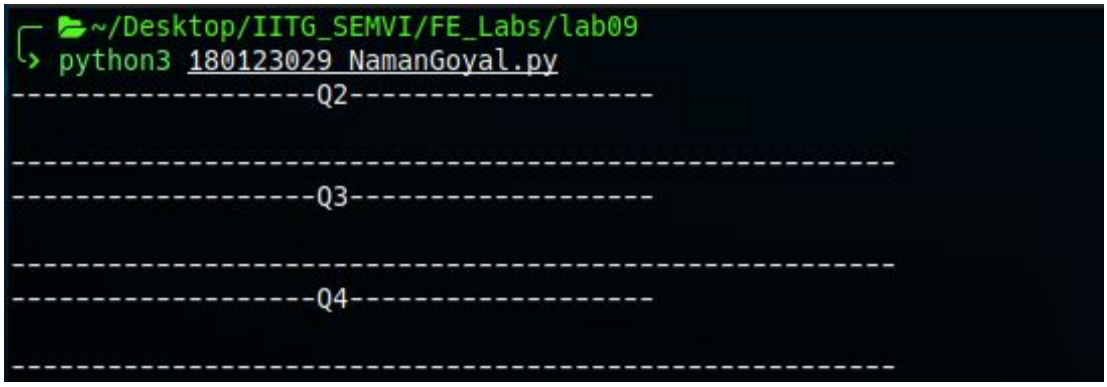
MA374 Financial Engineering lab: 09

Name: Naman Goyal
Roll No. 180123029

- **To execute my .py file**
  Run $python3 180123029_NamanGoyal.py on the terminal. The snapshot is shown below:

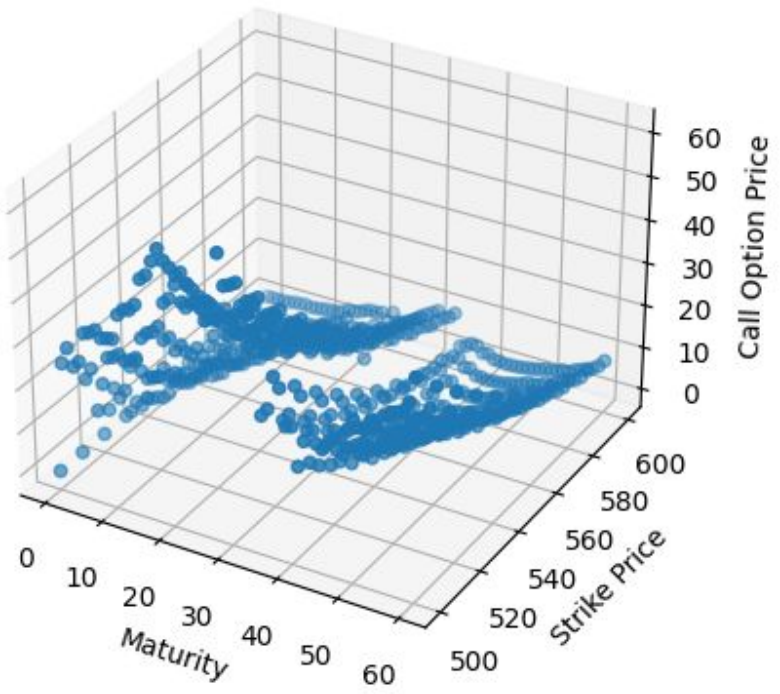


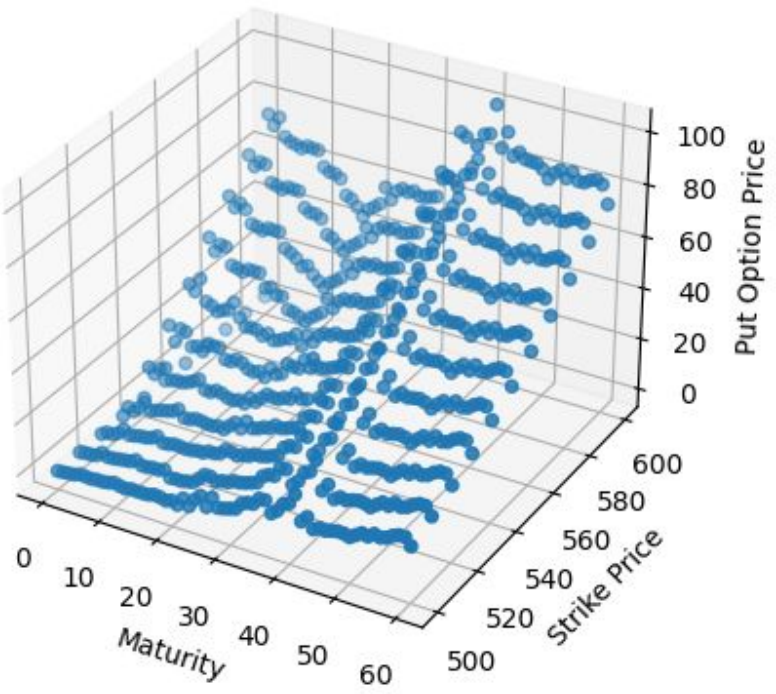
Ques.1

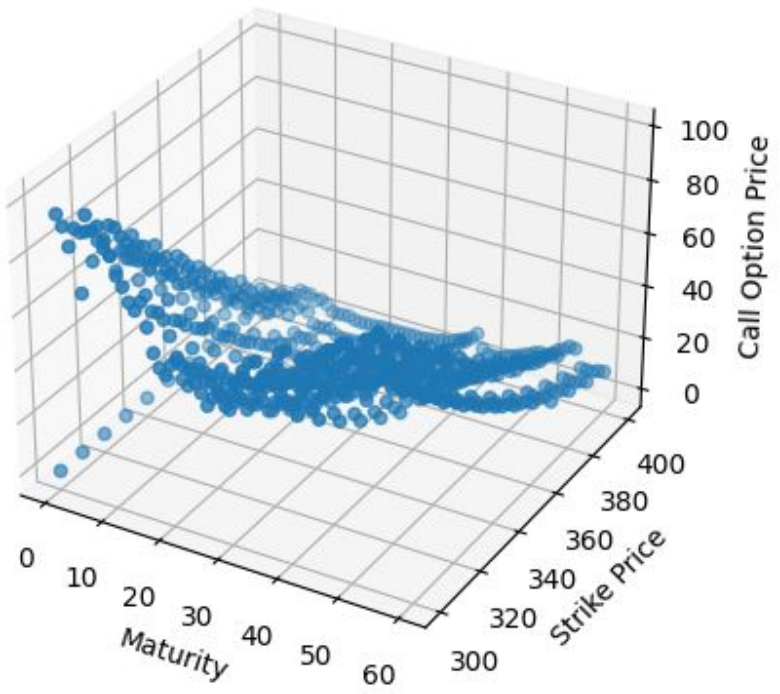
- The companies data chosen:
  - **NIFTY**
  - **CIPLA**
  - **ICICI**
  - **ITC**

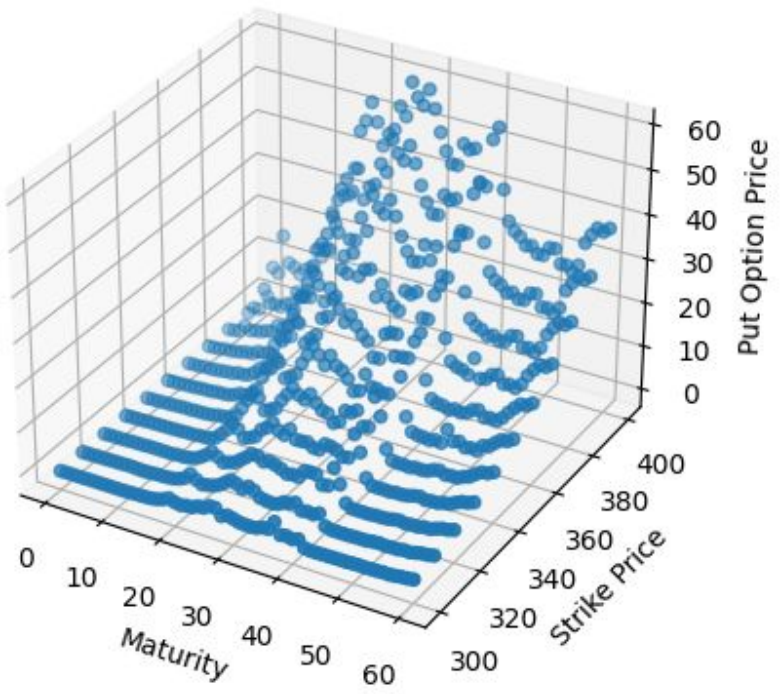
Ques.2

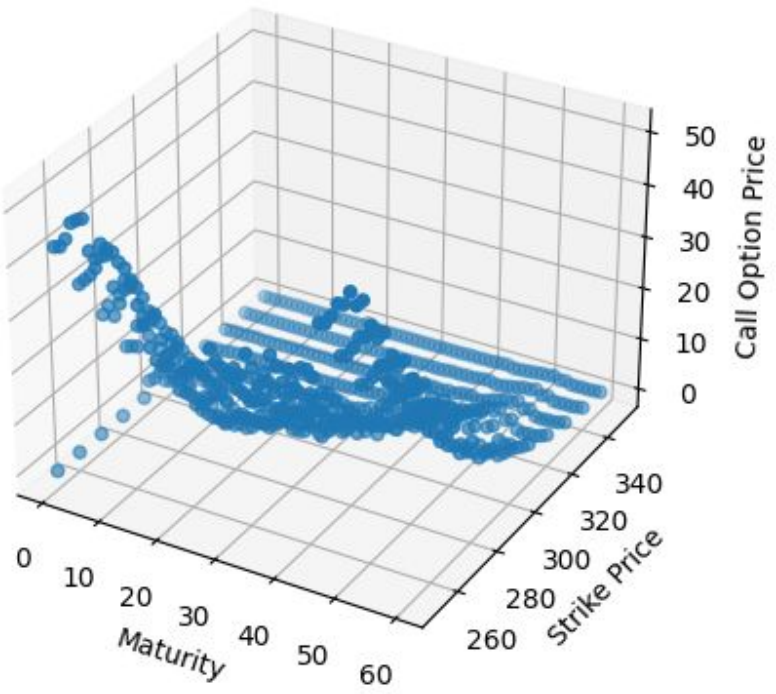
3D Graphs obtained : ->

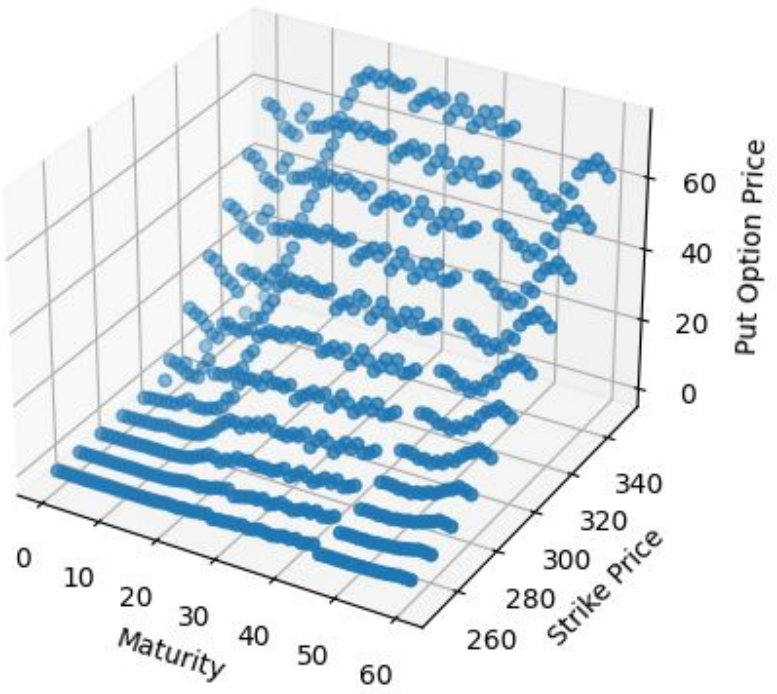

Call Option Price for CIPLA
Call Option Price
0
10
20
30
40
50
60
Strike Price
500
520
540
560
580
600
Maturity
0
10
20
30
40
50
60


Put Option Price for CIPLA
Put Option Price
100
80
60
40
20
0
Strike Price
600
580
560
540
520
500
Maturity
0
10
20
30
40
50
60

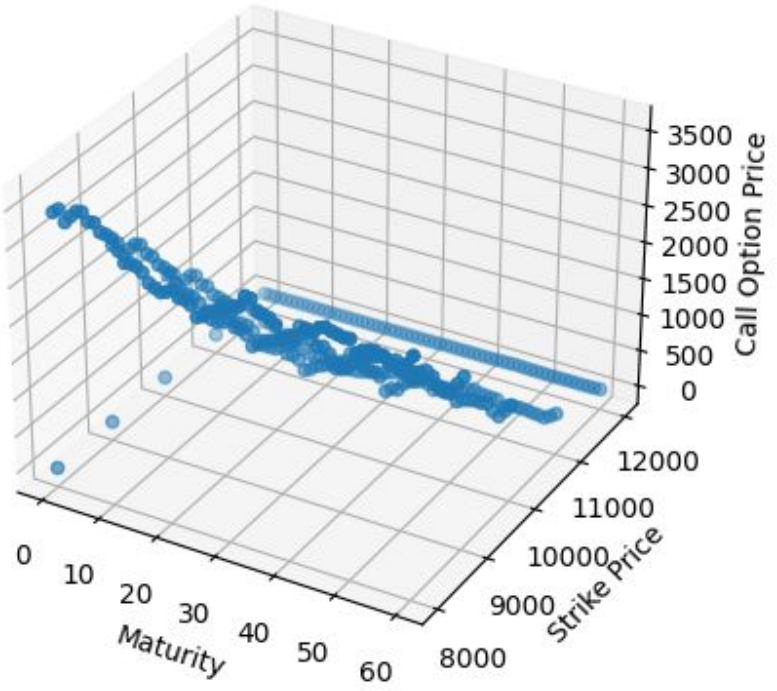

Call Option Price for ICICI
Call Option Price
100
80
60
40
20
0
Strike Price
400
380
360
340
320
300
Maturity
0
10
20
30
40
50
60

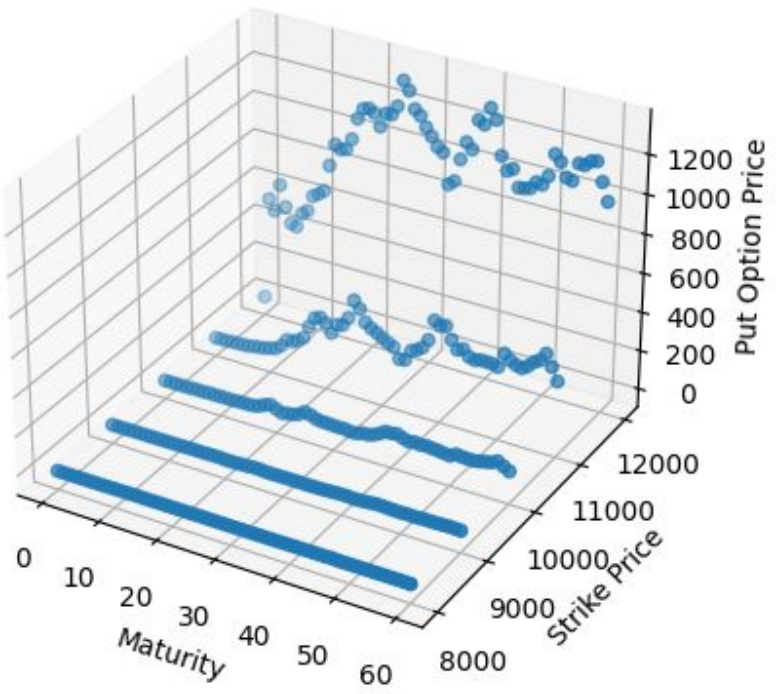

Put Option Price for ICICI
Put Option Price
0
10
20
30
40
50
60
Strike Price
300
320
340
360
380
400
Maturity
0
10
20
30
40
50
60

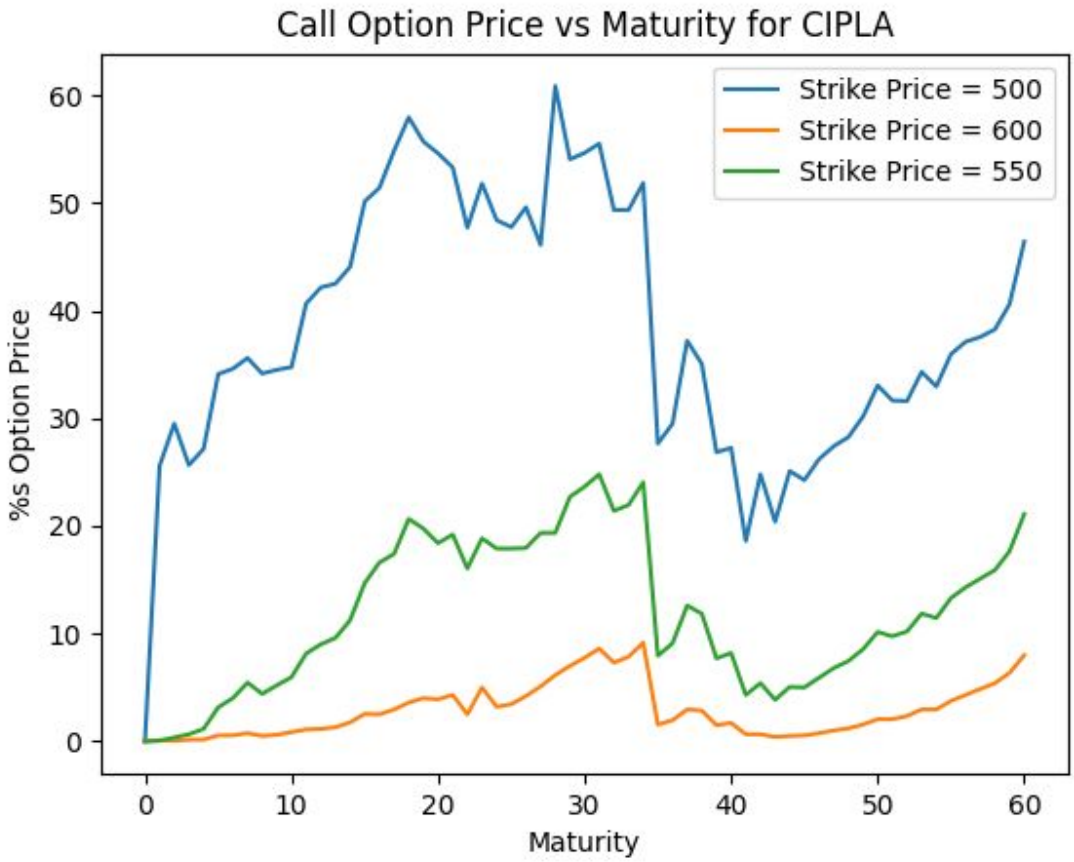

Call Option Price for ITC
Call Option Price
0
10
20
30
40
50
Strike Price
260
280
300
320
340
Maturity
0
10
20
30
40
50
60

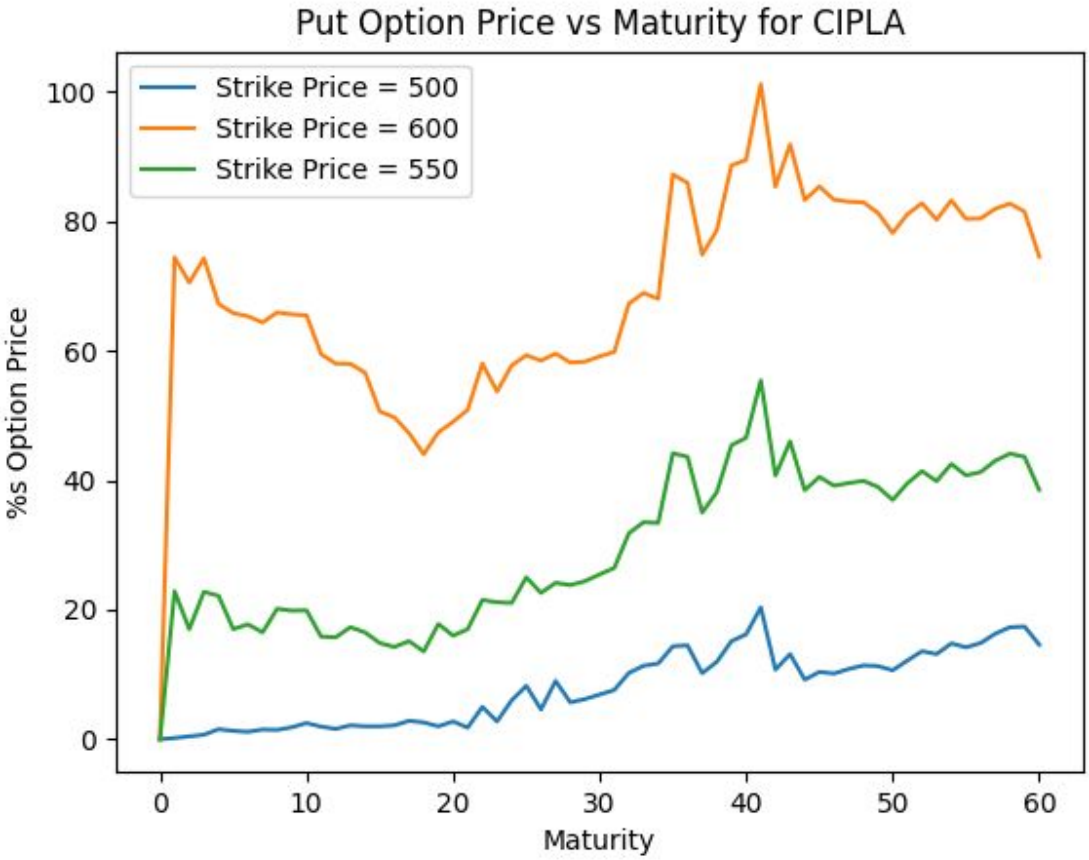

Put Option Price for ITC
Put Option Price
0
20
40
60
Strike Price
260
280
300
320
340
Maturity
0
10
20
30
40
50
60

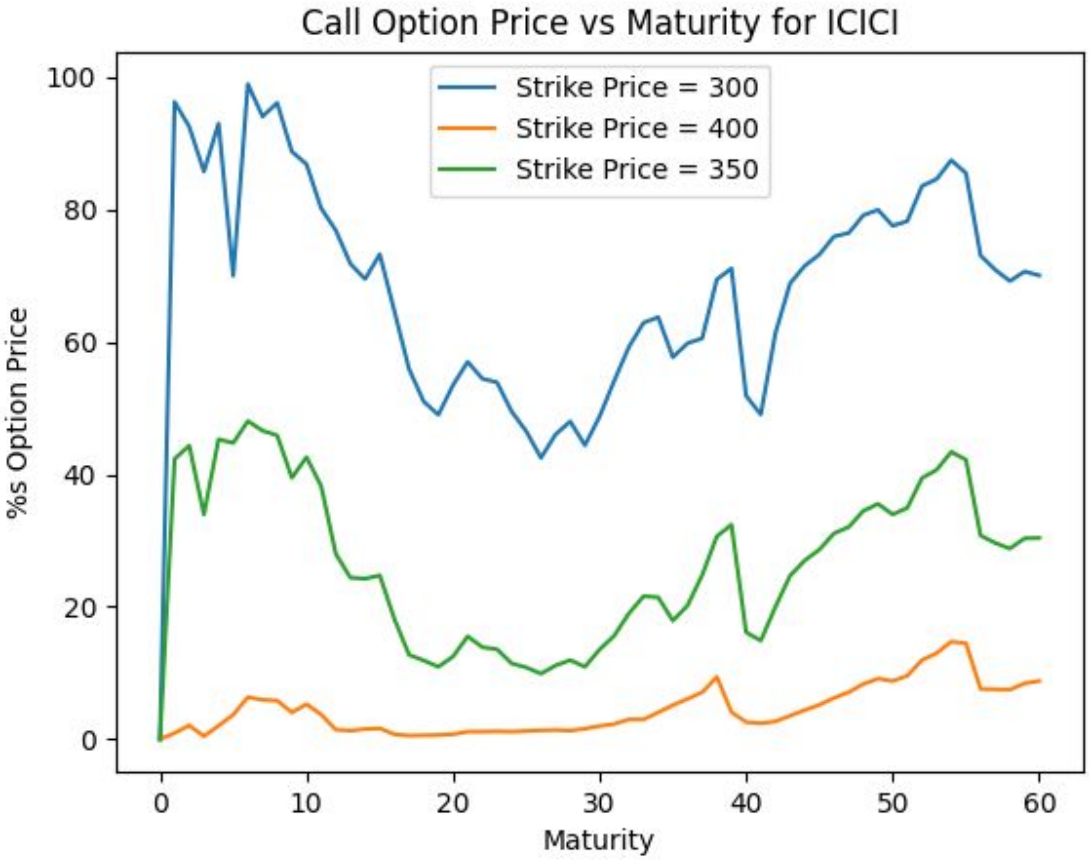
Call Option Price for NIFTY

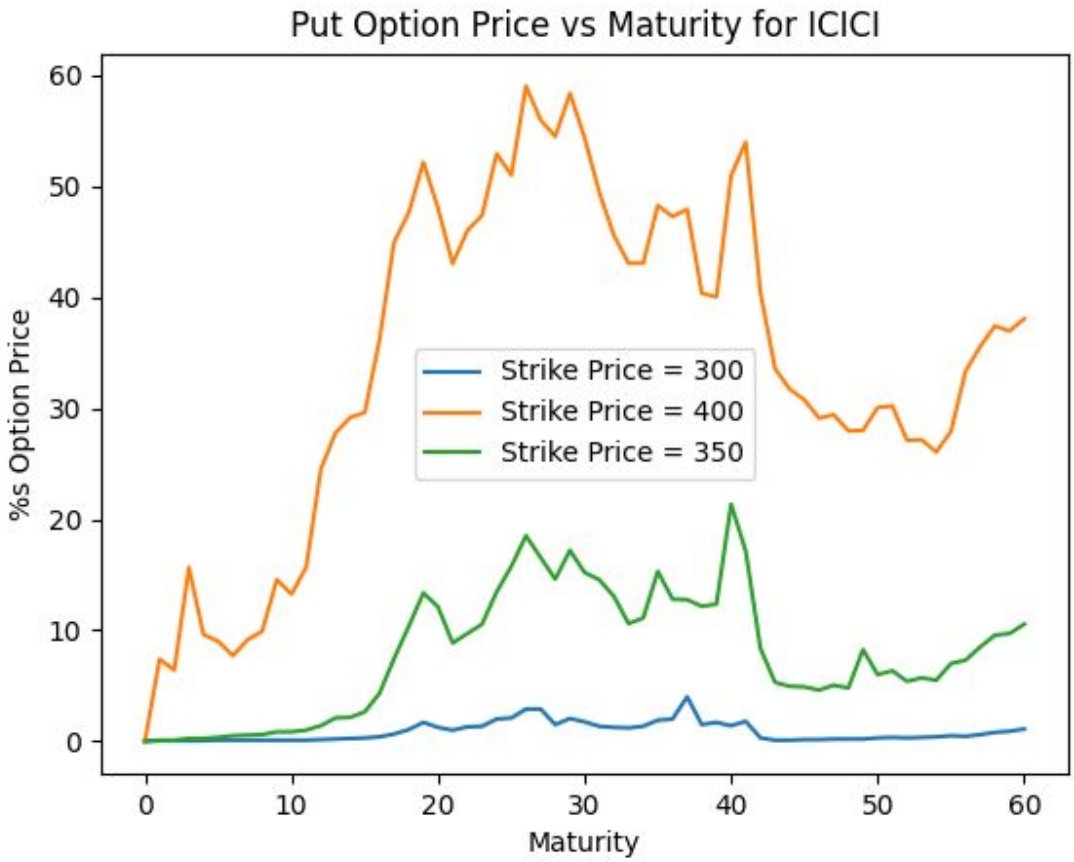


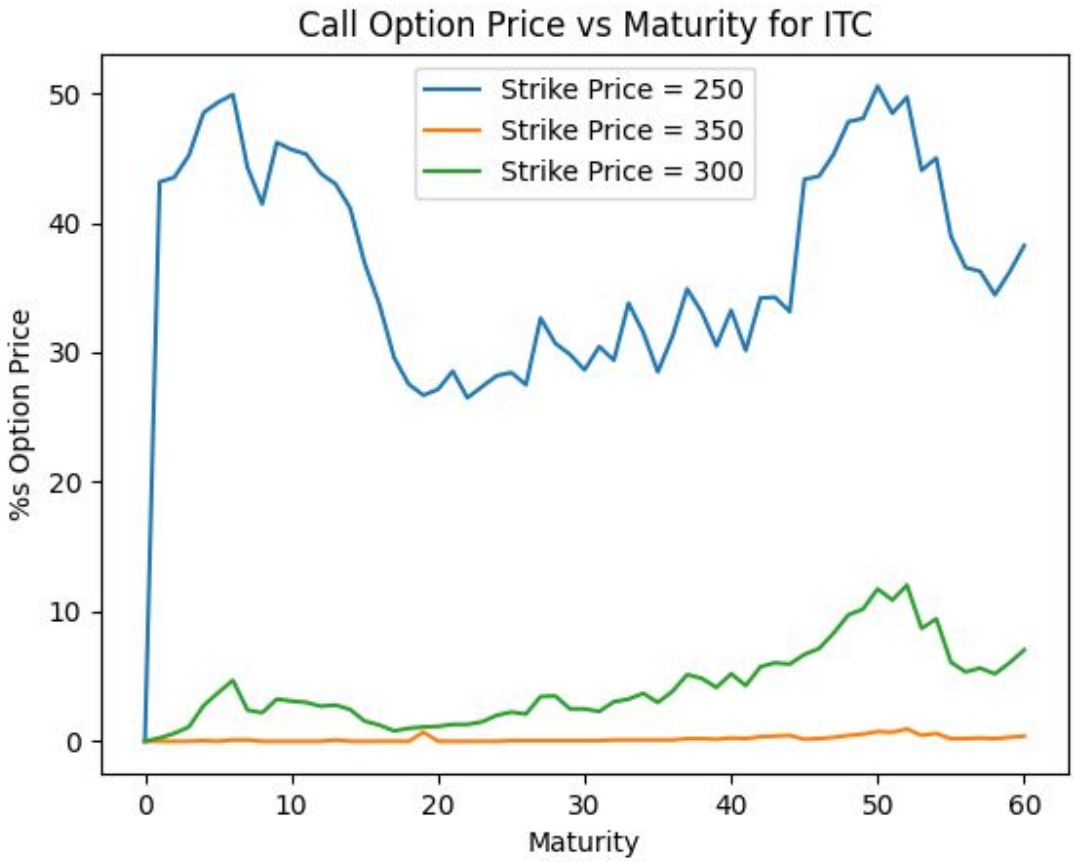

Put Option Price for NIFTY
Put Option Price
1200
1000
800
600
400
200
0
12000
11000
10000
9000
8000
Strike Price
0
10
20
30
40
50
60
Maturity

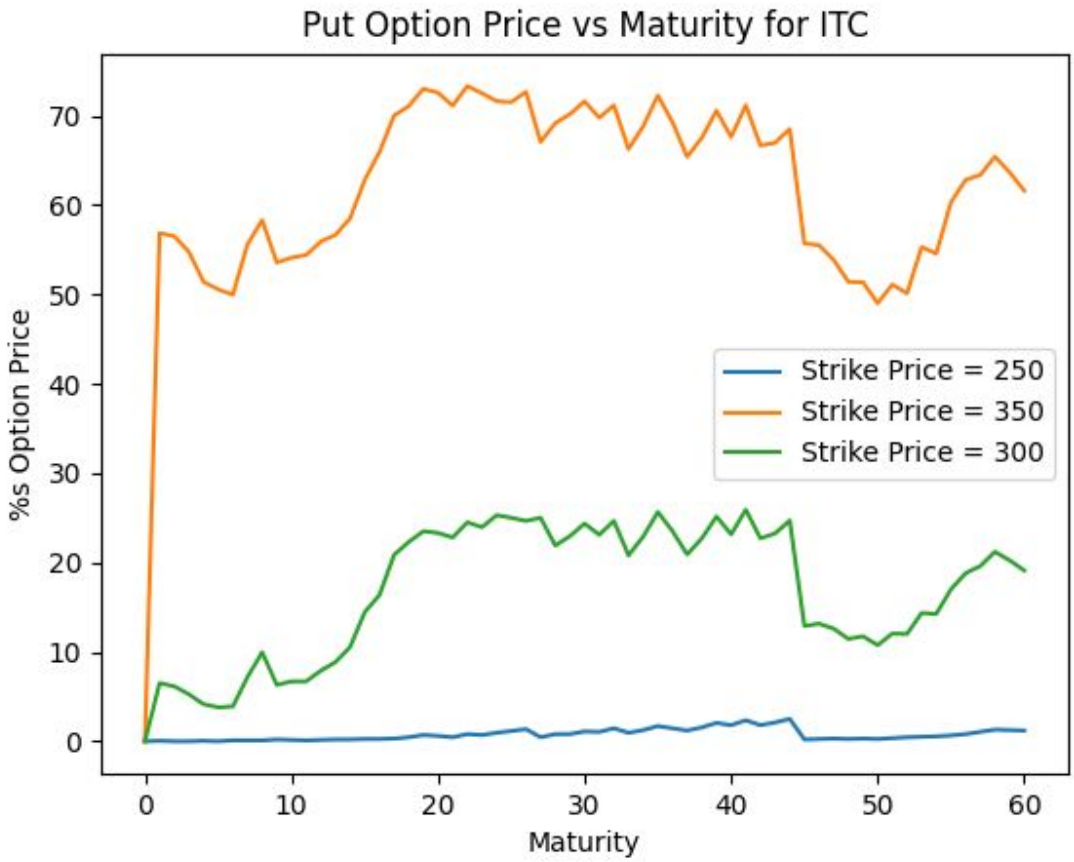

Call Option Price vs Maturity for CIPLA
Strike Price = 500
Strike Price = 600
Strike Price = 550
%s Option Price
Maturity
0
10
20
30
40
50
60

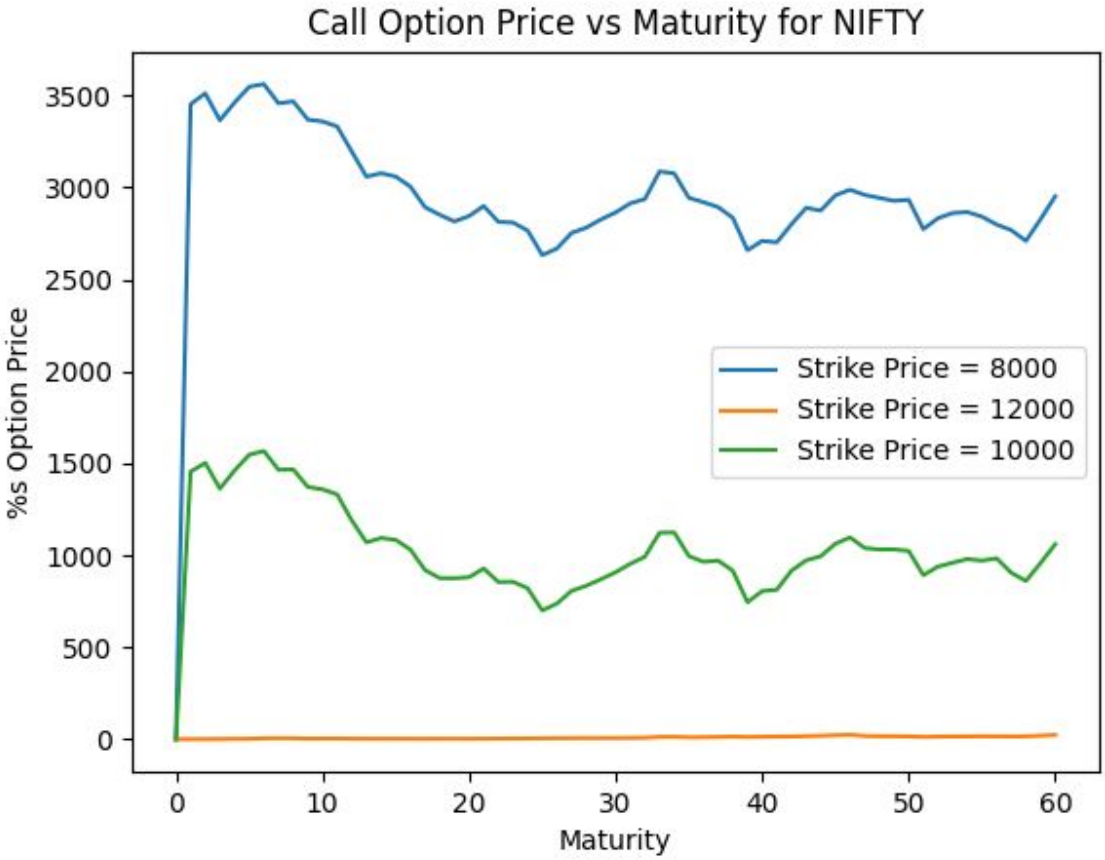

Put Option Price vs Maturity for CIPLA
Strike Price = 500
Strike Price = 600
Strike Price = 550
%s Option Price
Maturity
0
20
40
60
80
100
0
10
20
30
40
50
60

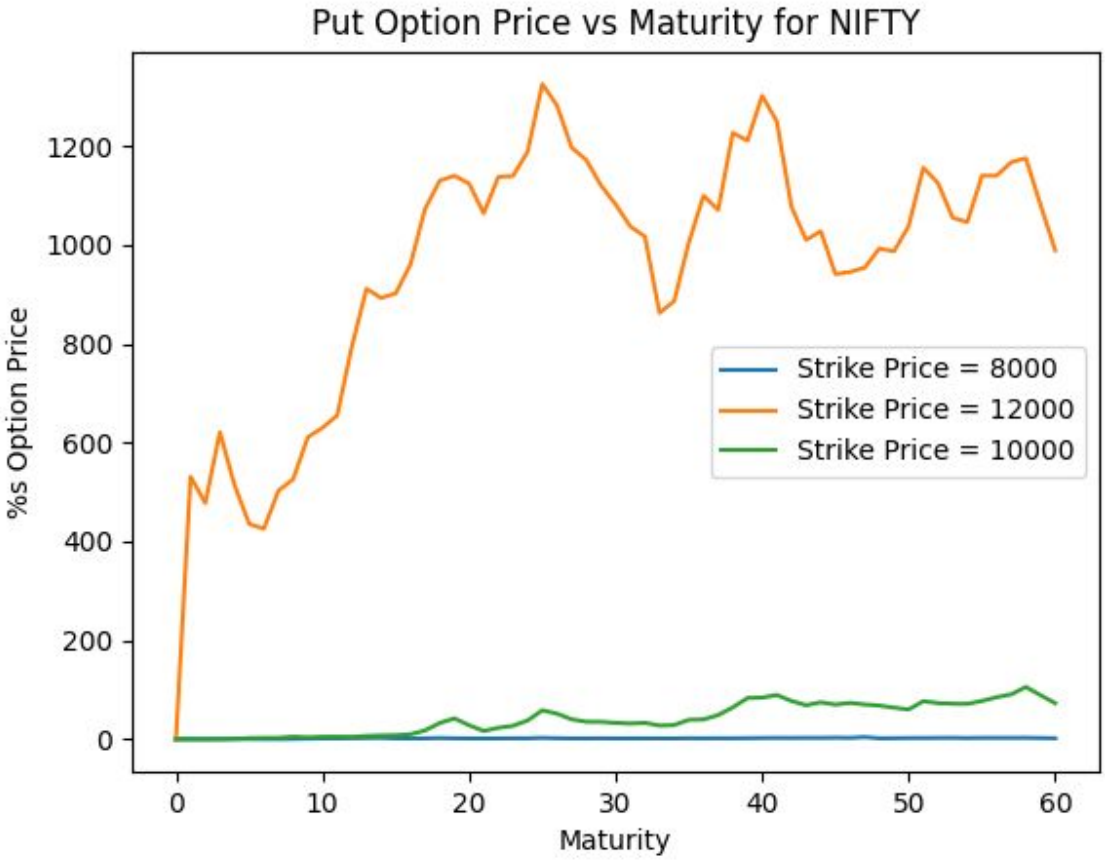

Call Option Price vs Maturity for ICICI
Strike Price = 300
Strike Price = 400
Strike Price = 350
%s Option Price
Maturity
0
20
40
60
80
100
0
10
20
30
40
50
60

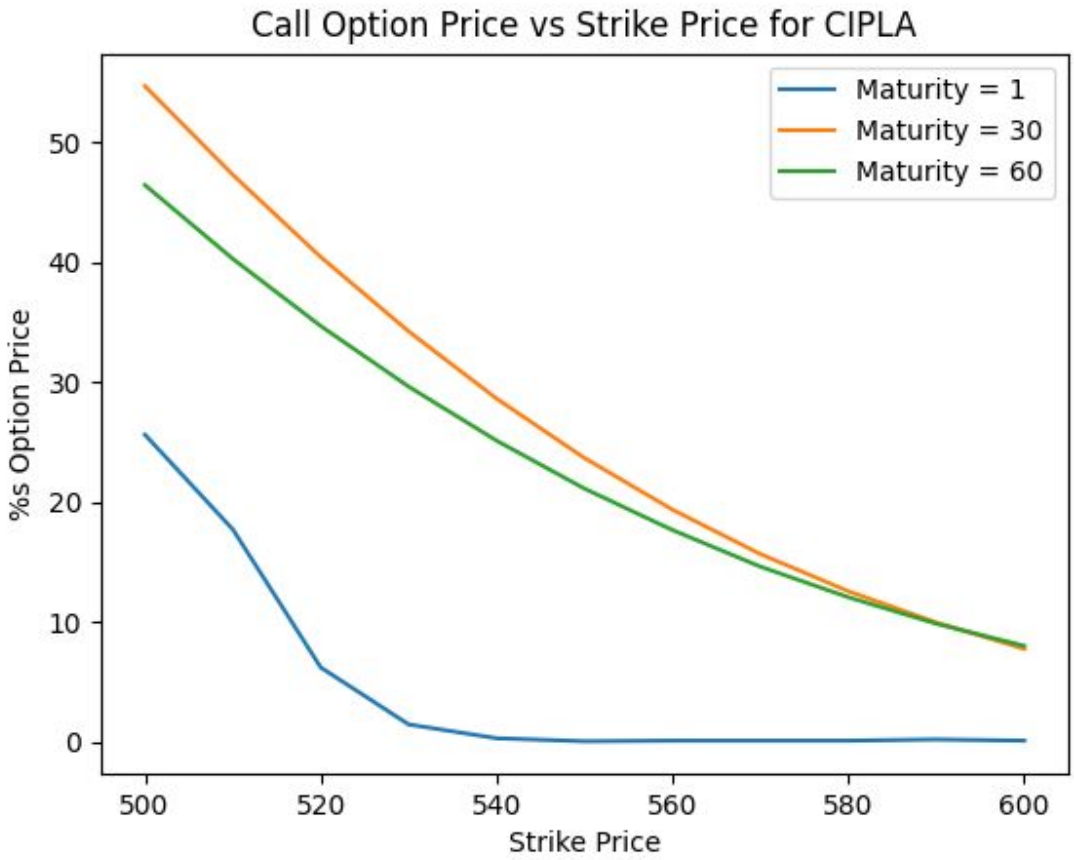

Put Option Price vs Maturity for ICICI
%s Option Price
Maturity
Strike Price = 300
Strike Price = 400
Strike Price = 350
0
10
20
30
40
50
60

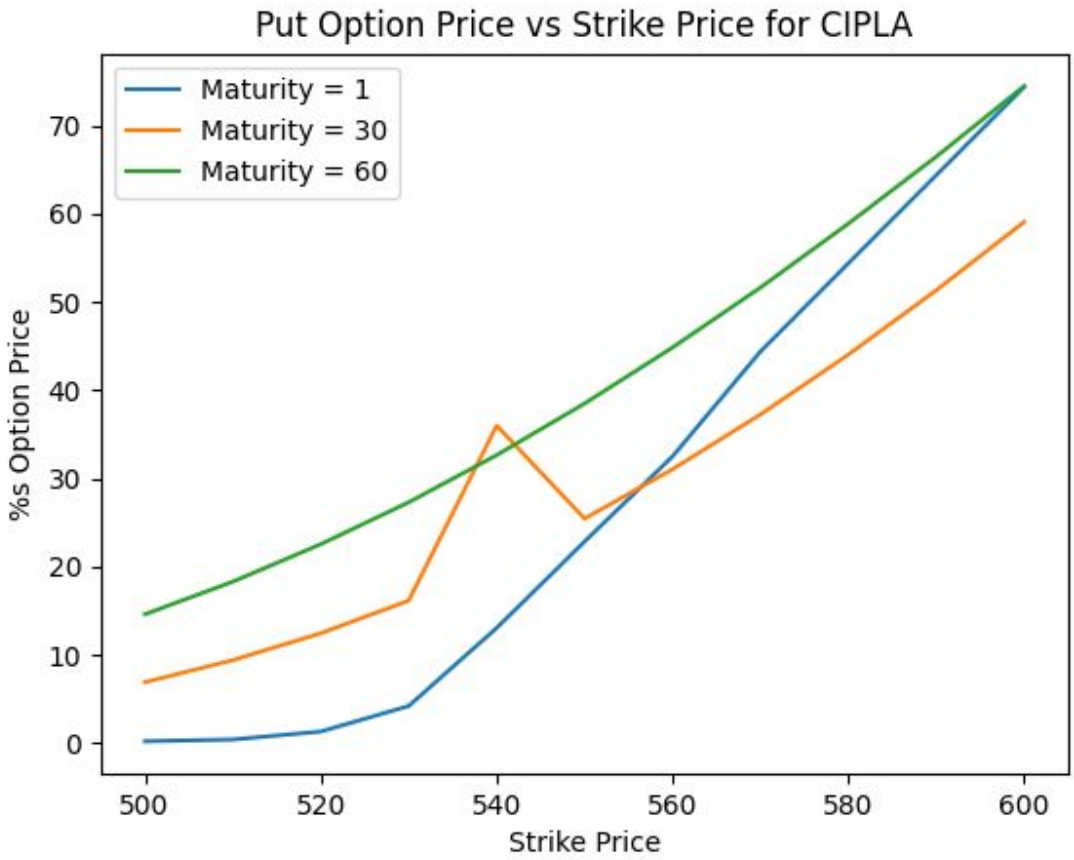

Call Option Price vs Maturity for ITC
Strike Price = 250
Strike Price = 350
Strike Price = 300
%s Option Price
Maturity
0
10
20
30
40
50
60

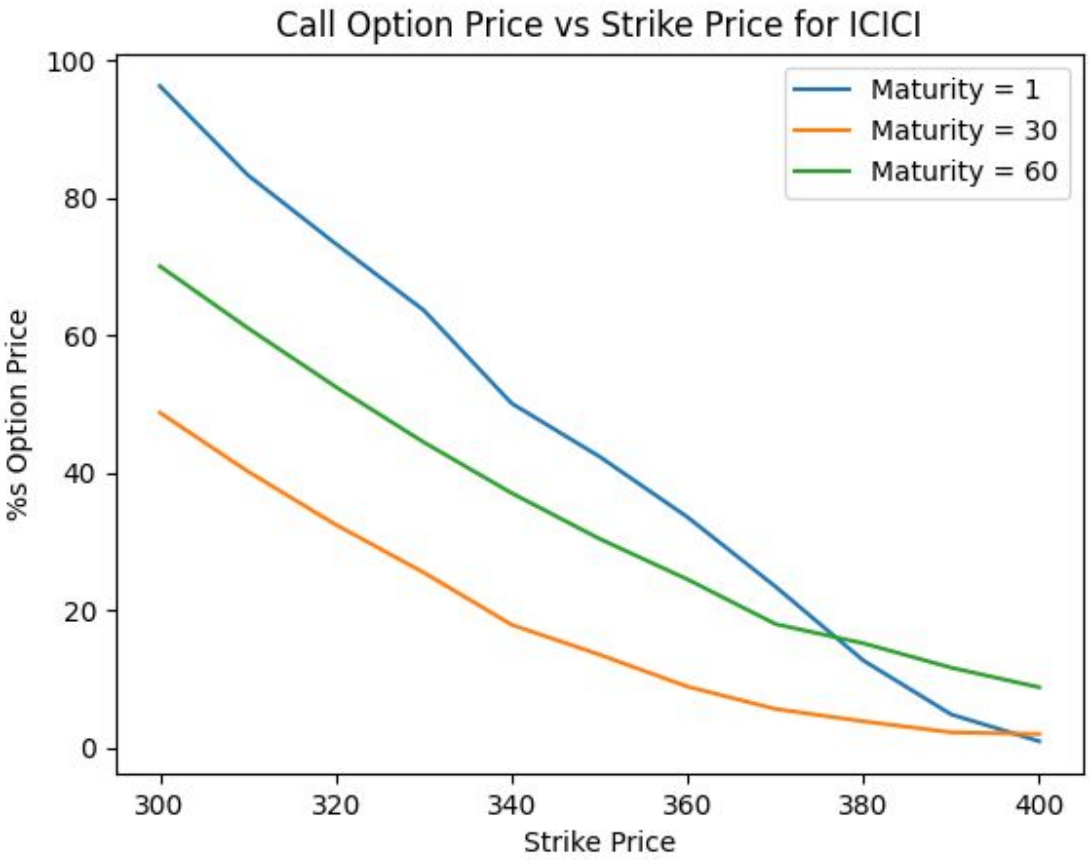

Put Option Price vs Maturity for ITC
%s Option Price
Maturity
Strike Price = 250
Strike Price = 350
Strike Price = 300
0
10
20
30
40
50
60
70

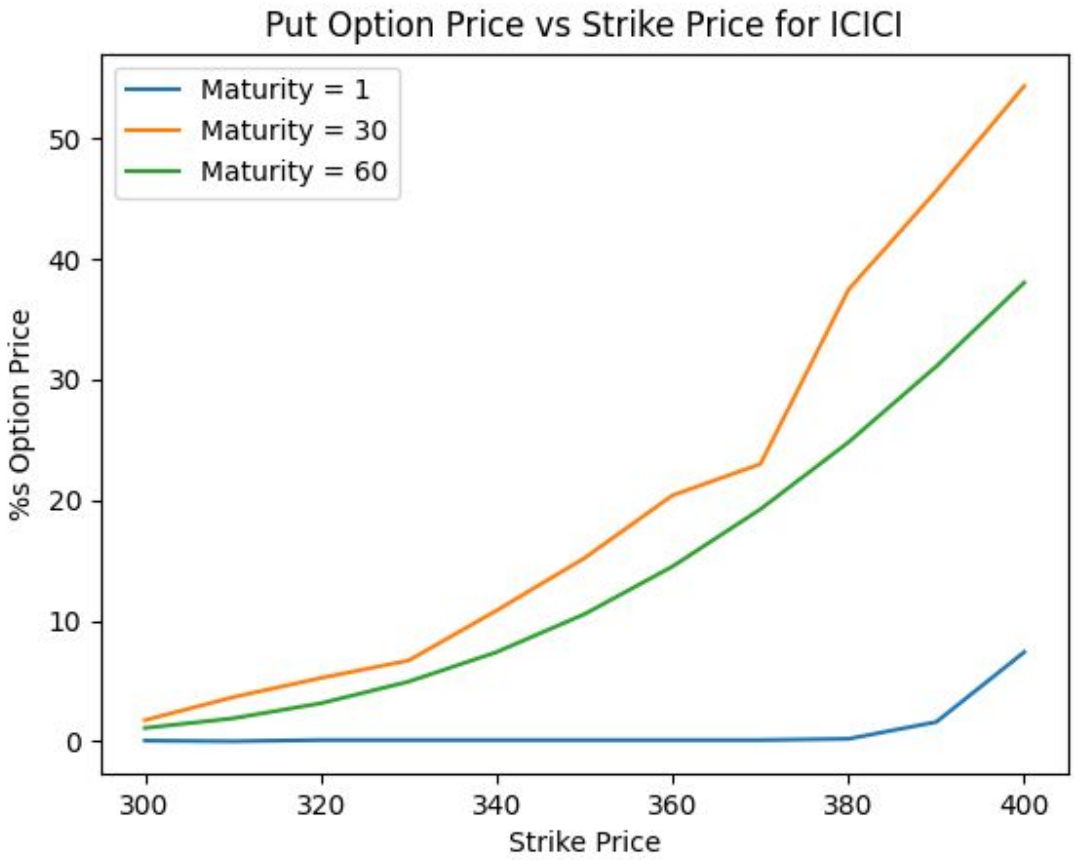

Call Option Price vs Maturity for NIFTY
%s Option Price
Maturity
Strike Price = 8000
Strike Price = 12000
Strike Price = 10000
0
500
1000
1500
2000
2500
3000
3500
0
10
20
30
40
50
60

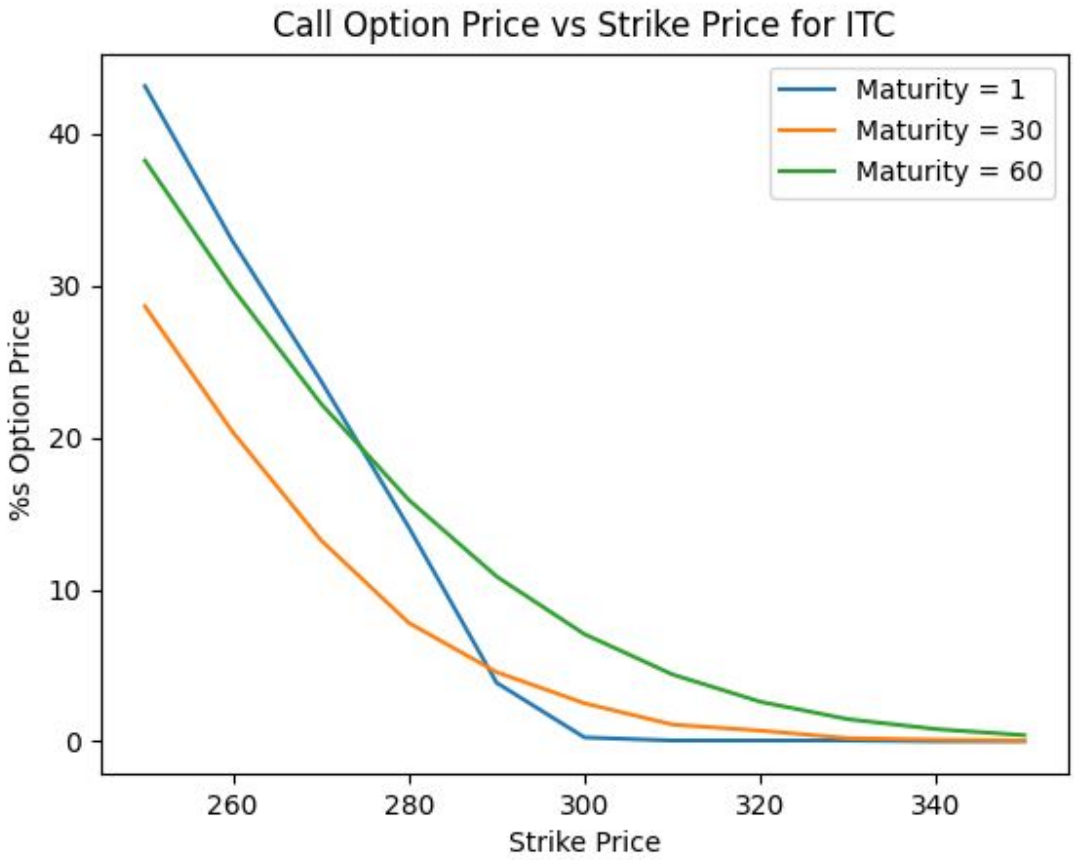

Put Option Price vs Maturity for NIFTY
%s Option Price
Maturity
0
200
400
600
800
1000
1200
0
10
20
30
40
50
60
Strike Price = 8000
Strike Price = 12000
Strike Price = 10000

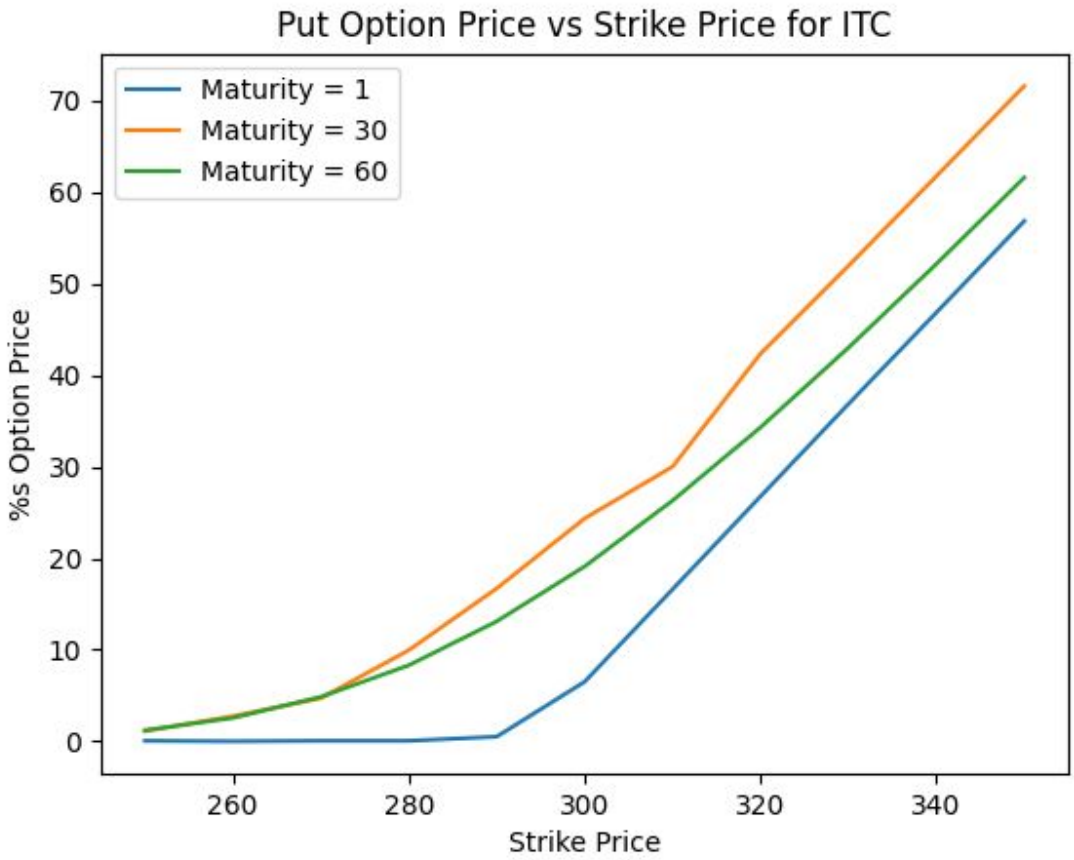

Call Option Price vs Strike Price for CIPLA
Maturity = 1
Maturity = 30
Maturity = 60
%s Option Price
0
10
20
30
40
50
500
520
540
560
580
600
Strike Price

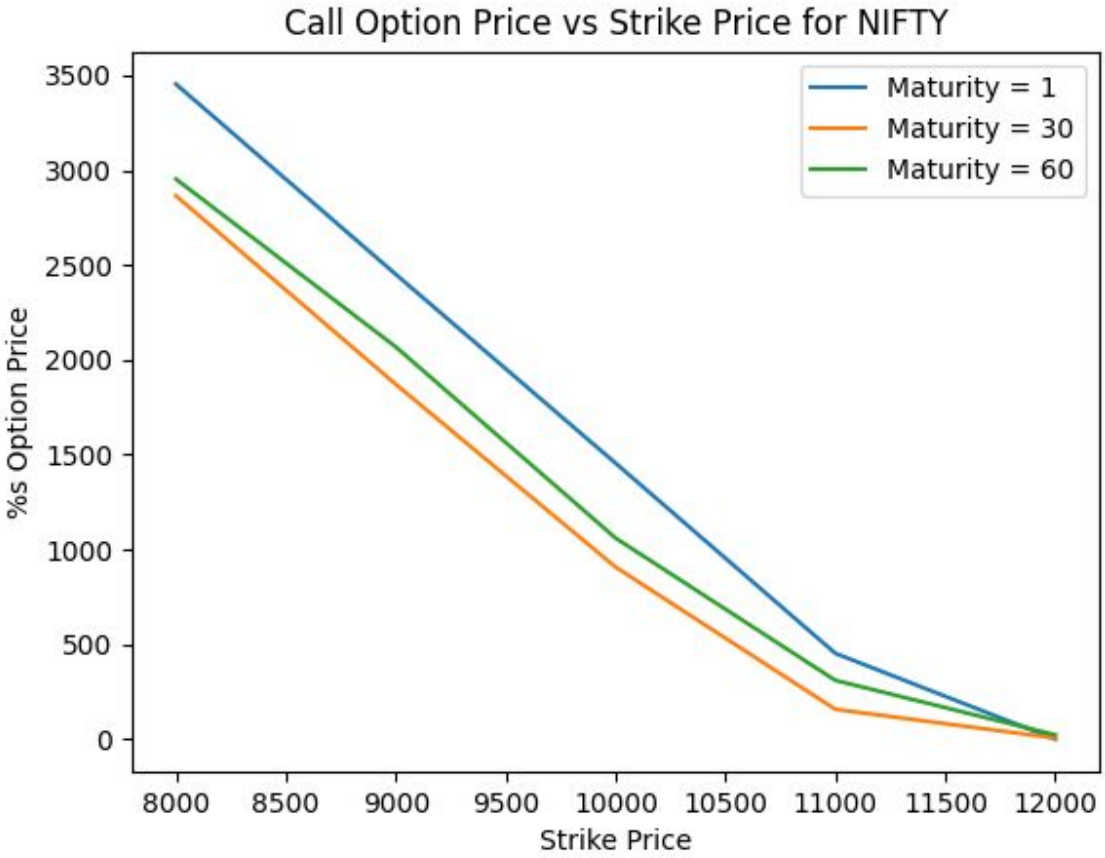

Put Option Price vs Strike Price for CIPLA
Maturity = 1
Maturity = 30
Maturity = 60
%s Option Price
0
10
20
30
40
50
60
70
500
520
540
560
580
600
Strike Price

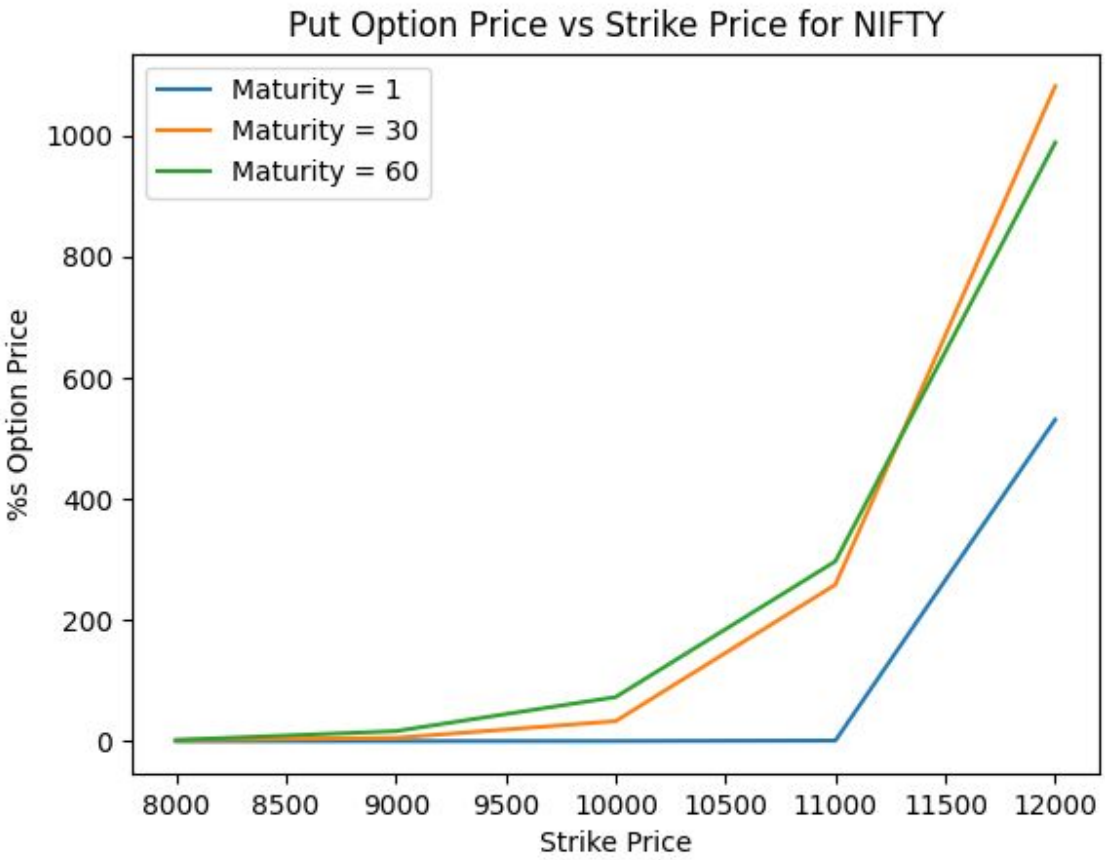

Call Option Price vs Strike Price for ICICI
Maturity = 1
Maturity = 30
Maturity = 60
%s Option Price
Strike Price
100
80
60
40
20
0
300
320
340
360
380
400


Put Option Price vs Strike Price for ICICI
Maturity = 1
Maturity = 30
Maturity = 60
%s Option Price
0
10
20
30
40
50
300
320
340
360
380
400
Strike Price


Call Option Price vs Strike Price for ITC
Maturity = 1
Maturity = 30
Maturity = 60
%s Option Price
0
10
20
30
40
260
280
300
320
340
Strike Price

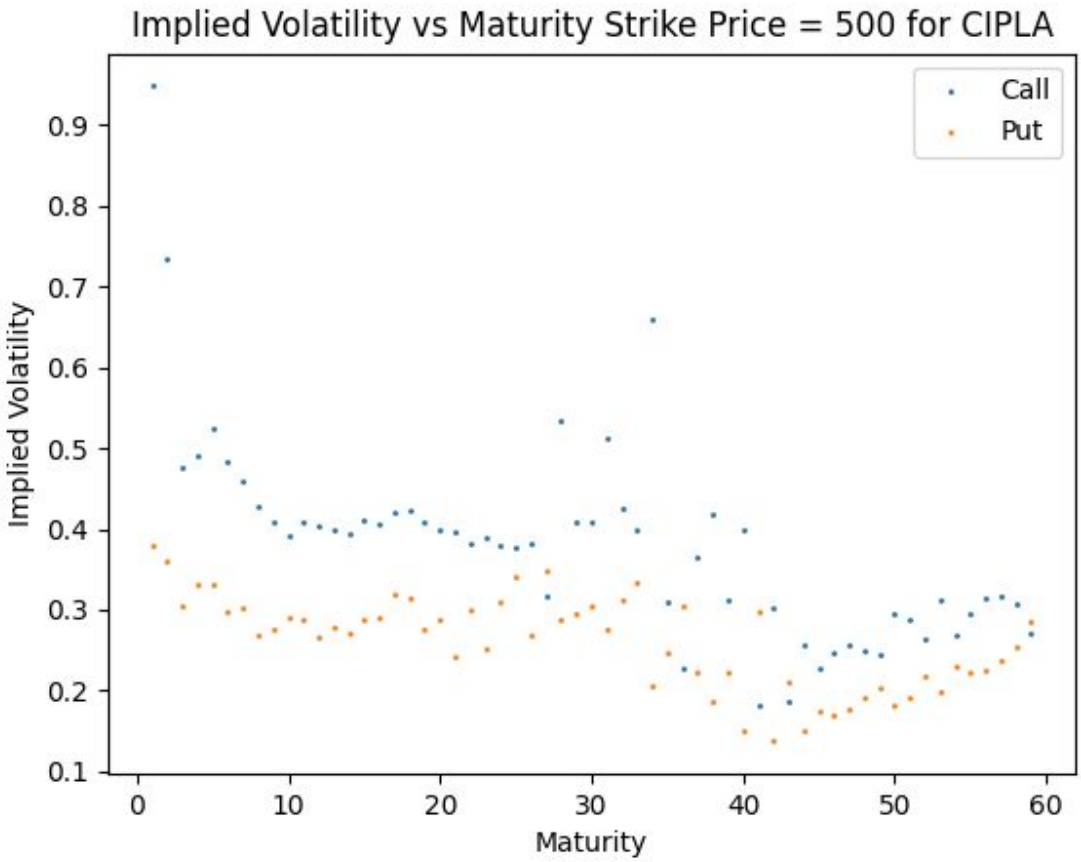

Put Option Price vs Strike Price for ITC
Maturity = 1
Maturity = 30
Maturity = 60
%s Option Price
Strike Price
0
10
20
30
40
50
60
70
260
280
300
320
340

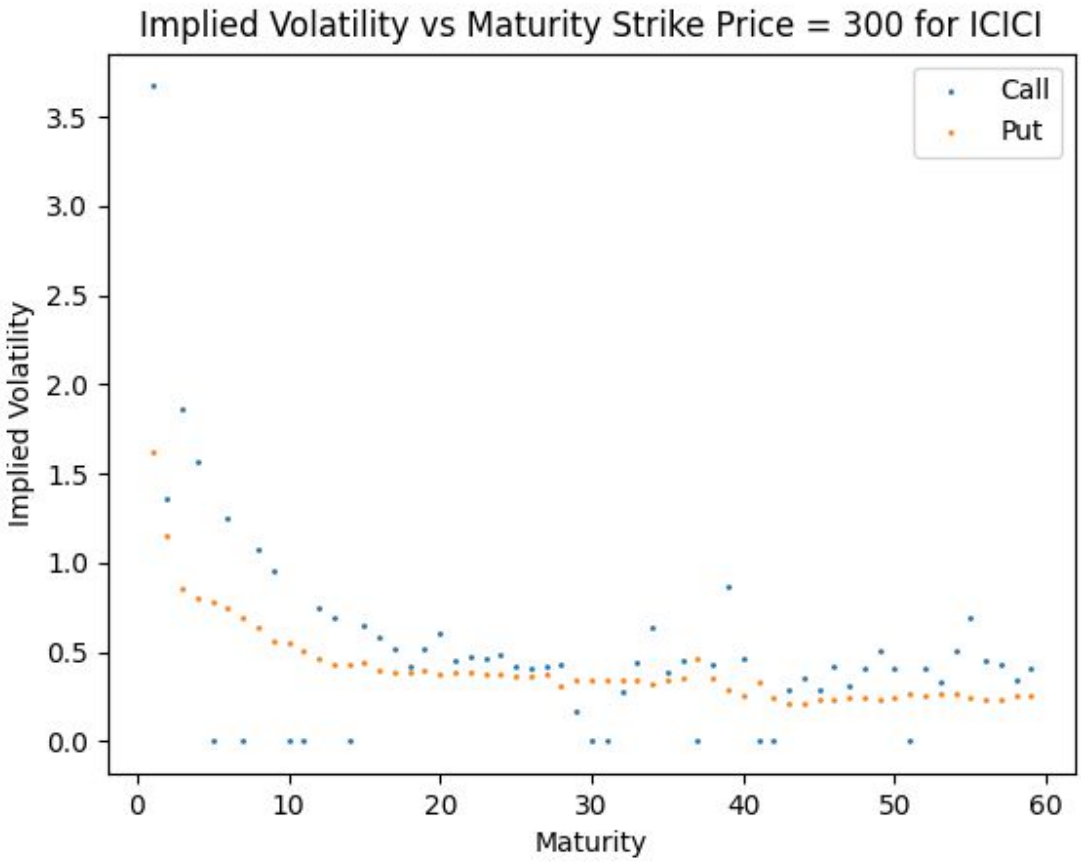

Call Option Price vs Strike Price for NIFTY
Maturity = 1
Maturity = 30
Maturity = 60
%s Option Price
Strike Price
3500
3000
2500
2000
1500
1000
500
0
8000
8500
9000
9500
10000
10500
11000
11500
12000

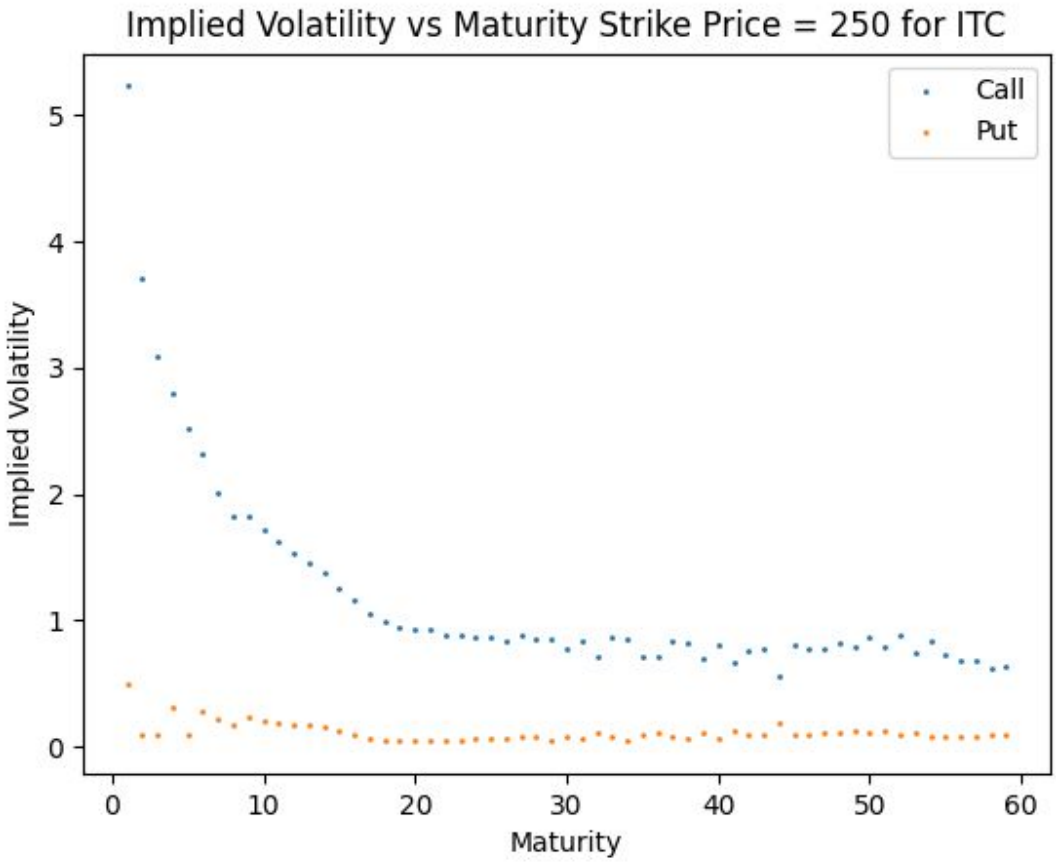


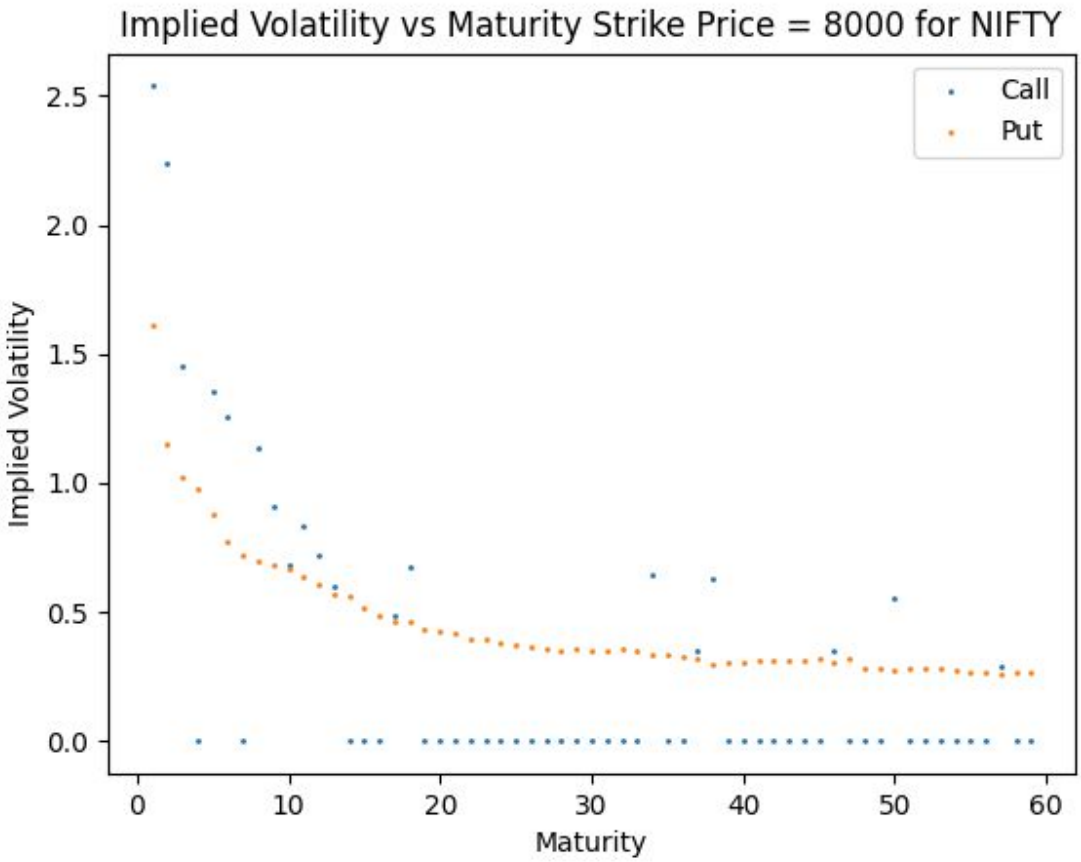
Ques.3

- The **bisection method** has been used to calculate **implied volatility**. The implied volatility is varied against **strike price and maturity**. The graphs obtained are shown below:

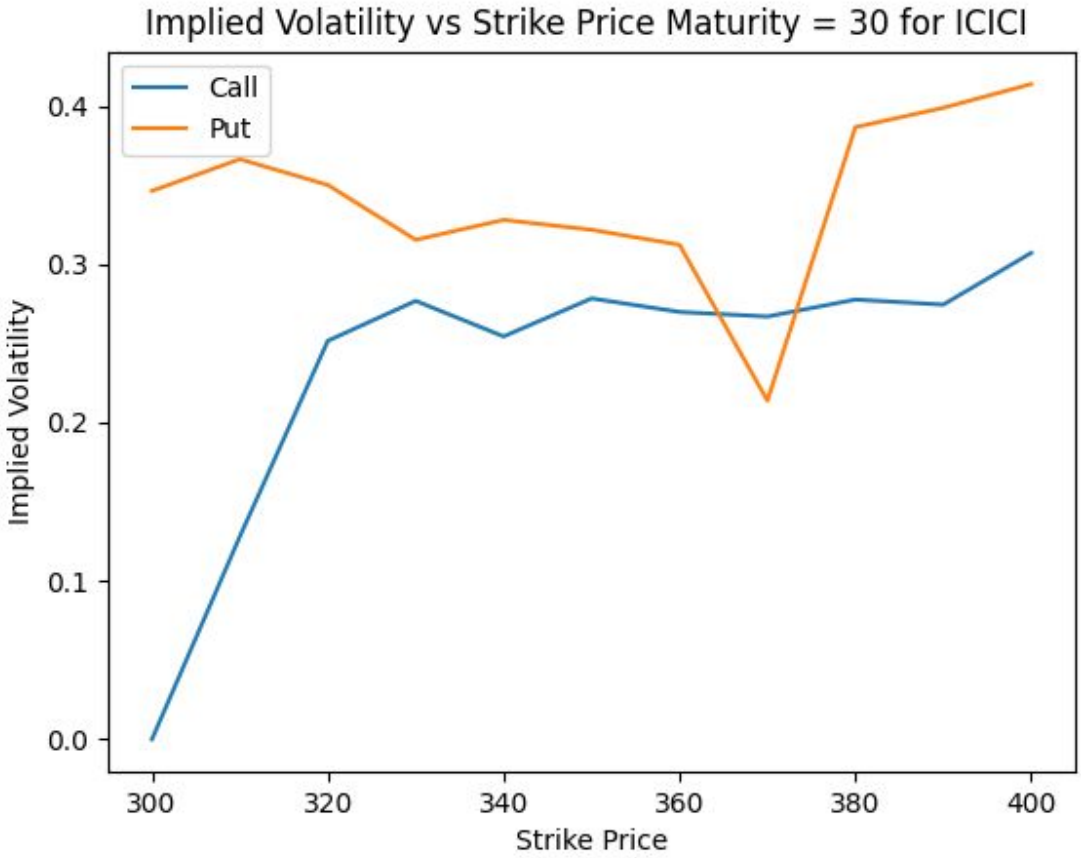

Implied Volatility vs Maturity Strike Price = 500 for CIPLA
Call
Put
Implied Volatility
Maturity
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
0
10
20
30
40
50
60


Implied Volatility vs Maturity Strike Price = 300 for ICICI
Call
Put
Implied Volatility
Maturity
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
0
10
20
30
40
50
60

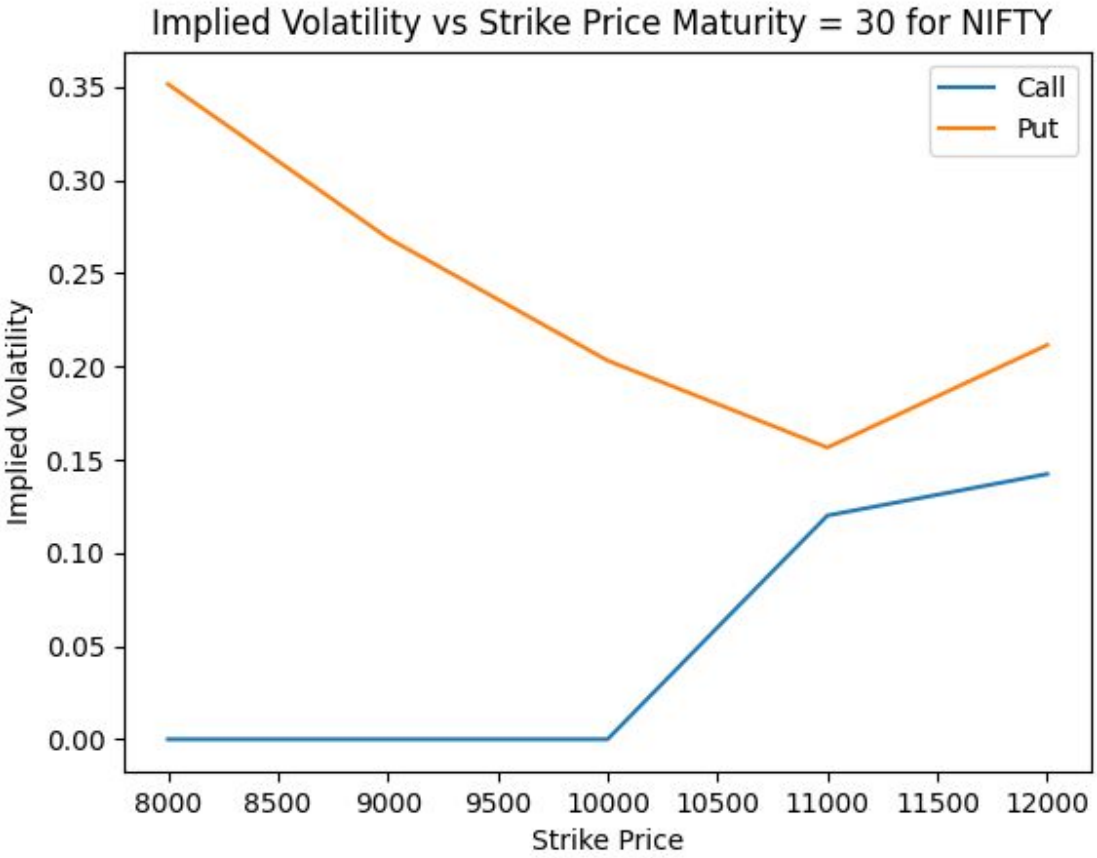

Implied Volatility vs Maturity Strike Price = 250 for ITC
Call
Put
Implied Volatility
Maturity
0
1
2
3
4
5
0
10
20
30
40
50
60

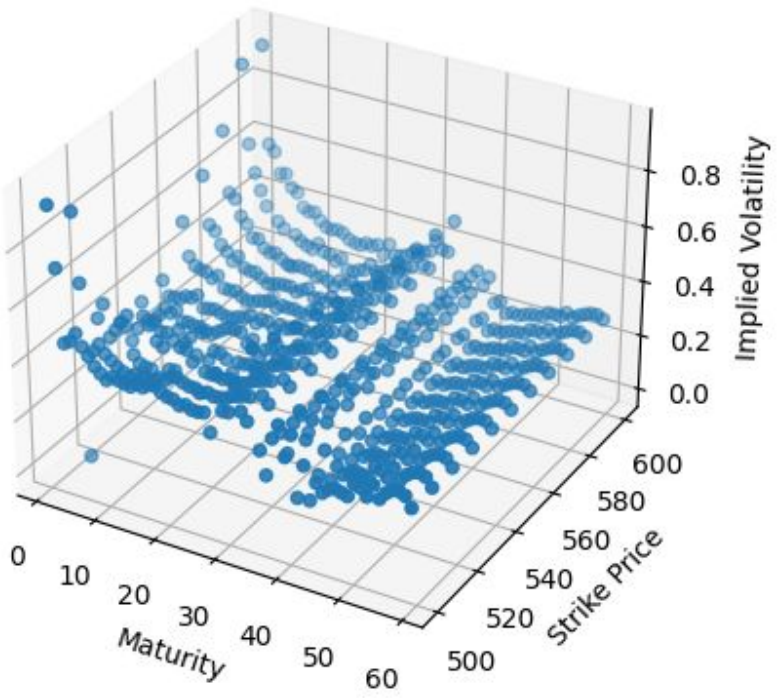

Implied Volatility vs Maturity Strike Price = 8000 for NIFTY
Call
Put
Implied Volatility
Maturity
2.5
2.0
1.5
1.0
0.5
0.0
0
10
20
30
40
50
60

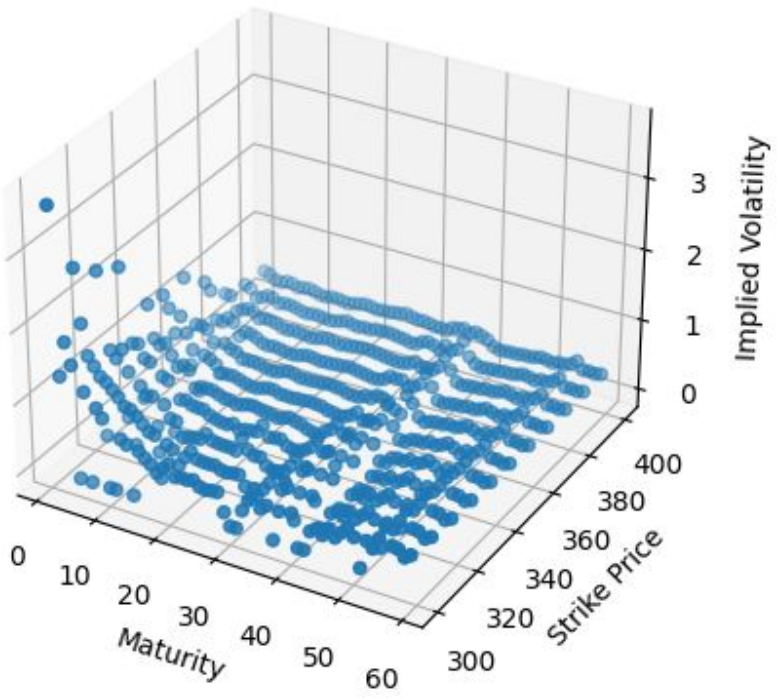

Implied Volatility vs Strike Price Maturity = 30 for CIPLA
Call
Put
Implied Volatility
0.50
0.45
0.40
0.35
0.30
0.25
0.20
500
520
540
560
580
600
Strike Price

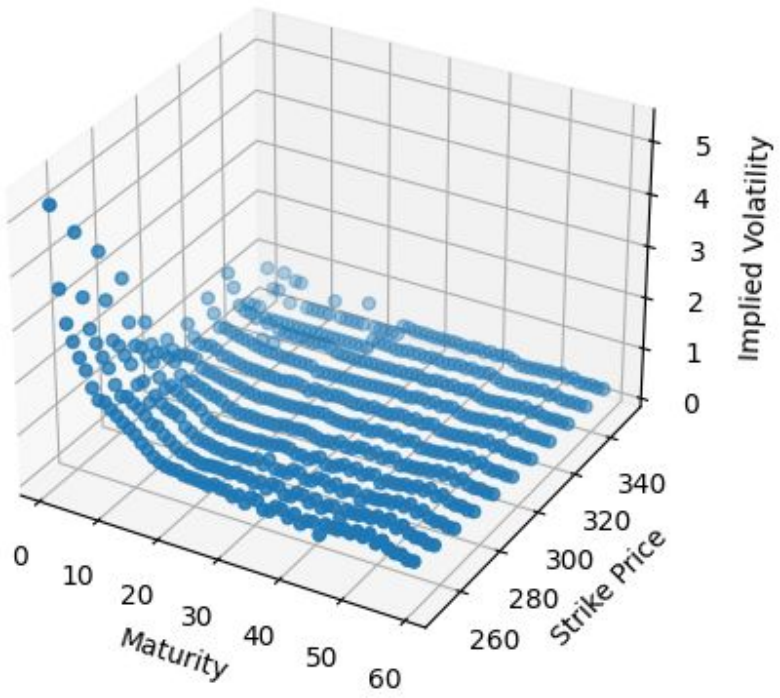

Implied Volatility vs Strike Price Maturity = 30 for ICICI
Call
Put
Implied Volatility
0.0
0.1
0.2
0.3
0.4
300
320
340
360
380
400
Strike Price

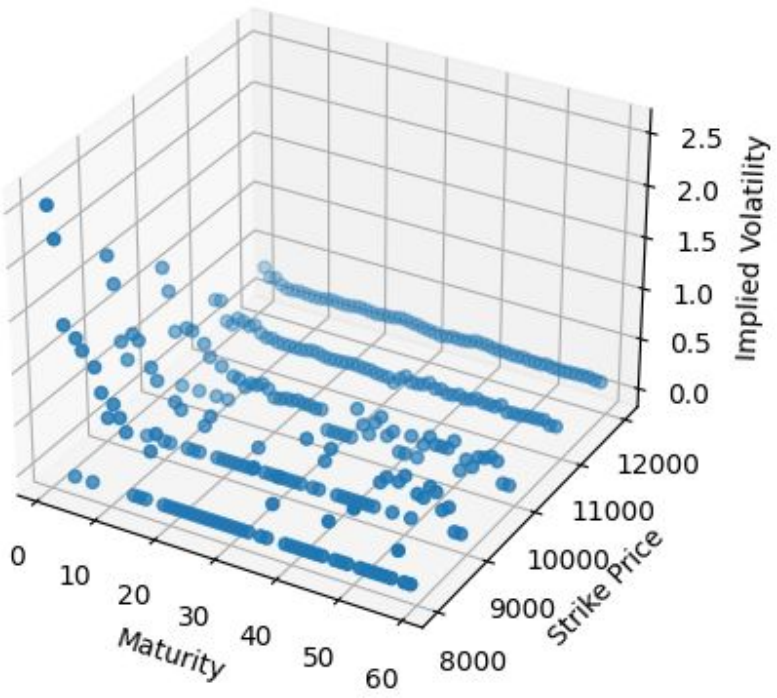

Implied Volatility vs Strike Price Maturity = 30 for ITC
Call
Put
Implied Volatility
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
260
280
300
320
340
Strike Price

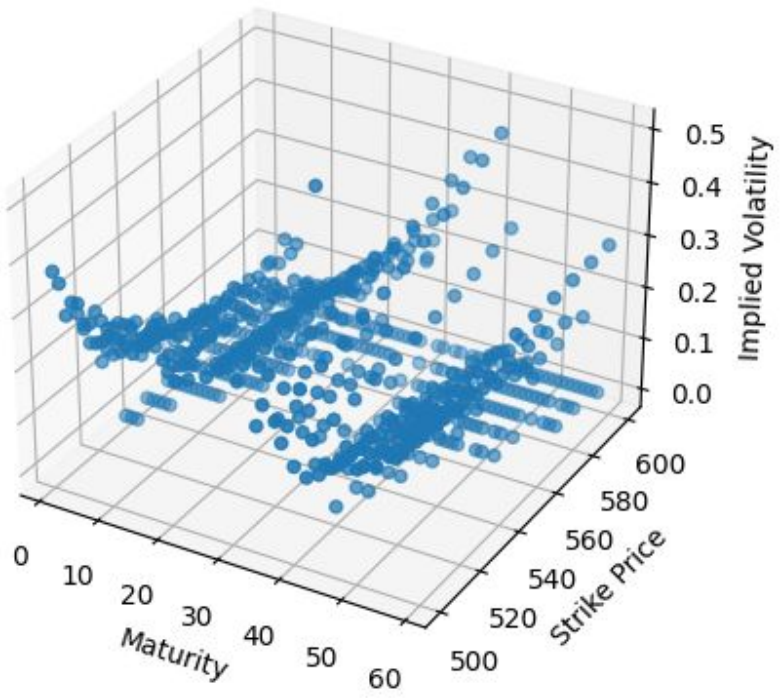

Implied Volatility vs Strike Price Maturity = 30 for NIFTY
Call
Put
Implied Volatility
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
8000
8500
9000
9500
10000
10500
11000
11500
12000
Strike Price

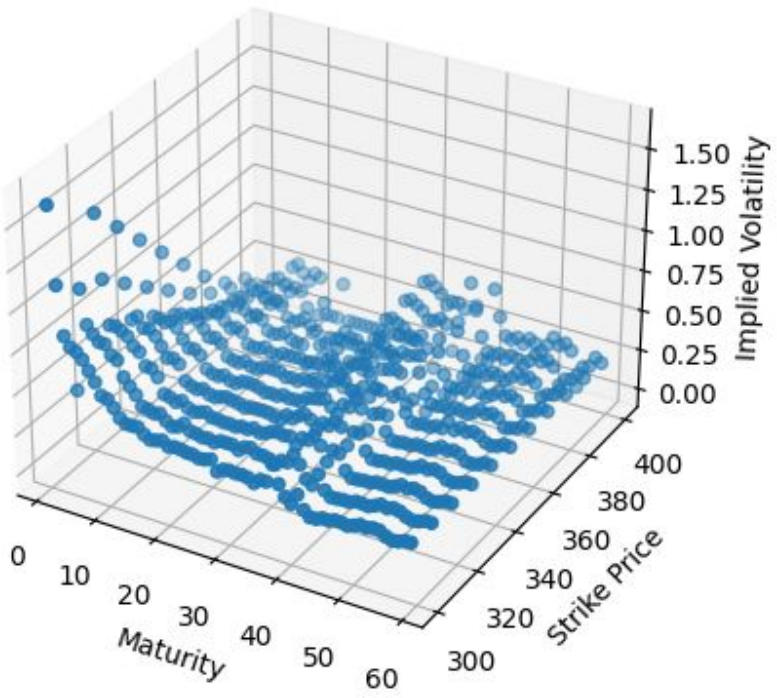

Call Implied Volatility for CIPLA
Implied Volatility
0.0
0.2
0.4
0.6
0.8
Strike Price
500
520
540
560
580
600
Maturity
0
10
20
30
40
50
60

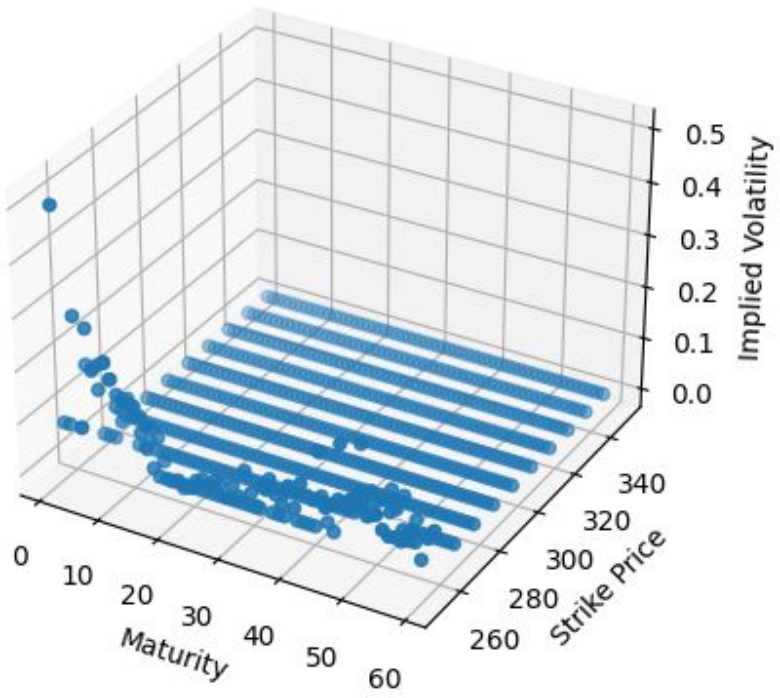

Call Implied Volatility for ICICI
Implied Volatility
0
1
2
3
Strike Price
300
320
340
360
380
400
Maturity
0
10
20
30
40
50
60

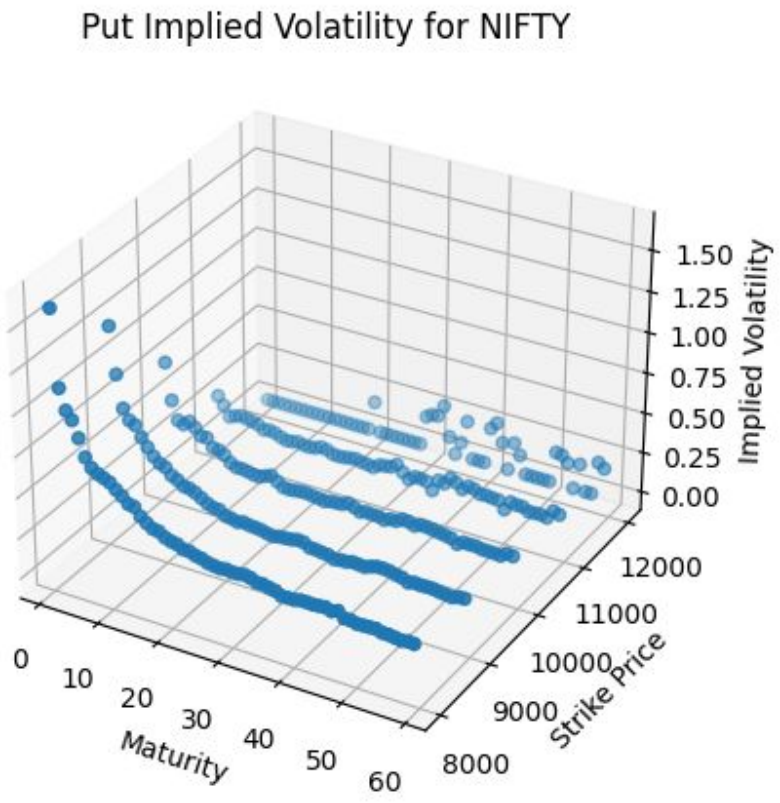

Call Implied Volatility for ITC
Implied Volatility
0
1
2
3
4
5
Strike Price
260
280
300
320
340
Maturity
0
10
20
30
40
50
60


Call Implied Volatility for NIFTY
Implied Volatility
2.5
2.0
1.5
1.0
0.5
0.0
Strike Price
12000
11000
10000
9000
8000
Maturity
0
10
20
30
40
50
60


Put Implied Volatility for CIPLA
Implied Volatility
0.0
0.1
0.2
0.3
0.4
0.5
Strike Price
500
520
540
560
580
600
Maturity
0
10
20
30
40
50
60

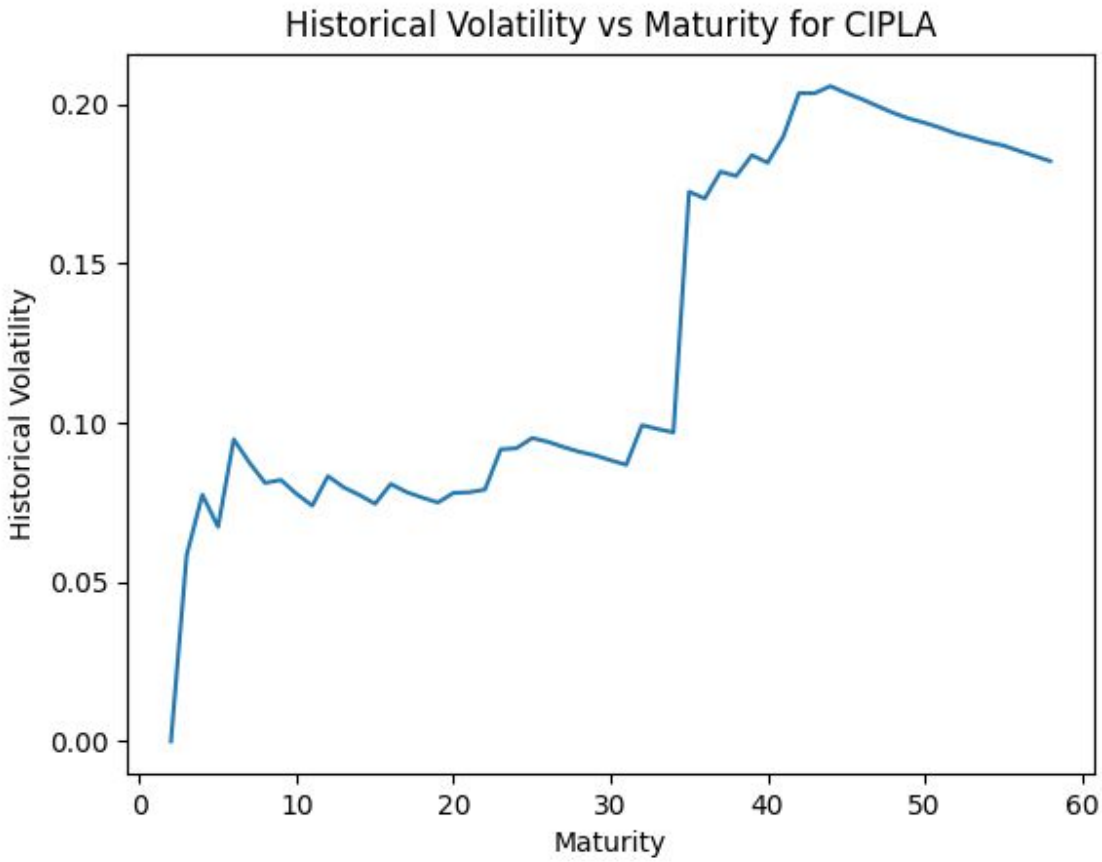

Put Implied Volatility for ICICI
Implied Volatility
1.50
1.25
1.00
0.75
0.50
0.25
0.00
Strike Price
400
380
360
340
320
300
Maturity
0
10
20
30
40
50
60

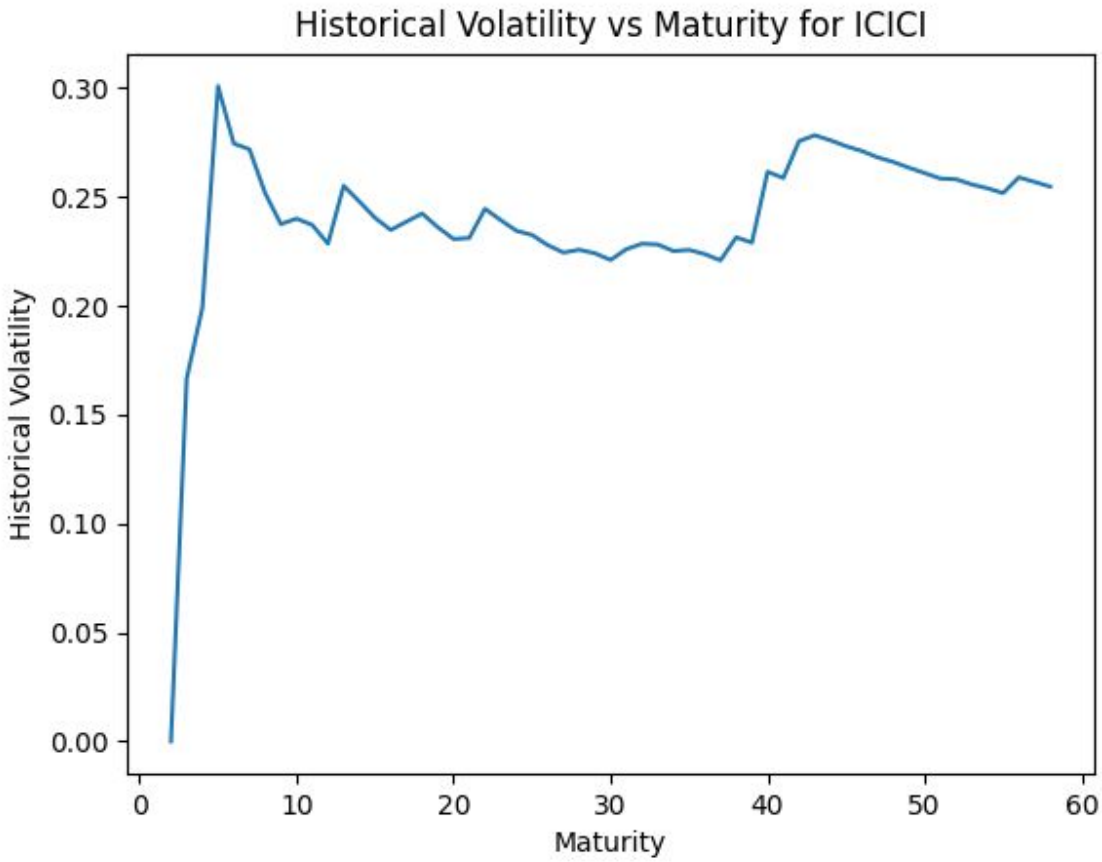

Put Implied Volatility for ITC
Implied Volatility
0.0
0.1
0.2
0.3
0.4
0.5
Strike Price
260
280
300
320
340
Maturity
0
10
20
30
40
50
60

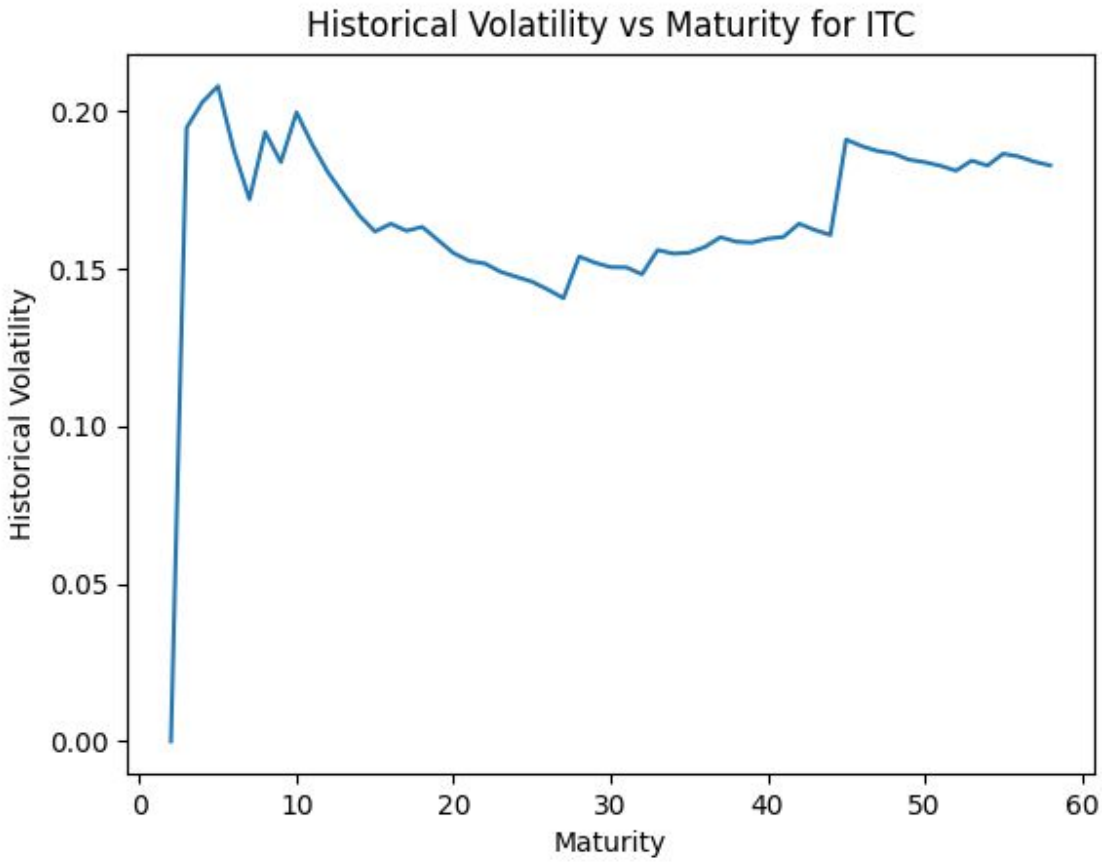


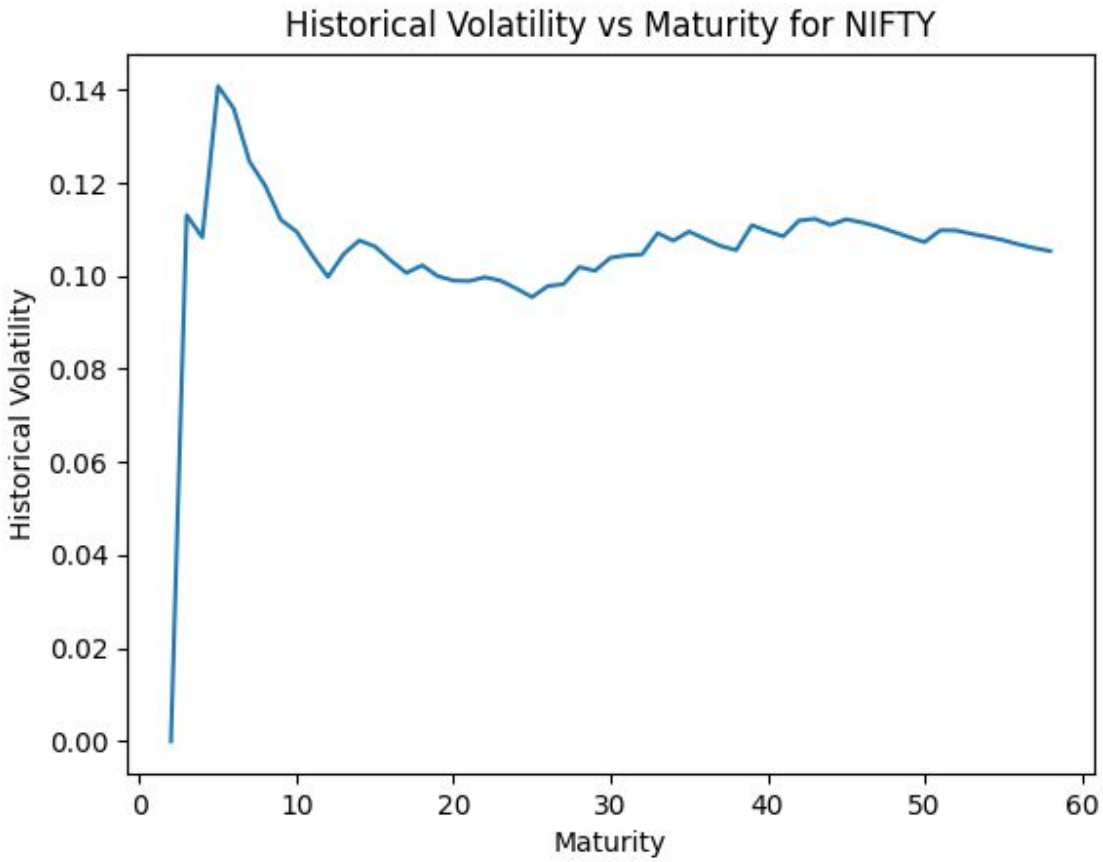
Ques.4

- The **Historic Volatility** is calculated for **various maturities**. The graphs obtained:


Historical Volatility vs Maturity for CIPLA
Historical Volatility
0.00
0.05
0.10
0.15
0.20
0
10
20
30
40
50
60
Maturity


Historical Volatility vs Maturity for ICICI
Historical Volatility
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0
10
20
30
40
50
60
Maturity


Historical Volatility vs Maturity for ITC
Historical Volatility
0.00
0.05
0.10
0.15
0.20
0
10
20
30
40
50
60
Maturity


Historical Volatility vs Maturity for NIFTY
Historical Volatility
0.14
0.12
0.10
0.08
0.06
0.04
0.02
0.00
0
10
20
30
40
50
60
Maturity