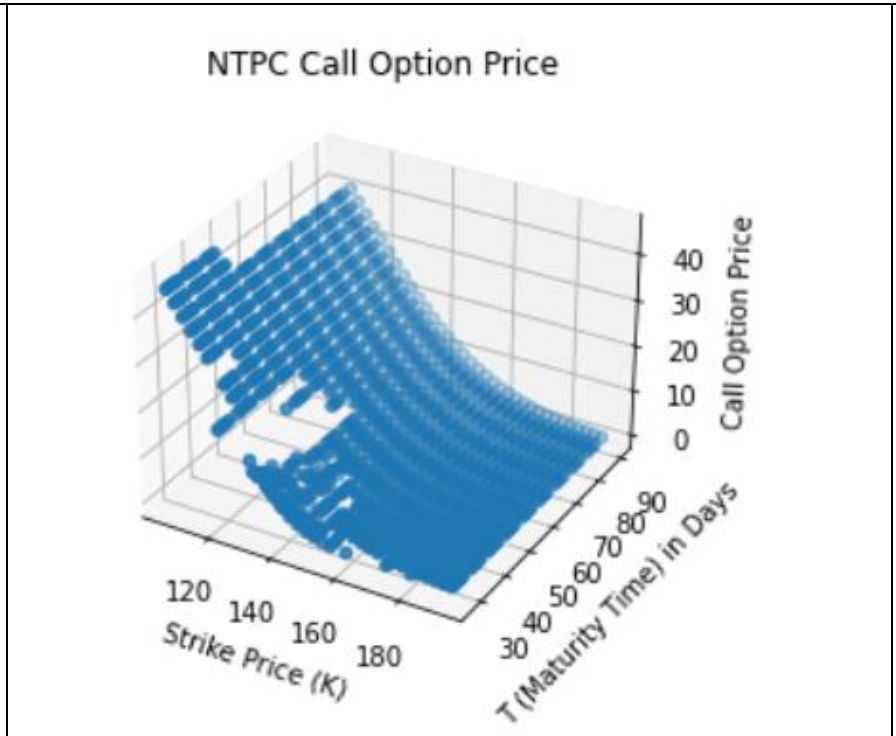
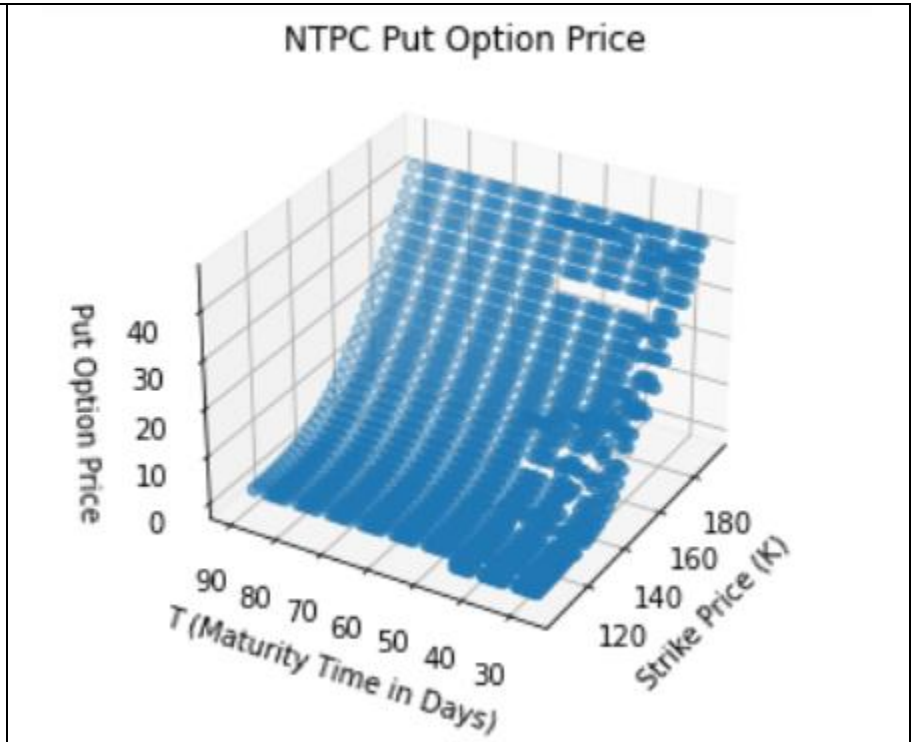
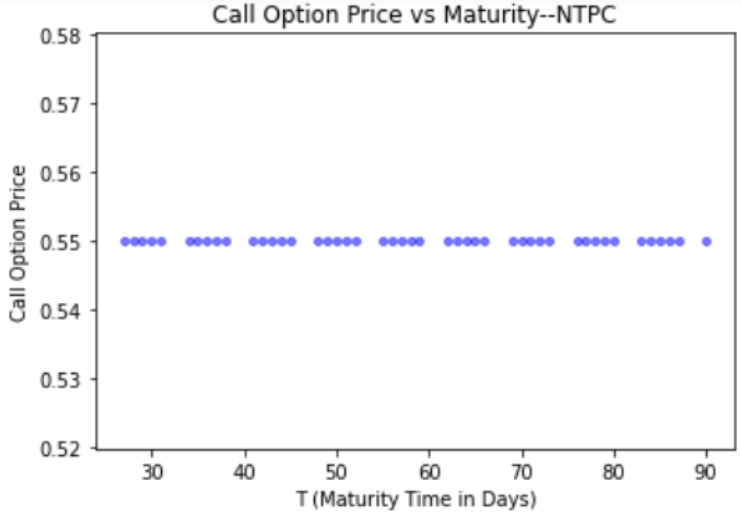
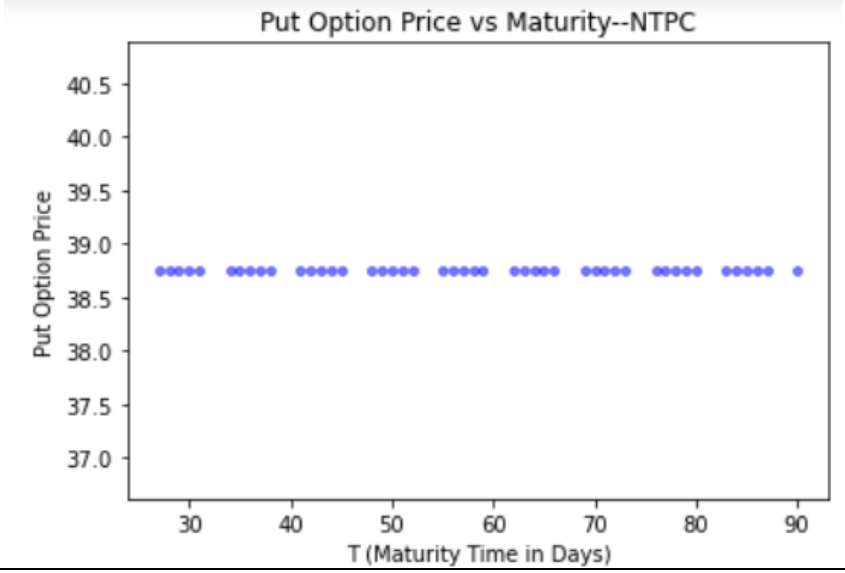

Put Option Price vs Maturity--NIFTY
Put Option Price
T (Maturity Time in Days)
0
250
500
750
1000
1250
1500
1750
0
20
40
60
80

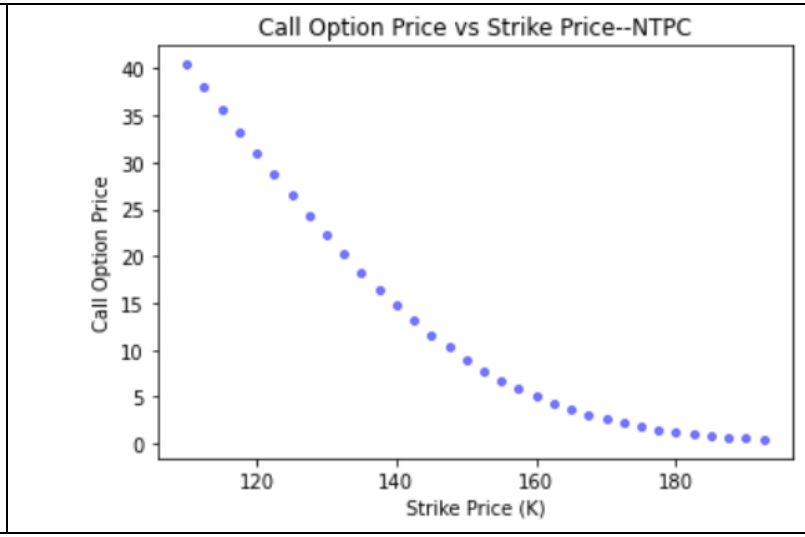
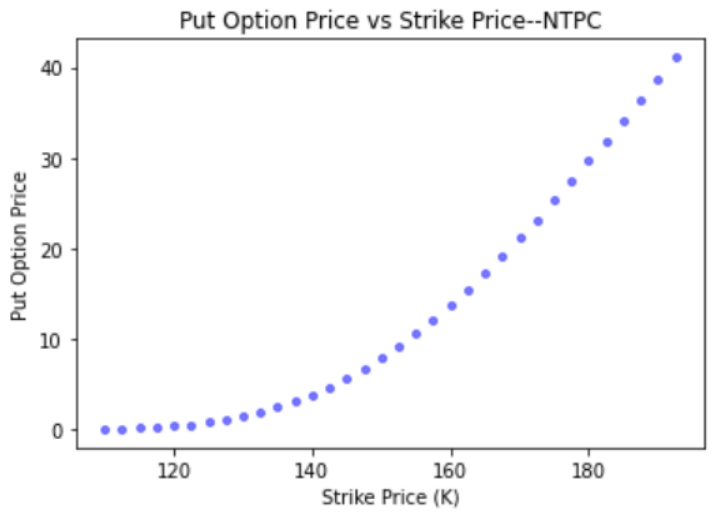

Put Option Price vs Strike Price--NIFTY
Put Option Price
Strike Price (K)
0
500
1000
1500
2000
7000
8000
9000
10000
11000
12000
13000

Stock Name	Call Option	Put Option
Coal India		
Coal India		

Coal India		
Grasim		

Grasim		
Grasim		

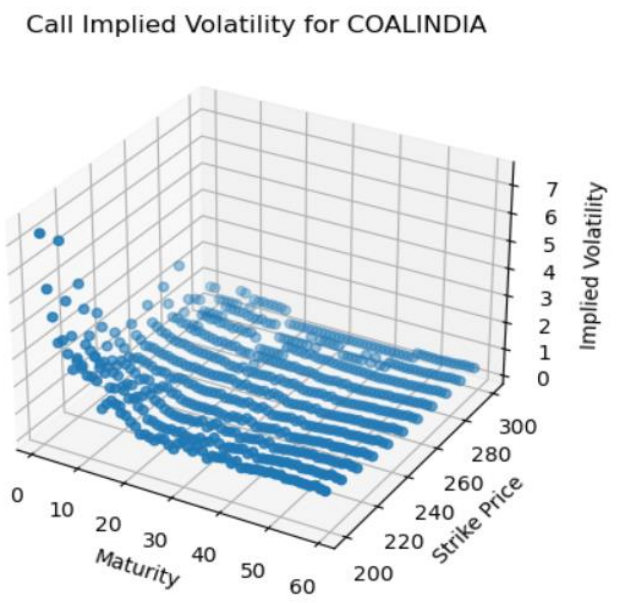
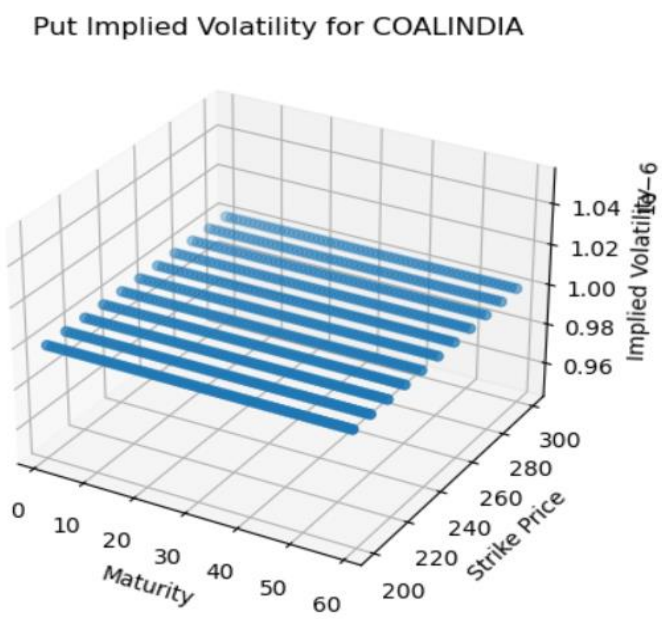
NTPC	 NTPC Call Option Price Call Option Price 0 10 20 30 40 Strike Price (K) 120 140 160 180 T (Maturity Time) in Days 30 40 50 60 70 80 90	 NTPC Put Option Price Put Option Price 0 10 20 30 40 T (Maturity Time in Days) 90 80 70 60 50 40 30 Strike Price (K) 120 140 160 180
NTPC	 Call Option Price vs Maturity--NTPC Call Option Price 0.52 0.53 0.54 0.55 0.56 0.57 0.58 T (Maturity Time in Days) 30 40 50 60 70 80 90	 Put Option Price vs Maturity--NTPC Put Option Price 37.0 37.5 38.0 38.5 39.0 39.5 40.0 40.5 T (Maturity Time in Days) 30 40 50 60 70 80 90

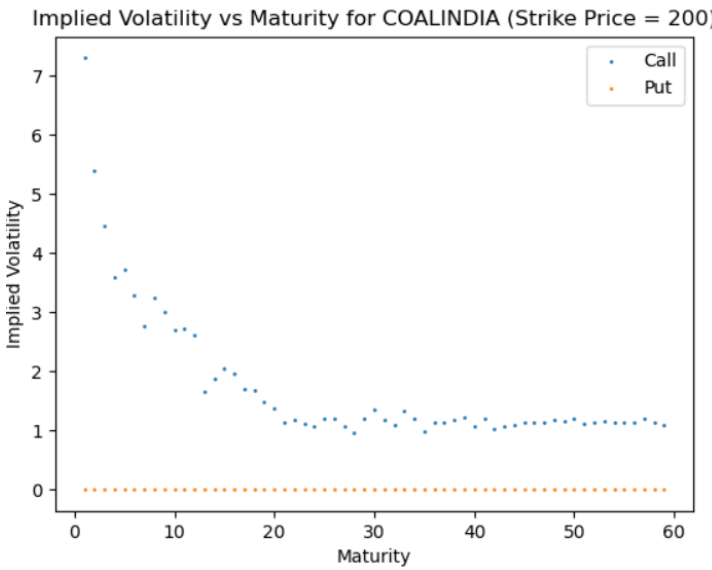
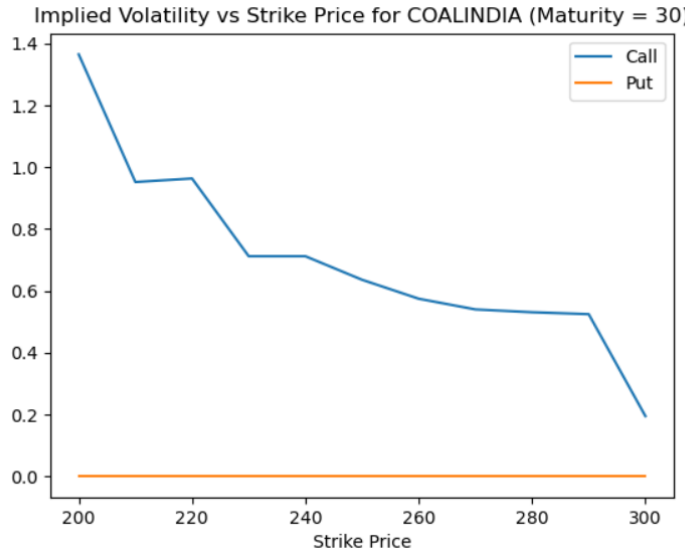
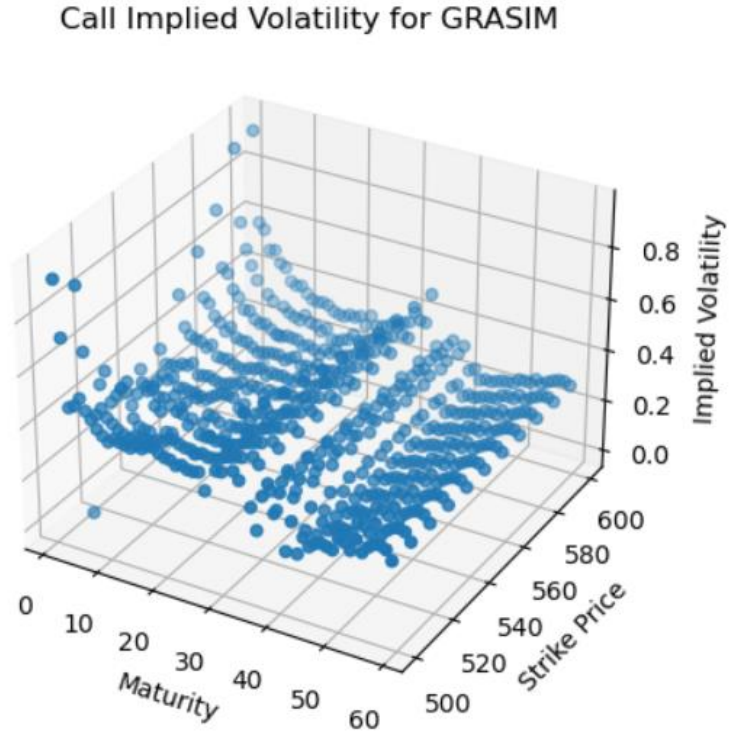
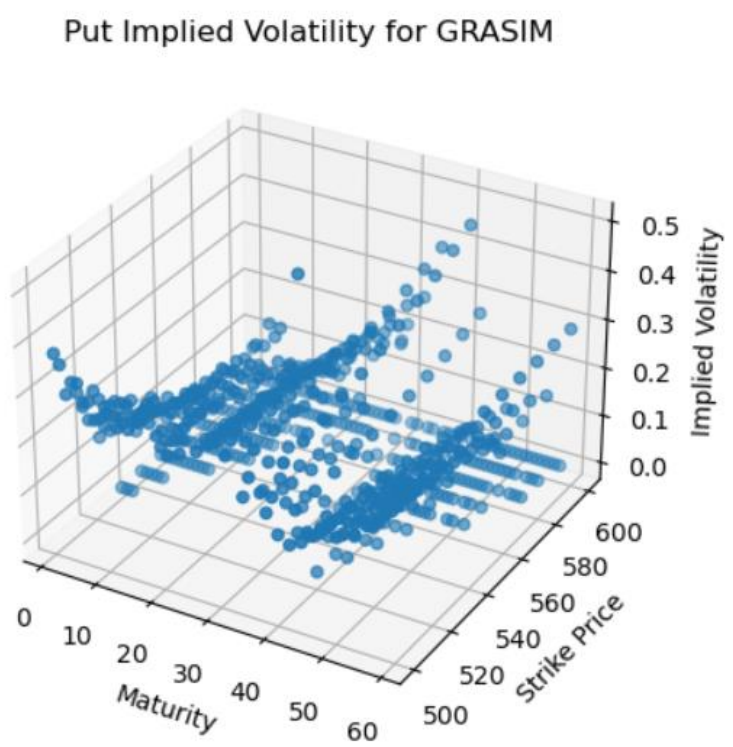
NTPC		

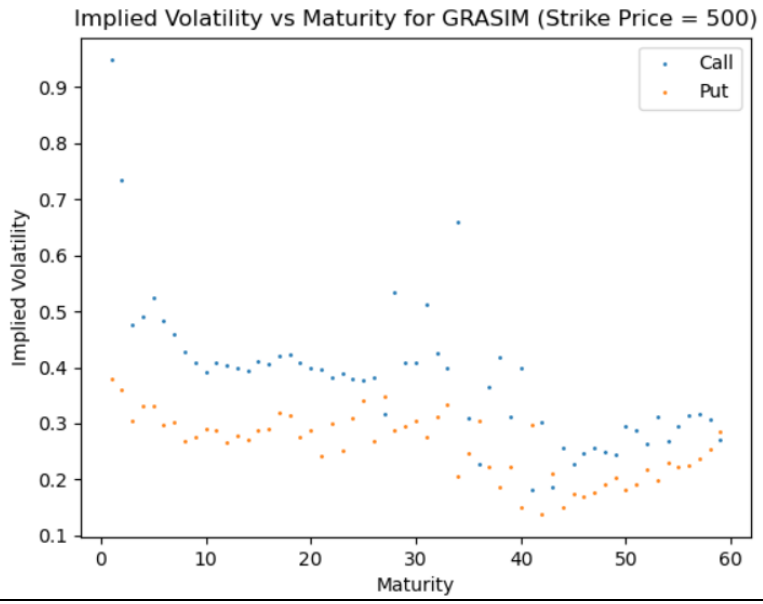
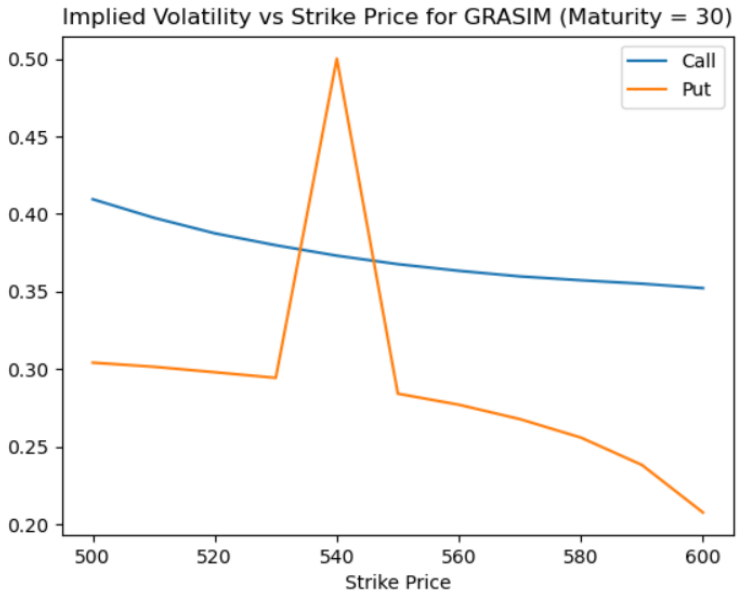
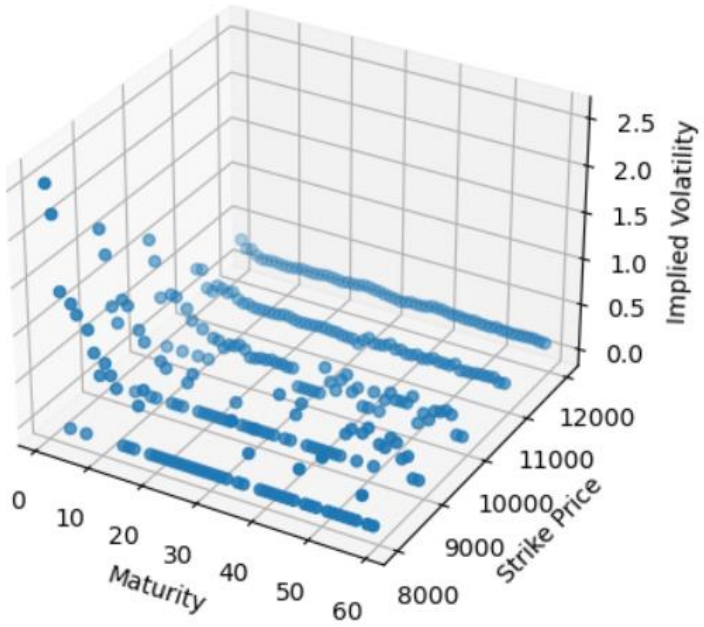
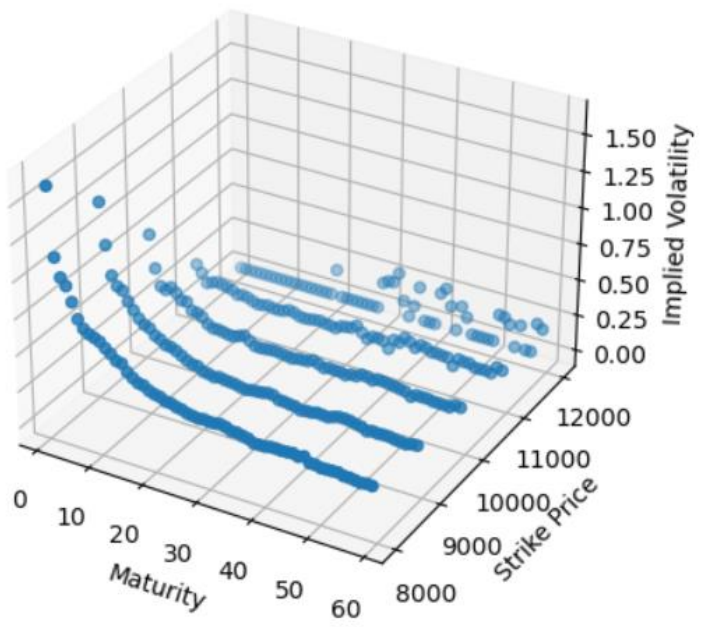
We can see that the graph of **Option Price vs Strike Price** resembles the theoretical graph with great similarity. But **Option Price vs Maturity** is somewhat a straight line (In real world scenarios, Option Price is somewhat kept constant with T). Also, the 3D graphs also seem to be matching theoretical graphs as well.

Question 3.

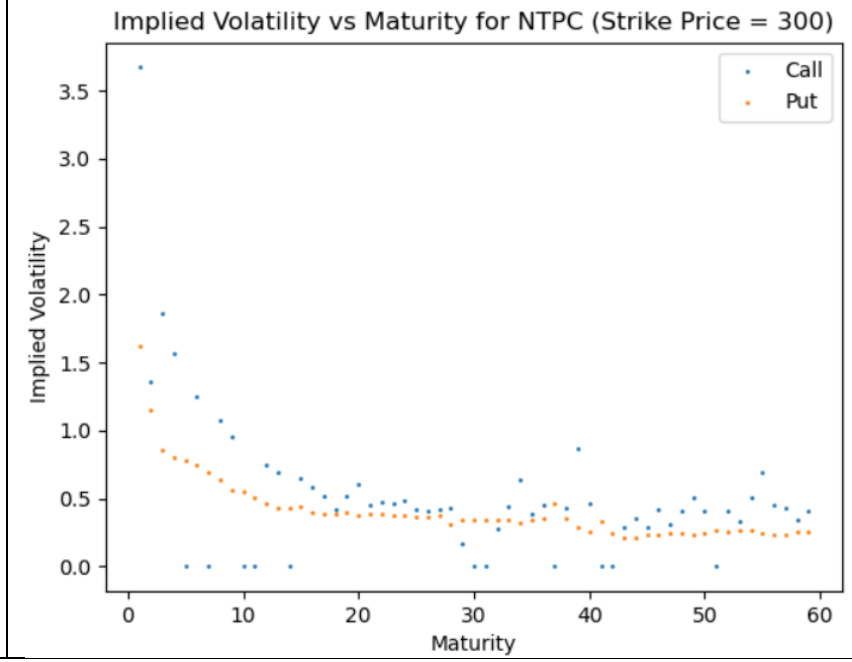
Fixing the other parameters, and also considering the option prices collected from internet, **implied volatility** was found using the **bisection** (**binary**) **method**. We can see that the 3D plots match with the theoretical plots. We can see that in the 2D plots, volatility is small (<0.5), and is mostly located near the x-axis.

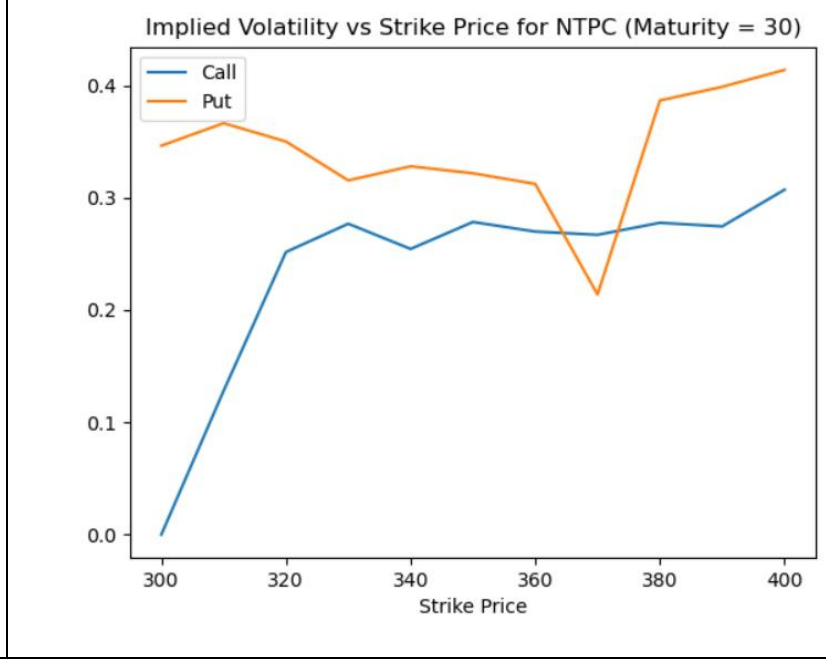
Stock Name	Graphs	Graphs
Coal India		

Coal India		
Grasim		

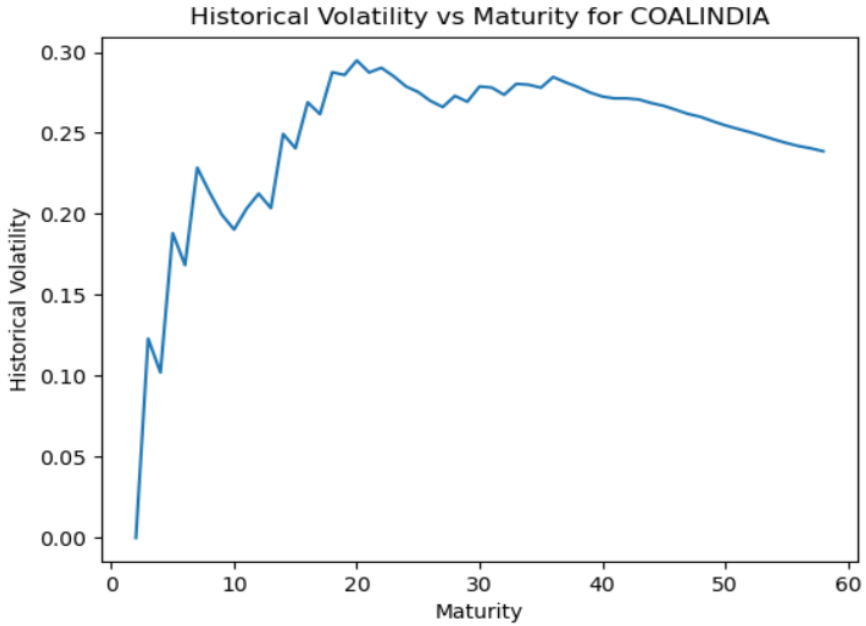
Grasim	 Implied Volatility vs Maturity for GRASIM (Strike Price = 500) Call Put Implied Volatility Maturity	 Implied Volatility vs Strike Price for GRASIM (Maturity = 30) Call Put Strike Price
NTPC	 Call Implied Volatility for NIFTY Implied Volatility Maturity Strike Price	 Put Implied Volatility for NIFTY Implied Volatility Maturity Strike Price

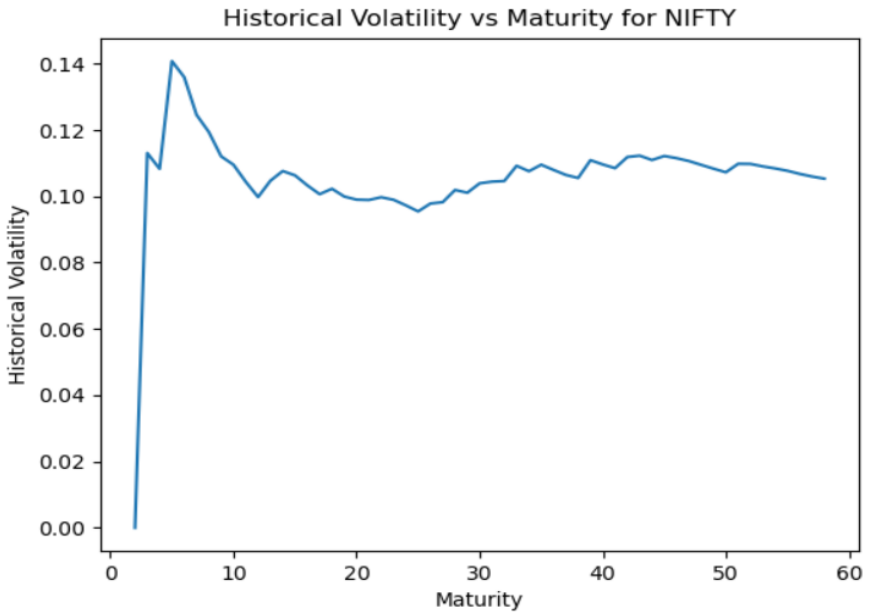
NTPC

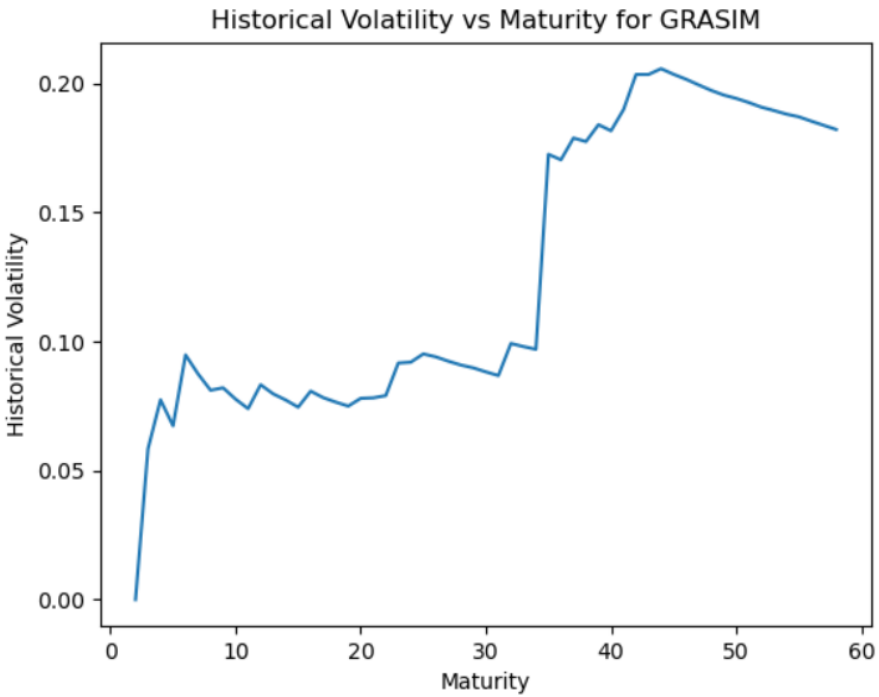


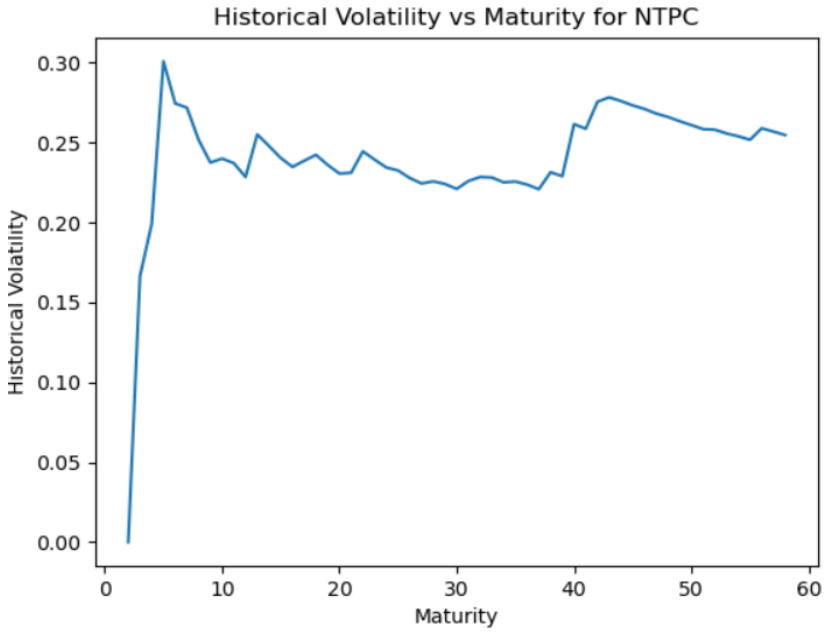


Question 4. The historical volatility has been estimated for the previous 2 months. The graphs are as follows:









Implied volatility accounts for expectations for future volatility, which are expressed in options premiums, while historical volatility measures past trading ranges of underlying securities and indexes. Since **option premiums** are **overvalued**, hence, it can be observed that **implied volatility** is **higher** than as **compared** to **historical volatility**.