

MA-374 Lab-08

Name- Harsh

Roll No.- 200123022

Question 1:

Part A):

Volatility is calculated using the following methodology:

- The collected data included stock prices for the companies and indices listed above, namely Sensex, Nifty, and various other companies.
- Returns were calculated using the following formula:

$$Returns(i) = \frac{S(i+1) - S(i)}{S(i)}$$

where $S(i)$ denote the stock price at time point i.

- Annual Volatility is calculated using the following formula:

$$Volatility = Standard_Deviation(Returns) * \sqrt{252}$$

Output-

For Stocks in bsedata1:		For Stocks in nsedata1:	
Stock Name	Annualised Volatility	Stock Name	Annualised Volatility
HDFC	0.128346	HDFC BANK	0.129919
ICICI	0.149631	ICICI BANK	0.156257
INFOSYS	0.189093	INFOSYS	0.187923
L&T	0.175105	ITC	0.168038
ONGC	0.204716	L&T	0.174625
RIL	0.163341	RELIANCE	0.163165
TATA MOTORS	0.22774	SBI	0.242245
TATA STEELS	0.357231	TCS	0.155635
TCS	0.156983	TITAN	0.195159
WIPRO	0.166726	WIPRO	0.16751
HBL POWER	0.493145	AARTI DRUGS	0.21234
ISGEC	0.292928	APAR INDUSTRIES	0.357747
JPASSOCIAT	0.722932	BEL	0.240858
MIRZA	0.402727	HDFC LIFE	0.128834
NBCC	0.539907	ECLERX	0.180872
PNB	0.50872	LUX	0.271178
PNBGILTS	0.296136	NHPC	0.203275
SUZLON	0.890266	NOCIL	0.274327
UNITINT	0.502982	RADICO	0.37039
YES BANK	0.919024	VMART	0.188834
SENSEX	0.109799	NIFTY 50	0.112095

Part B):

- Option prices were compared by varying the value of K .
- Call prices were computed using the following black scholes formula:

$$C(t, x) = xN(d_+) - Ke^{-r\tau}N(d_-)$$

$$\text{where } d_{\pm} = \frac{1}{\sigma\sqrt{\tau}} \left[\log\left(\frac{x}{K}\right) + (r \pm \frac{\sigma^2}{2})\tau \right]$$

- Put prices were computed using put-call parity as follows:

$$P(t, x) = C(t, x) + K e^{-r\tau} - x$$

For the calculations, the following parameter values were utilized: the volatility value derived from the previous question, and a fixed interest rate of 5%.

- o S_0 = final value of the stock price
- o Varying $K = A * S_0$ by taking $A = 0.5 : 0.1 : 1.5$.
- o Time to maturity = 0.5 years

Output- (Next Page)

For Stocks in bsedata1:

Stock Name	6 month Call-Option Price	6 month Put-Option Price
HDFC	80.451	40.2728
ICICI	49.1549	27.1572
INFOSYS	99.4316	62.1816
L&T	129.537	78.0262
ONGC	10.3021	6.67763
RIL	150.06	87.1449
TATA MOTORS	29.6851	20.1029
TATA STEELS	12.6273	9.84596
TCS	186.308	105.837
WIPRO	23.4929	13.7946
HBL POWER	15.7762	13.1689
ISGEC	45.3372	33.4798
JPASSOCIAT	2.1246	1.87696
MIRZA	30.8882	24.7675
NBCC	6.28439	5.32765
PNB	8.67394	7.28018
PNBGILTS	6.10305	4.52165
SUZLON	2.72183	2.45987
UNITINT	1.04788	0.877768
YES BANK	5.4413	4.93269

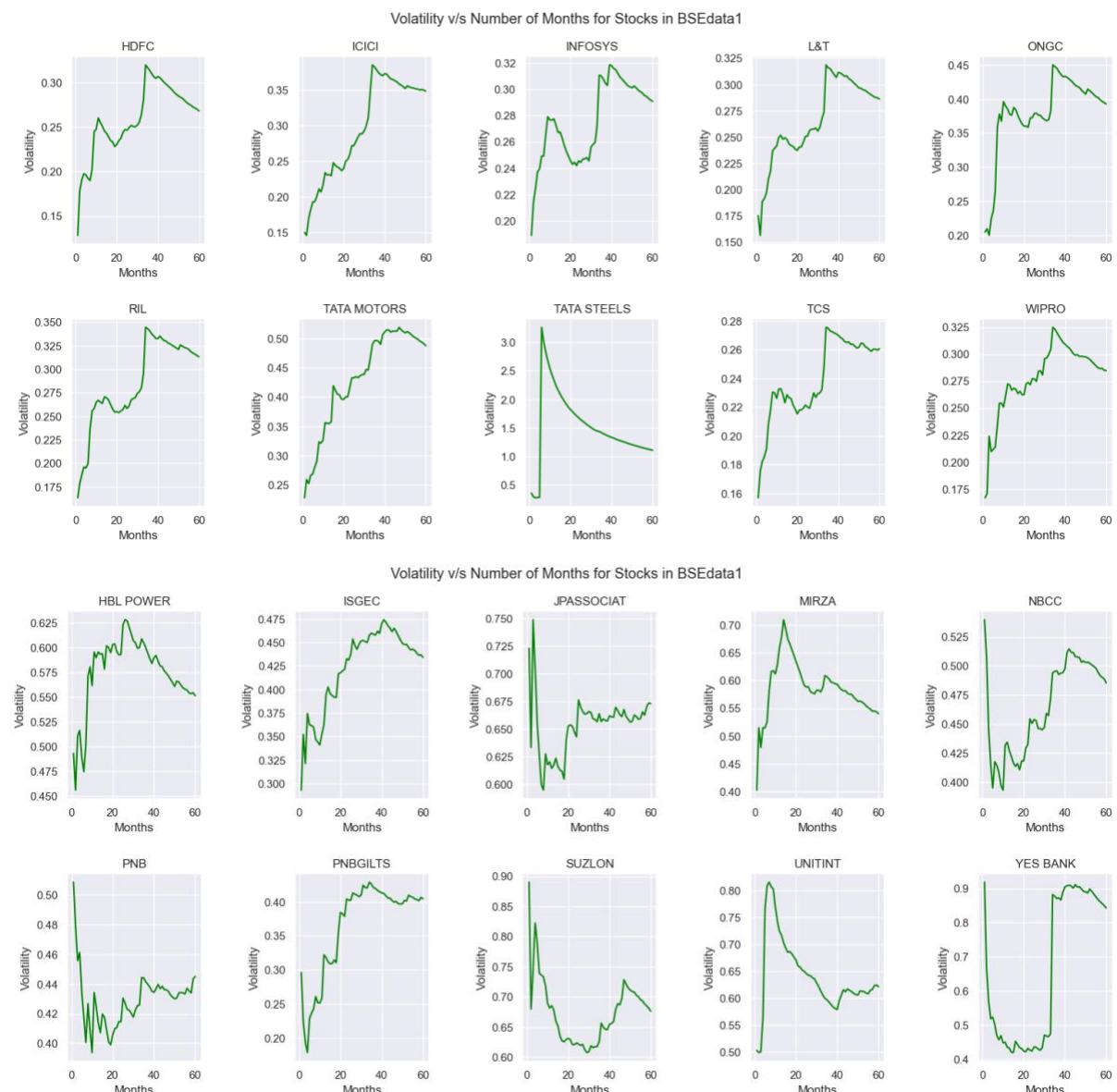
For Stocks in nsedata1:

Stock Name	6 month Call-Option Price	6 month Put-Option Price
HDFC BANK	81.1797	40.9805
ICICI BANK	50.7481	28.7529
INFOSYS	98.917	61.6794
ITC	19.9479	11.7619
L&T	129.233	77.7346
RELIANCE	149.879	86.9888
SBI	49.3844	34.2321
TCS	184.972	104.563
TITAN	175.496	111.363
WIPRO	23.5736	13.8766
AARTI DRUGS	33.2495	21.8896
APAR INDUSTRIES	201.249	156.977
BEL	8.00089	5.53435
HDFC LIFE	28.0685	14.0877
ECLERX	81.4454	49.8581
LUX	145.245	104.688
NHPC	2.77389	1.79246
NOCIL	20.8039	15.0511
RADICO	117.147	92.1505
VMART	187.158	116.968

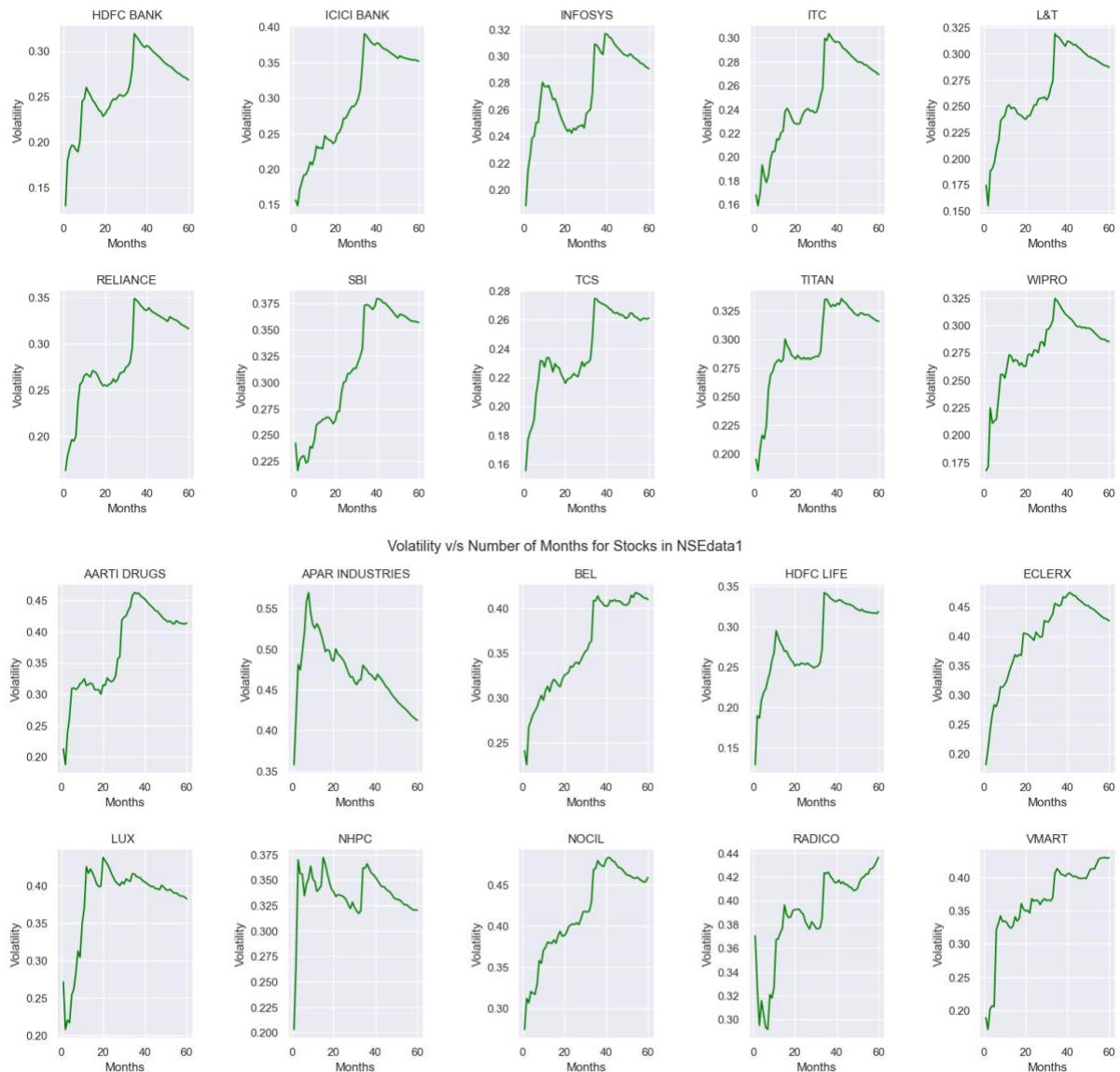
Part C):

In the current analysis, volatilities were computed for a historical time period extending back by one month at each iteration. The method of calculating option prices remains consistent with that used in Part B. The resulting values for both volatility and option prices were then plotted against the corresponding length of the historical time period being considered, ranging from 0.5 to 1.5, in increments of 0.1. It is important to note that all parameters, except for volatility, are kept constant as used in Part B.

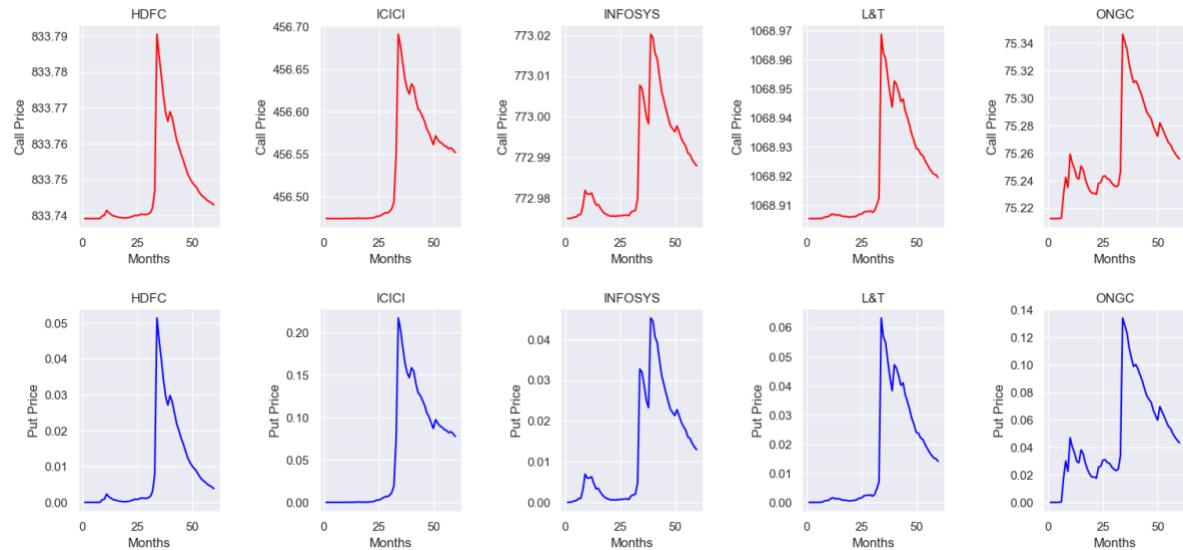
Output-



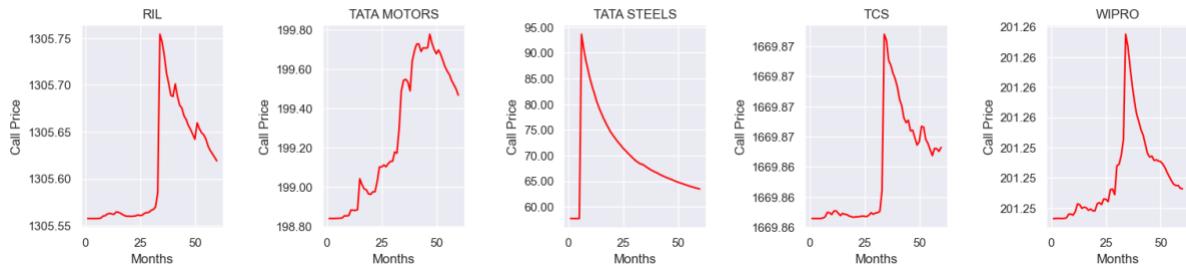
Volatility v/s Number of Months for Stocks in NSEdata1



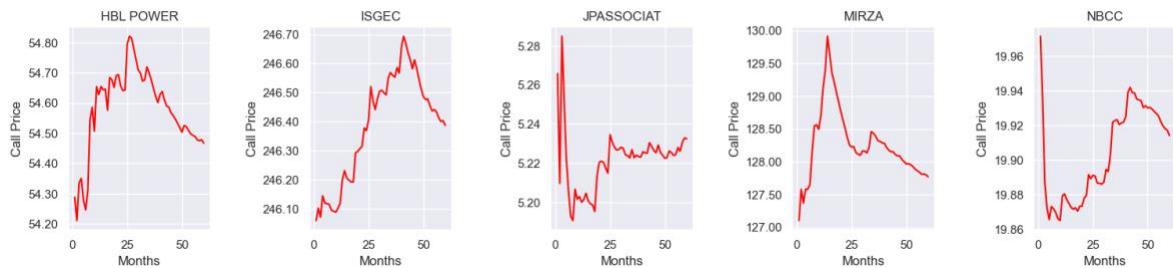
A = 0.5 □ Option Price v/s Number of Months for Stocks in BSEdata1



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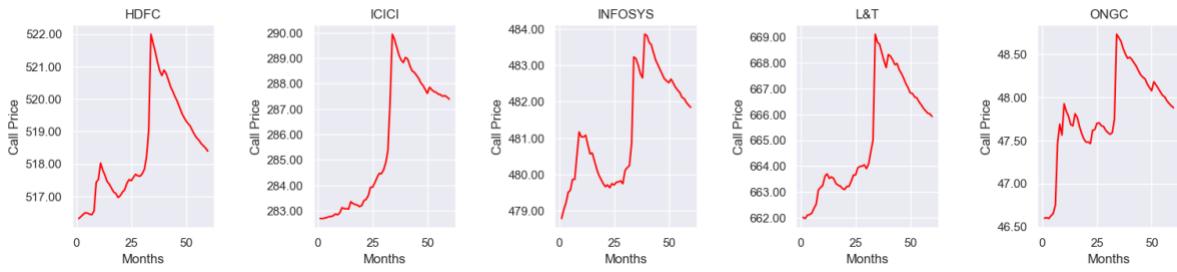
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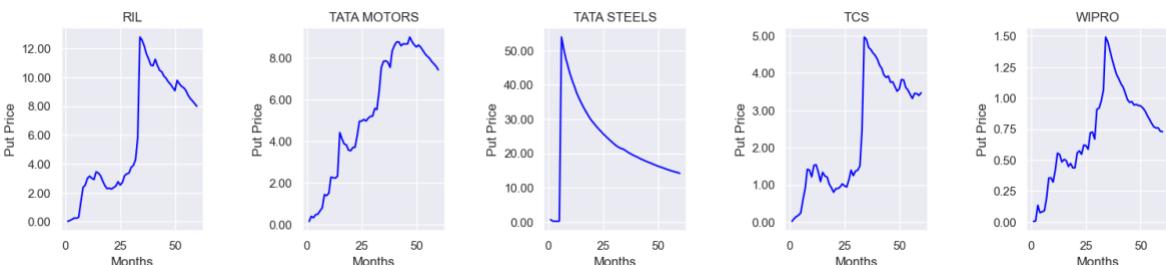
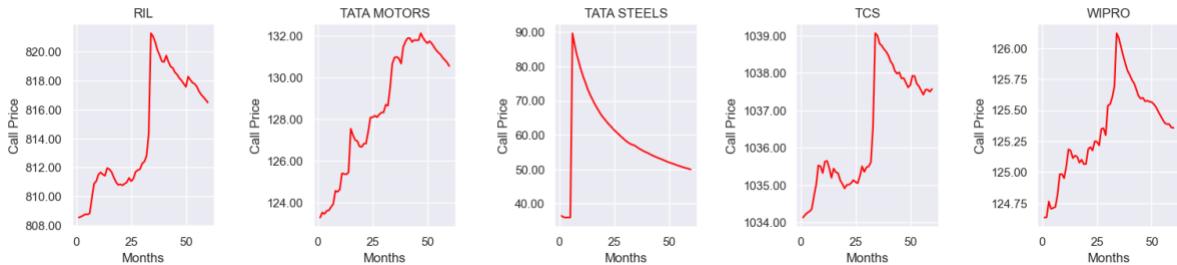
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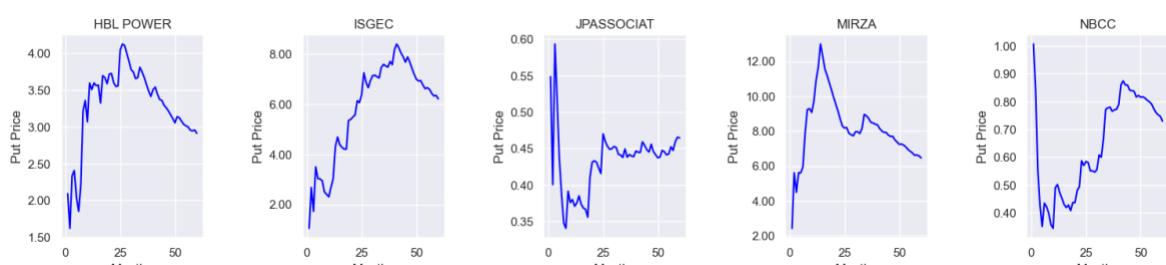
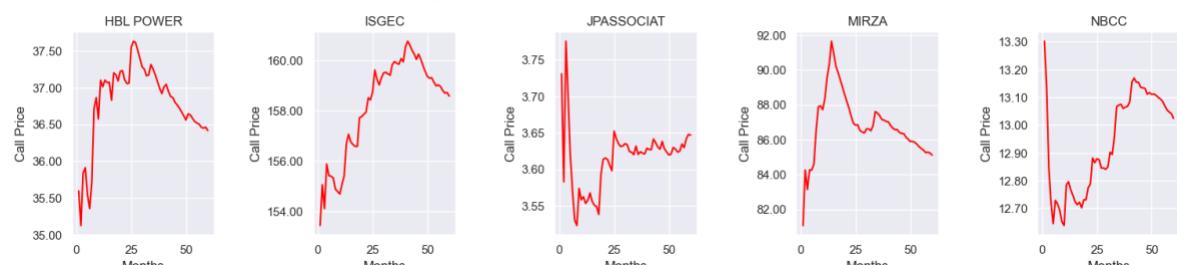
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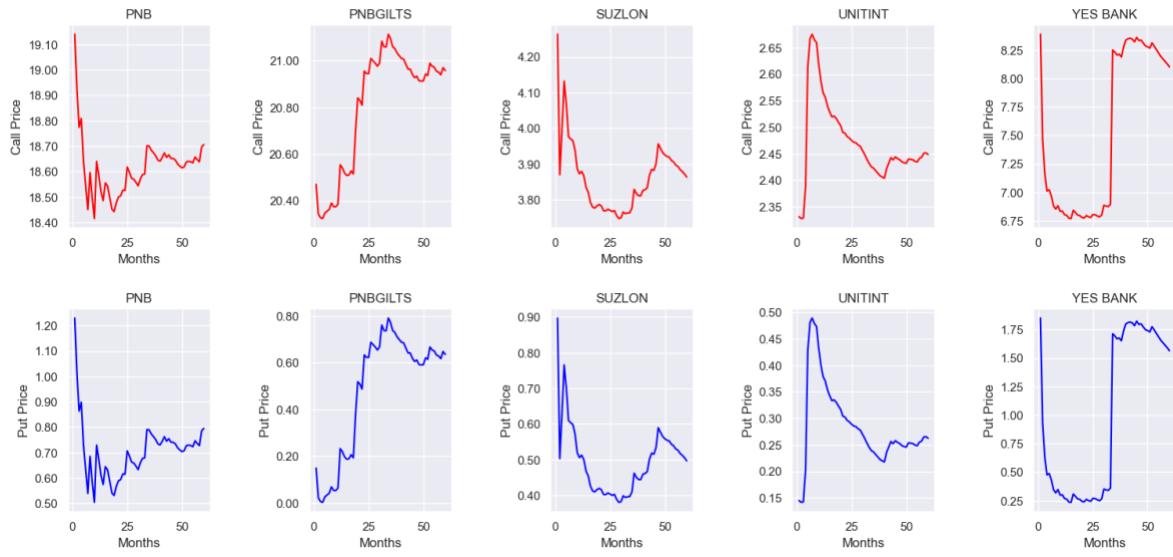
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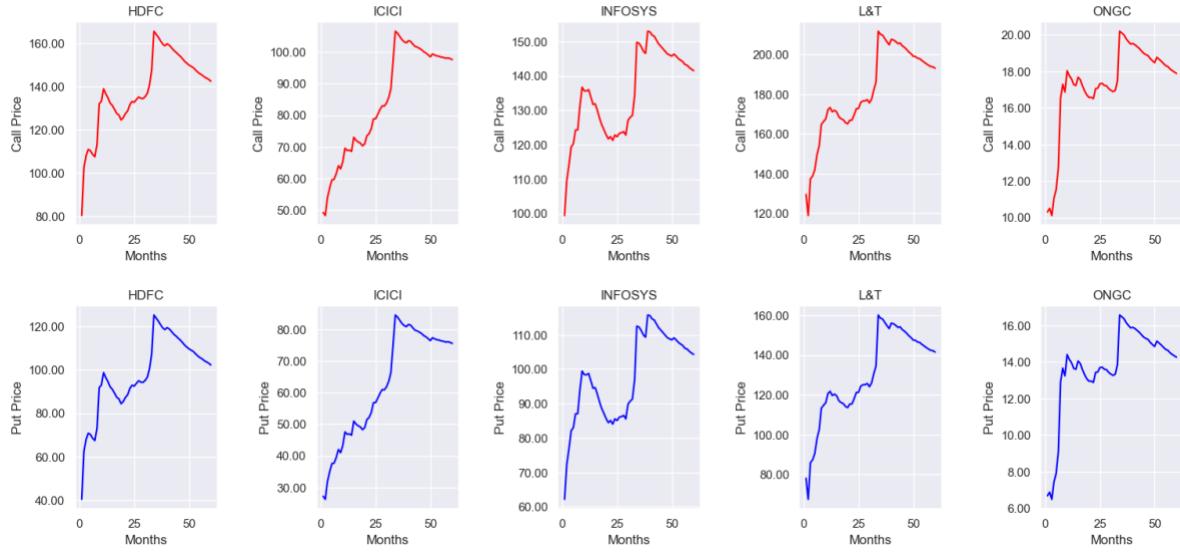
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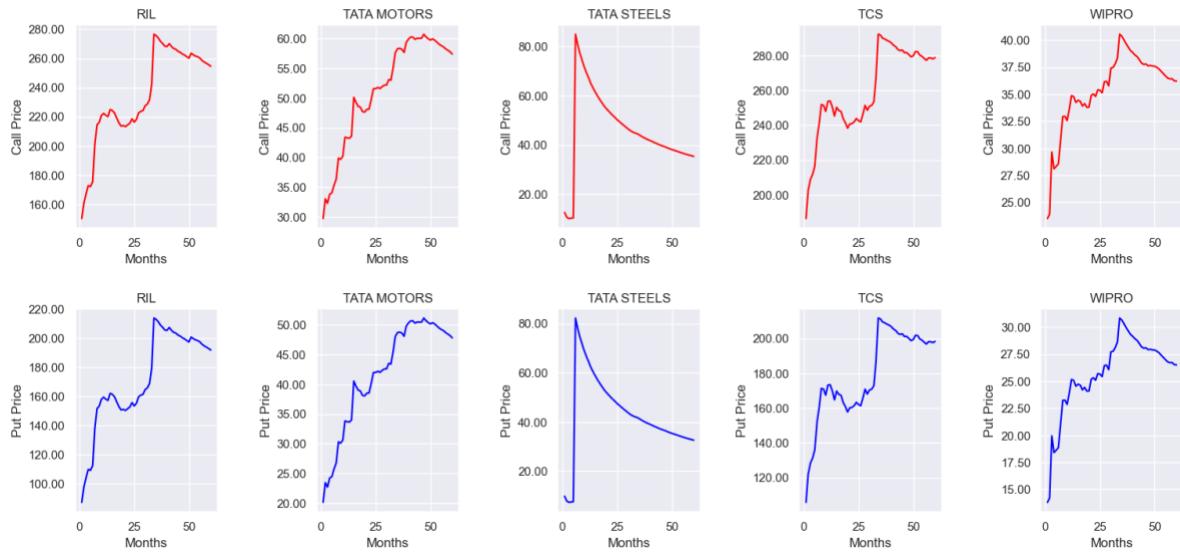
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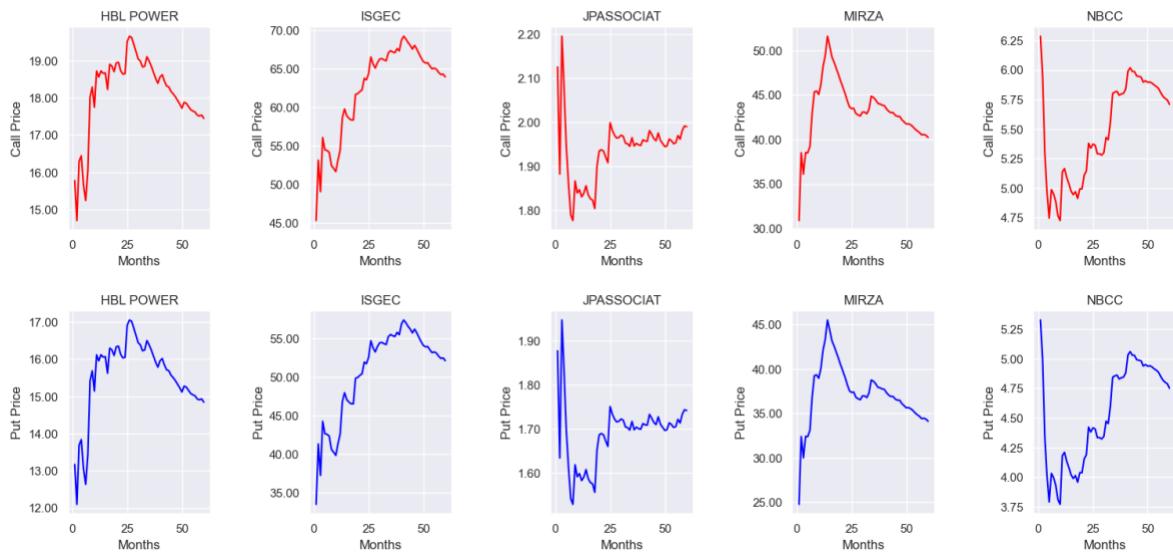
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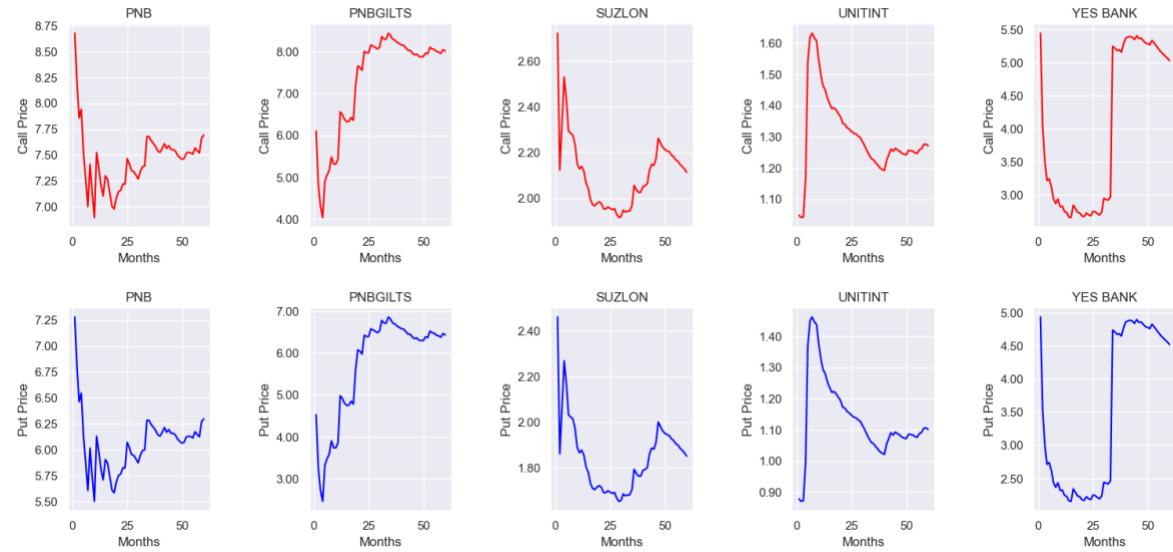
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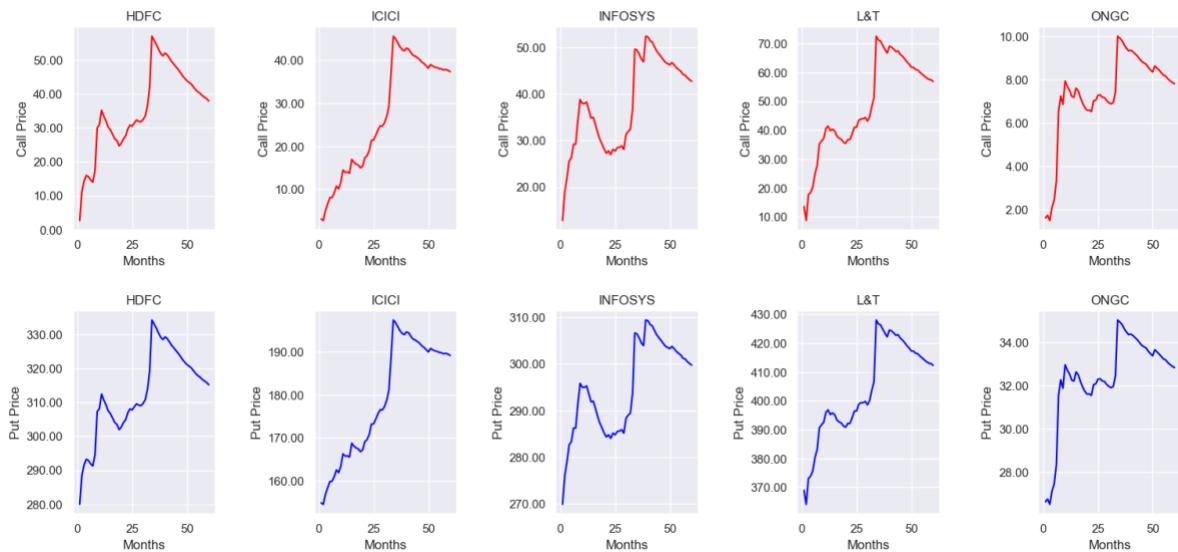
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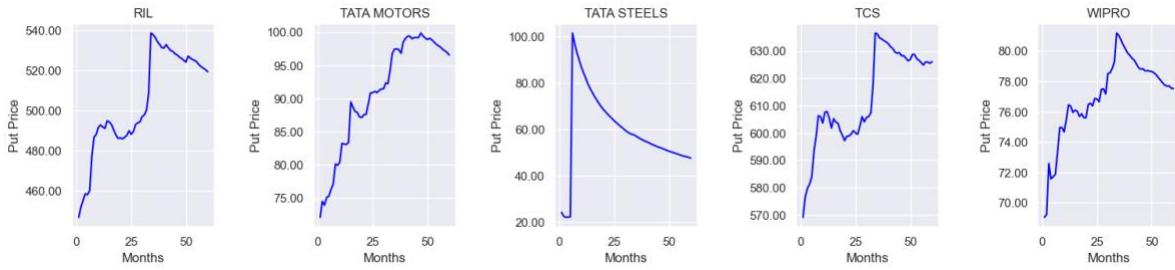
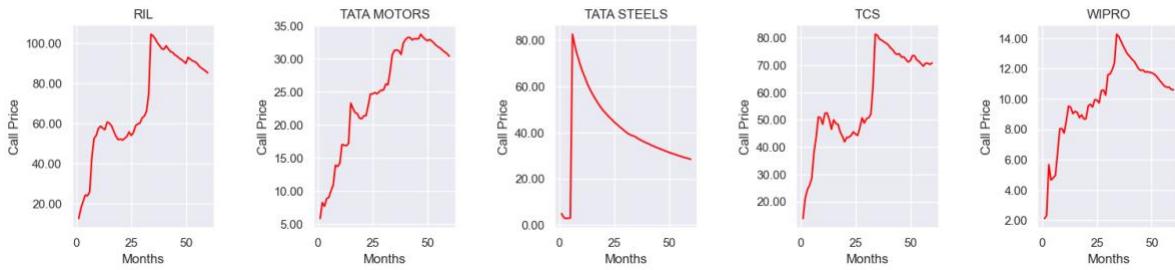
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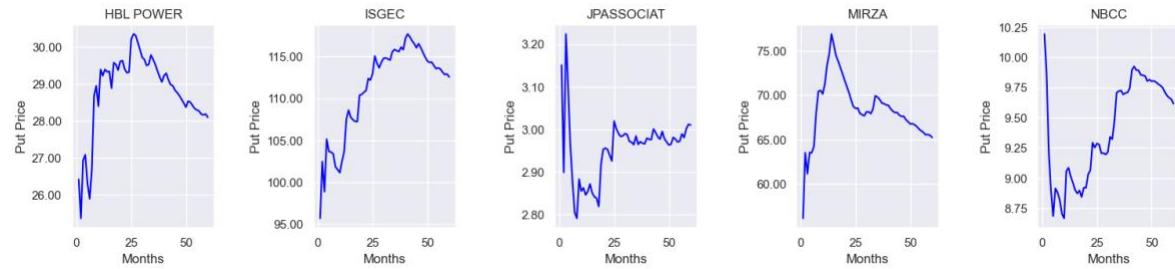
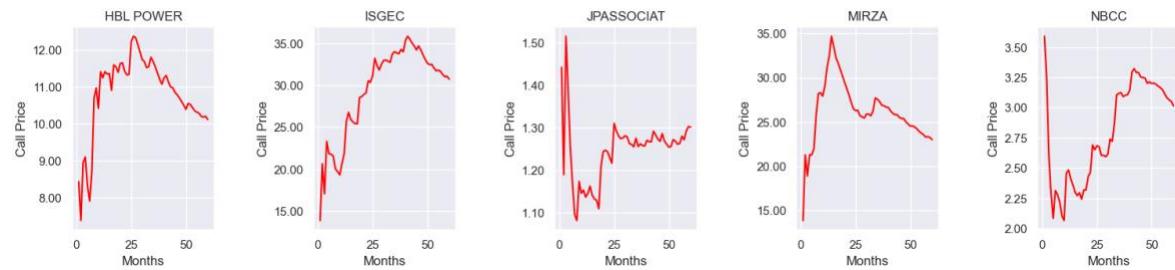
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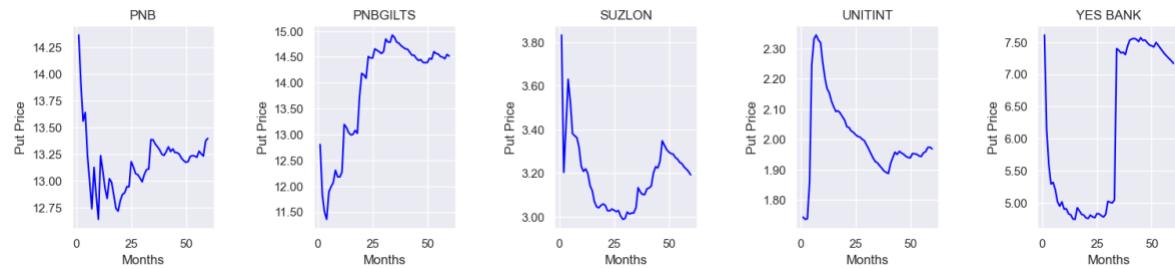
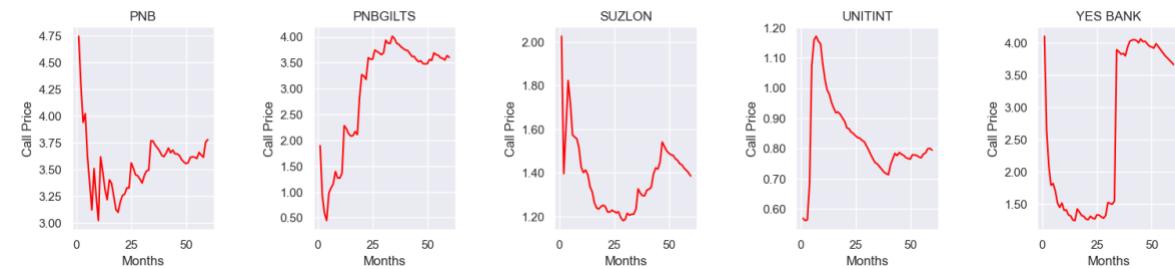
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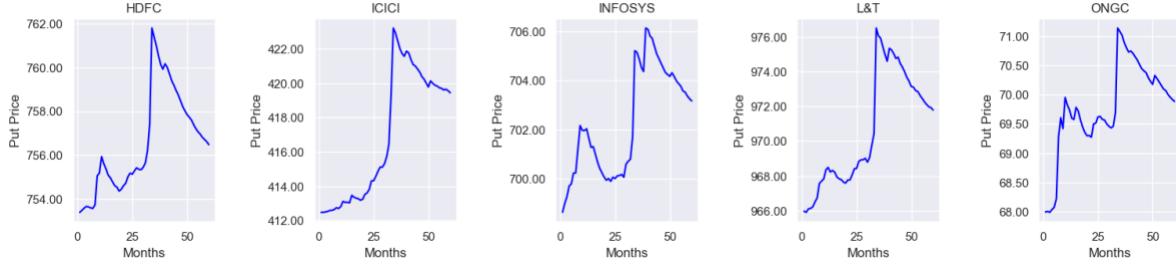
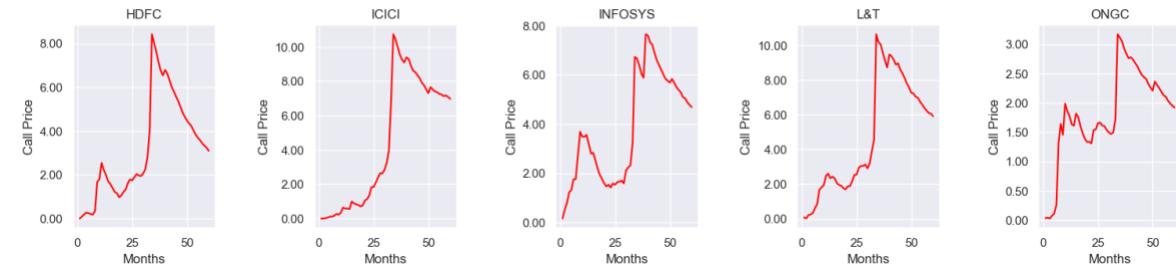
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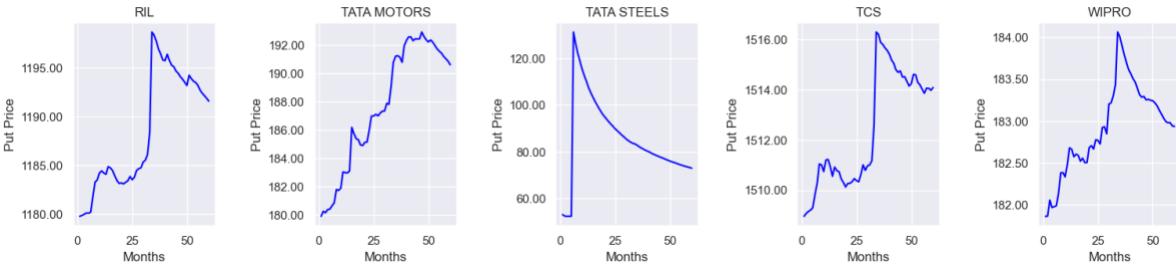
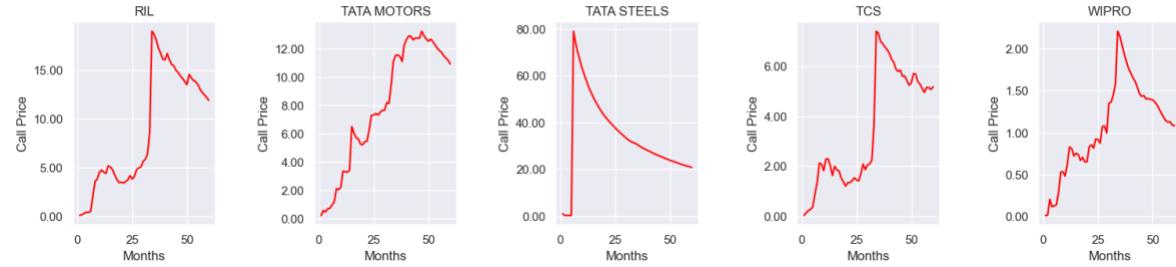
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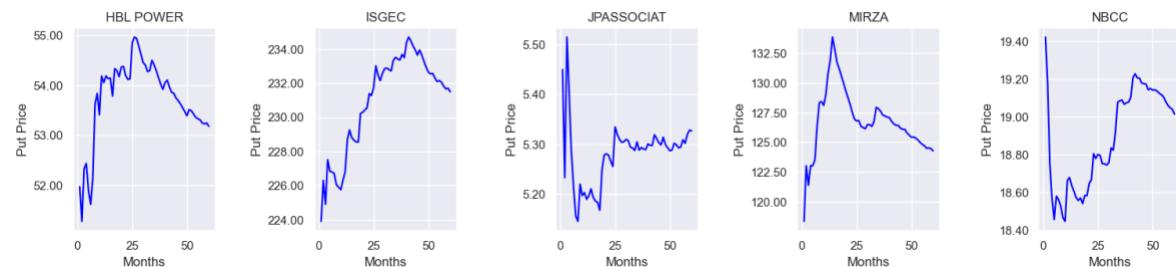
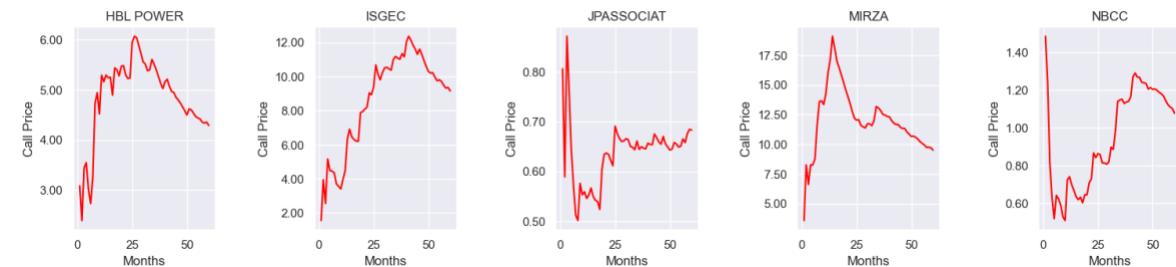
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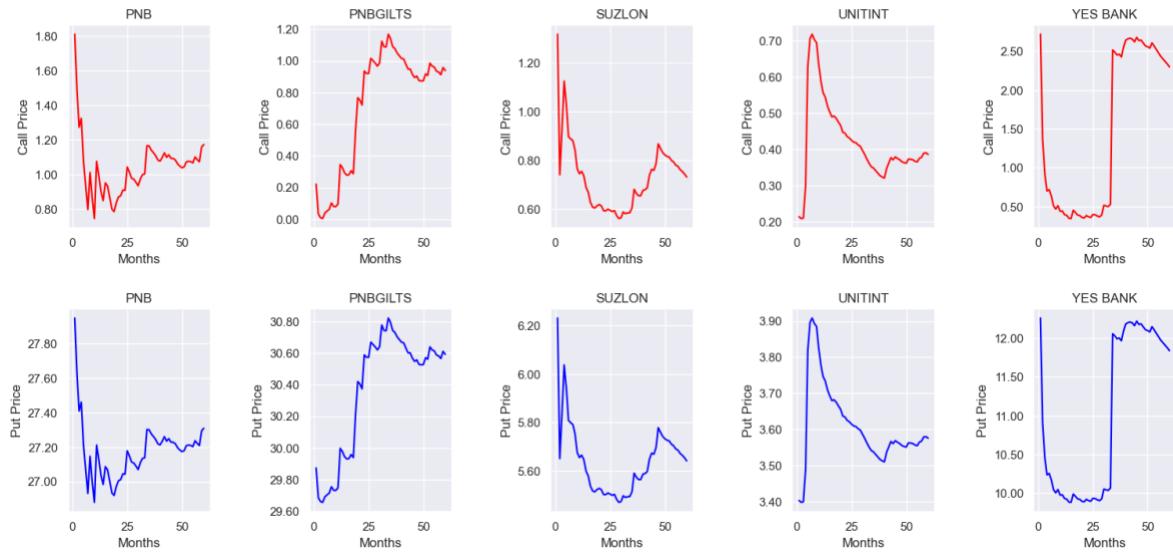
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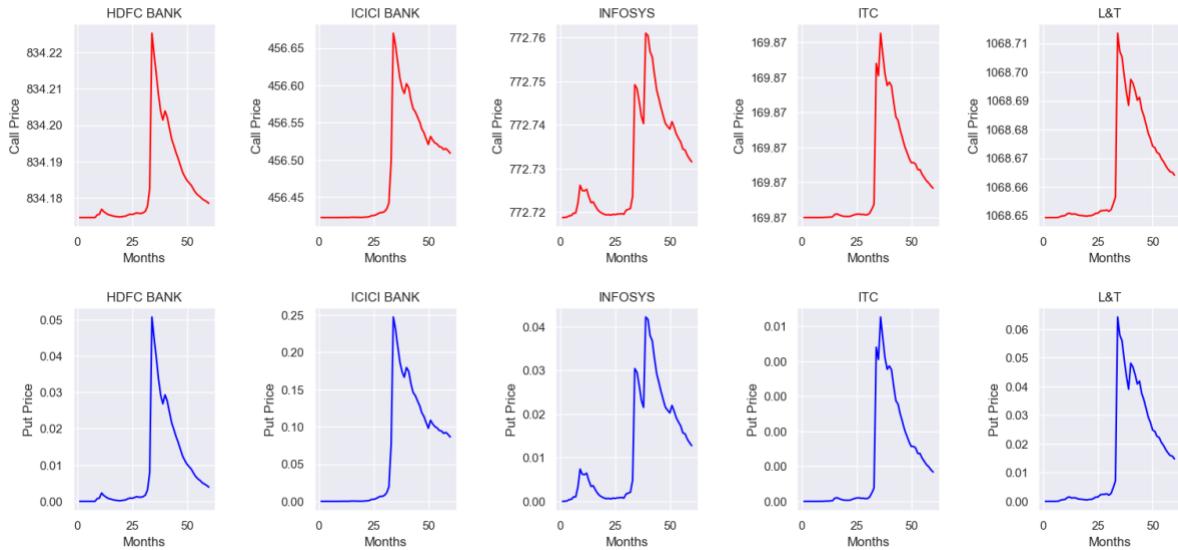
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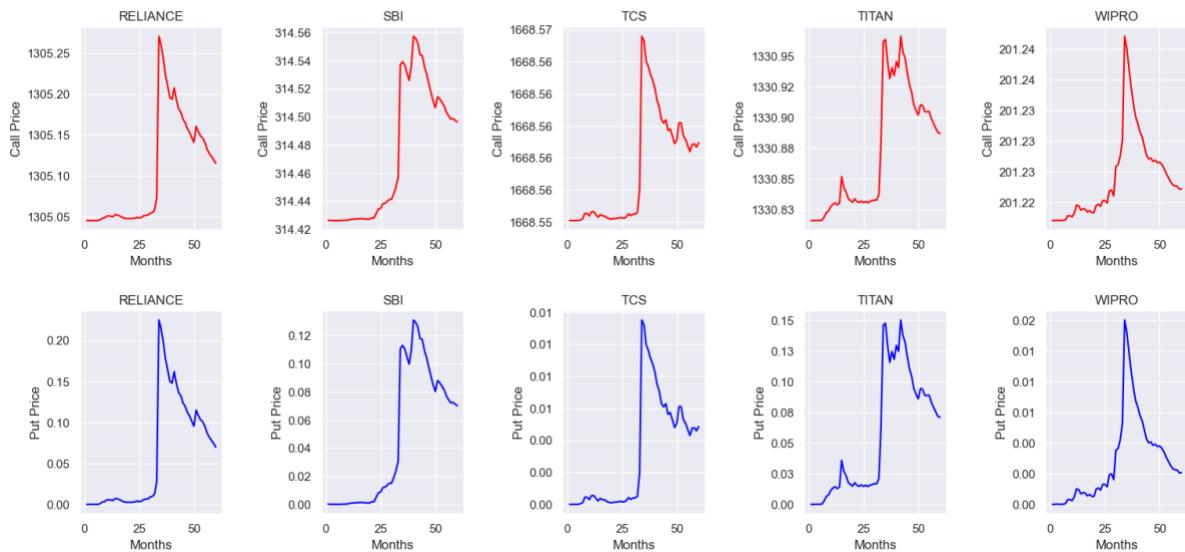
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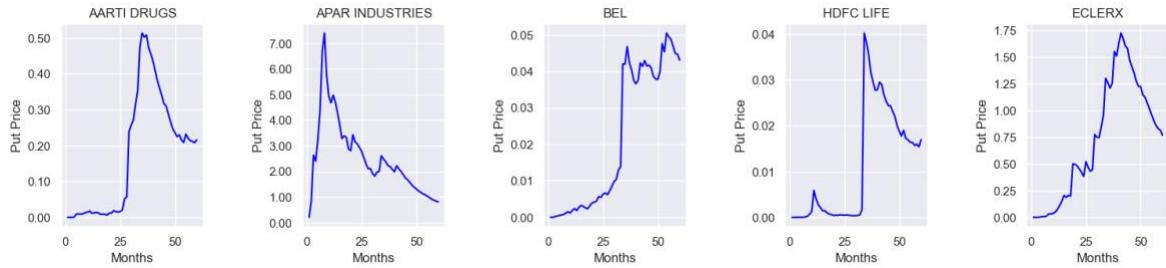
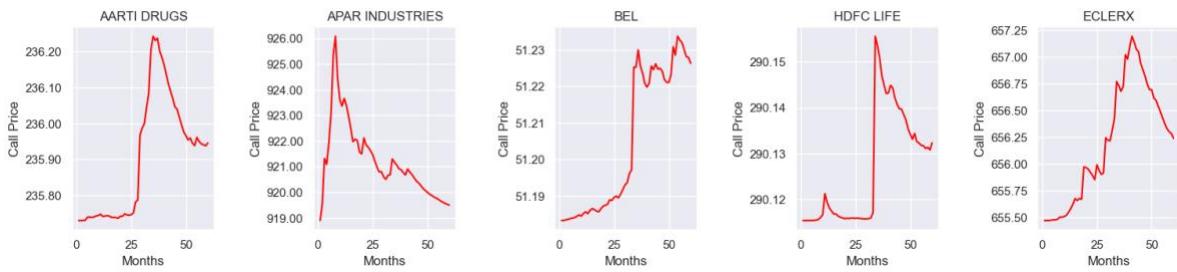
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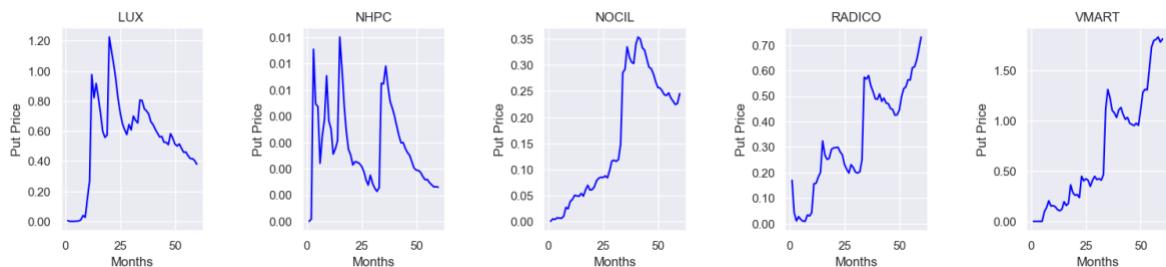
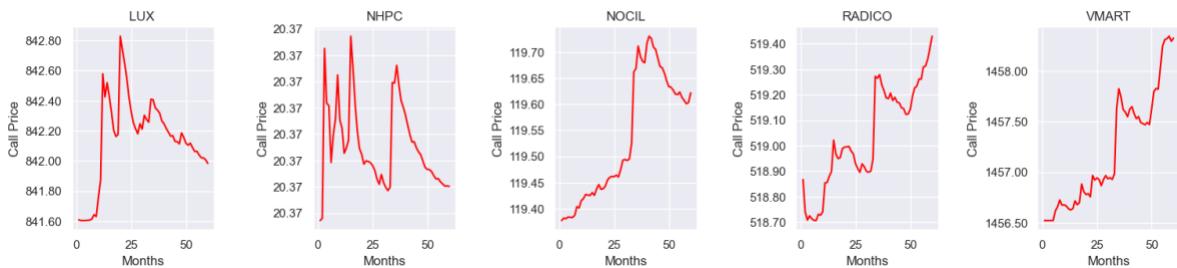
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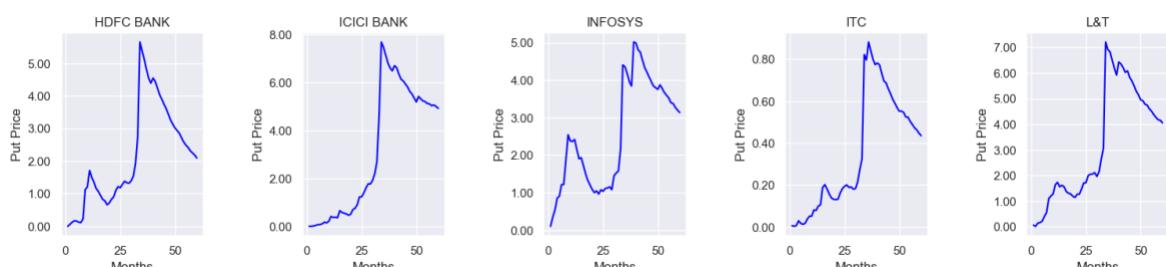
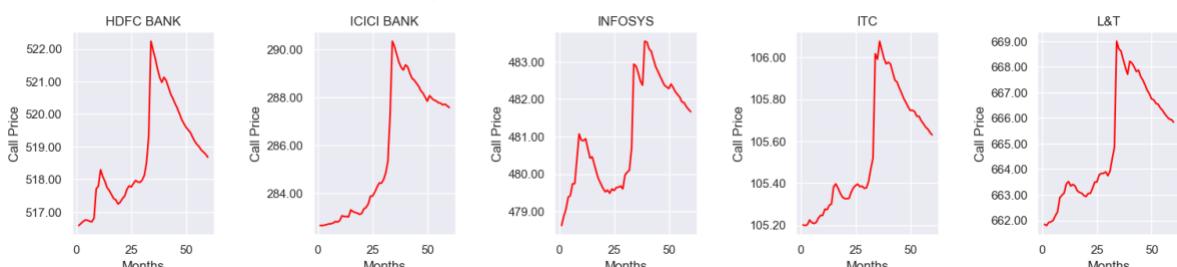
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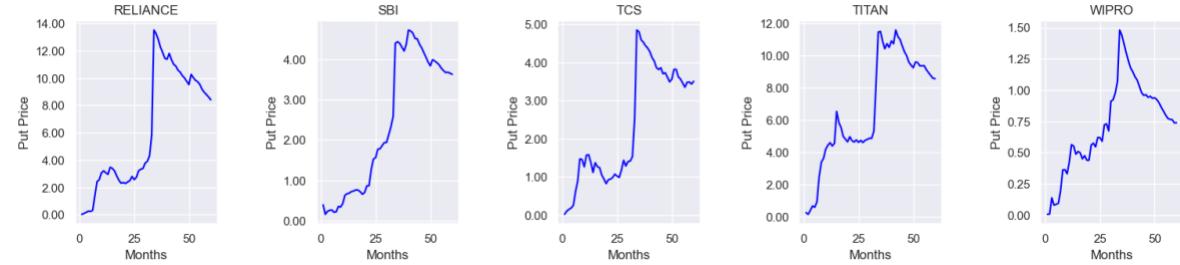
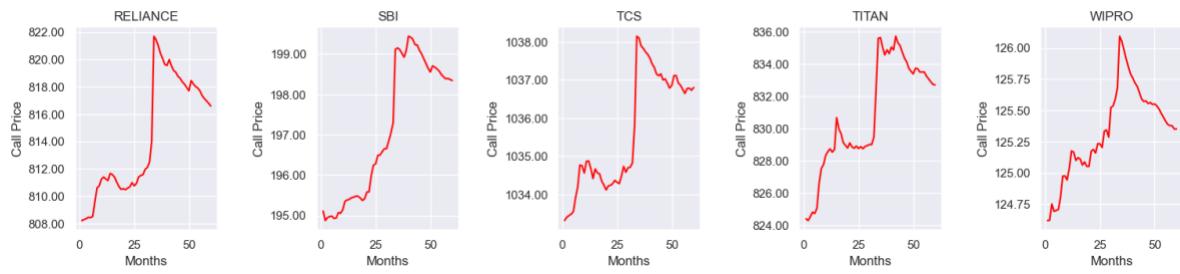
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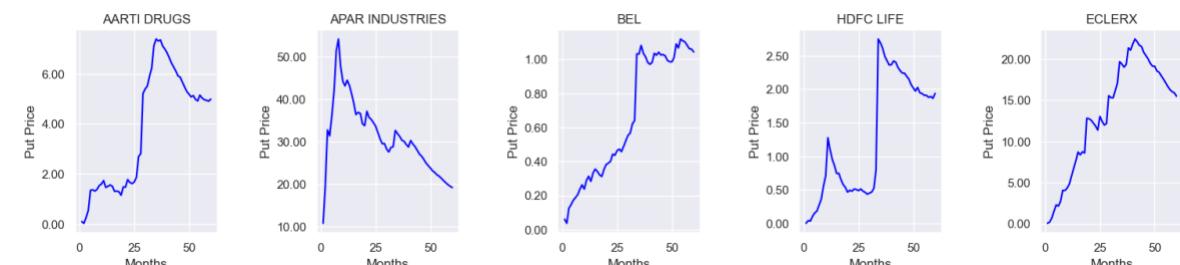
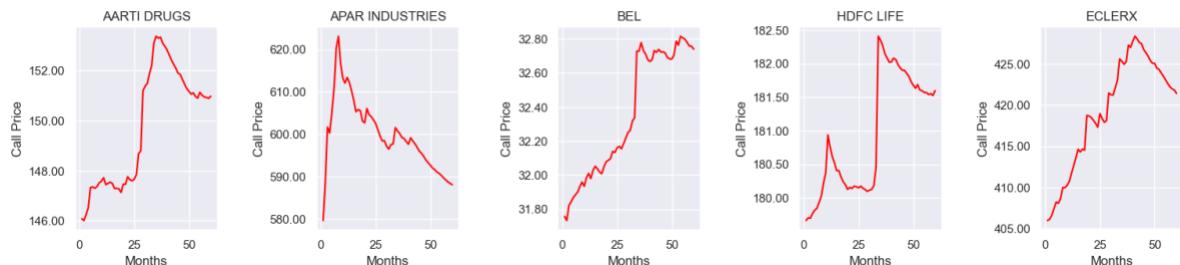
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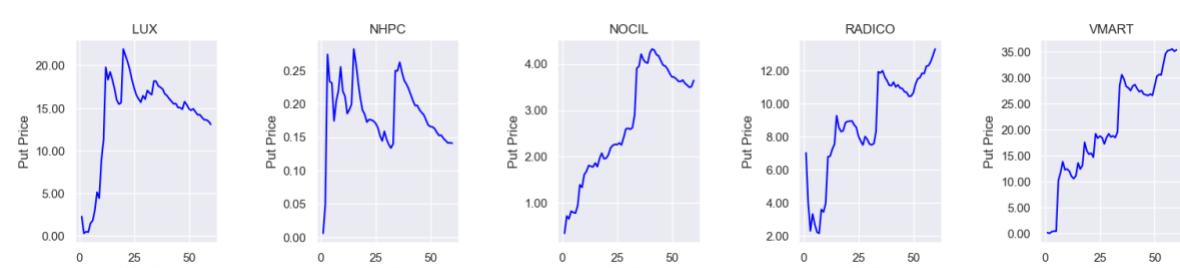
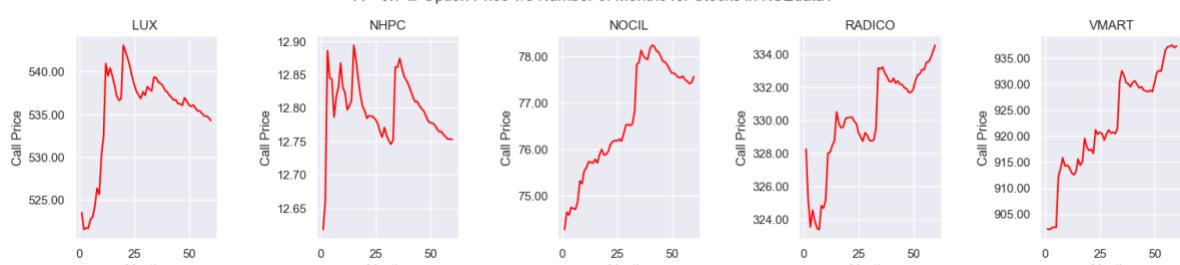
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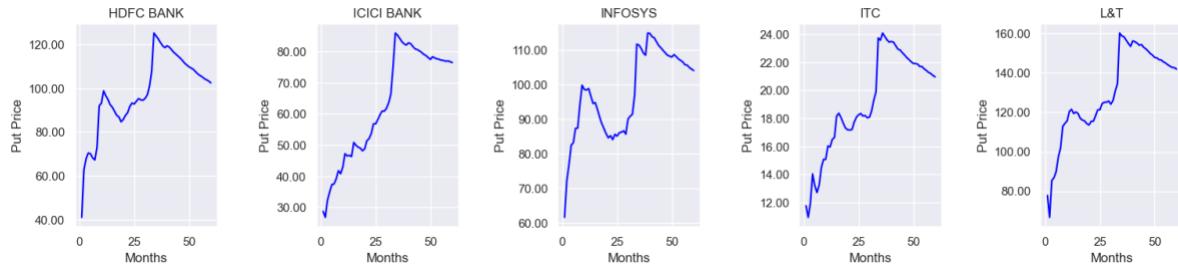
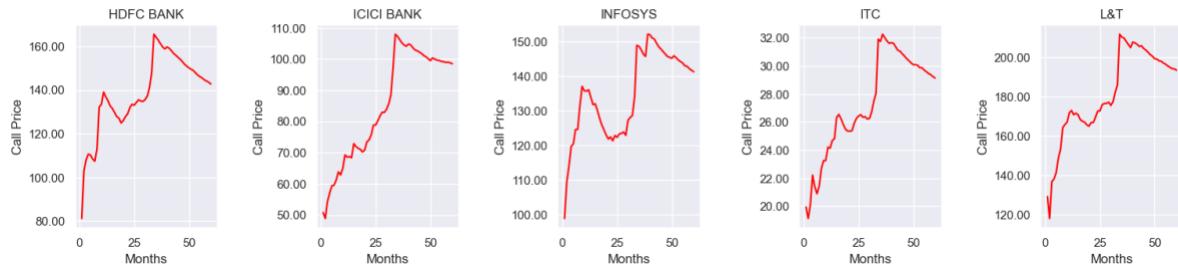
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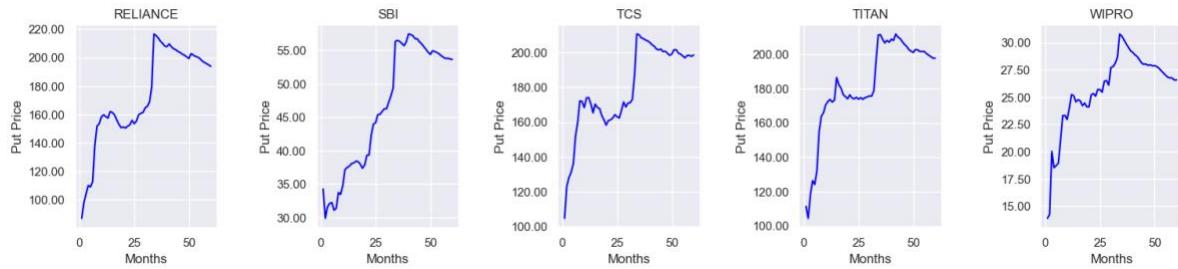
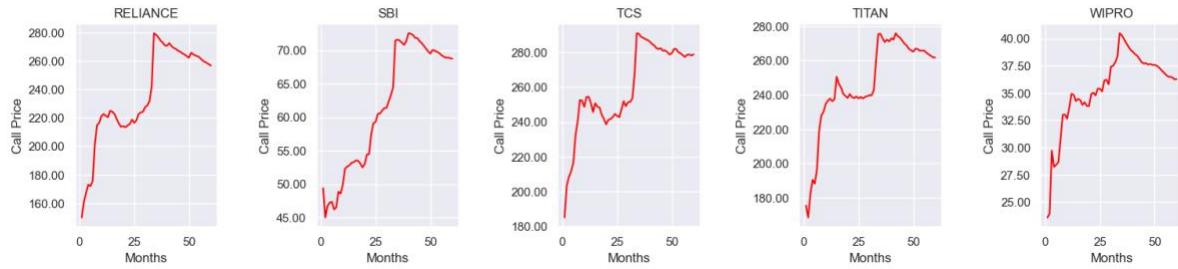
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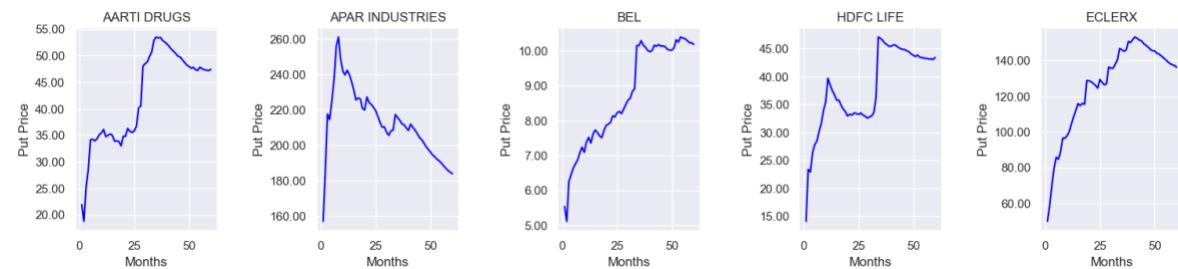
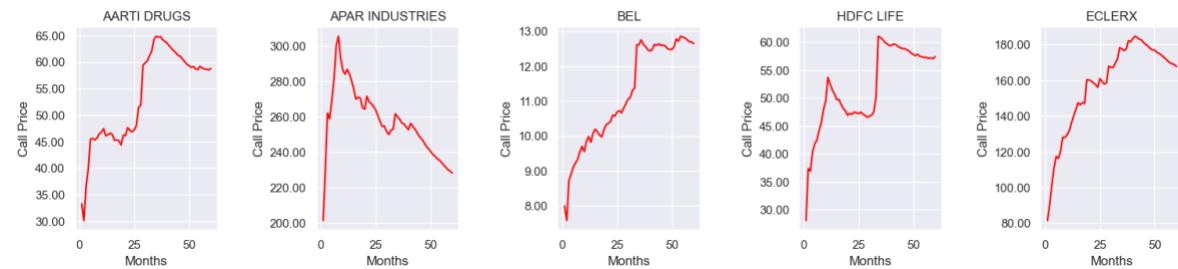
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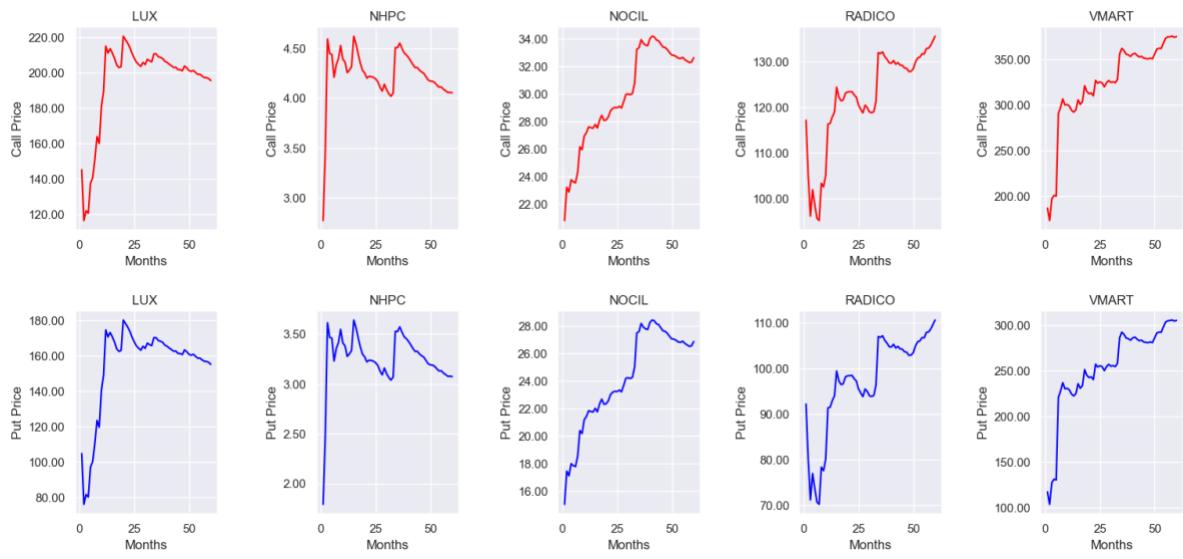
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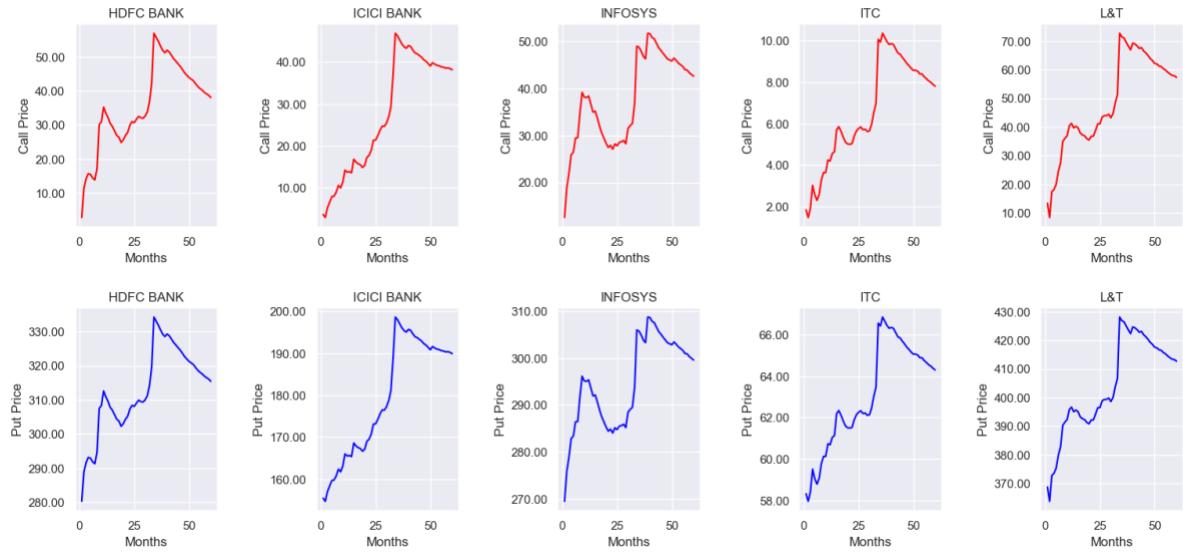
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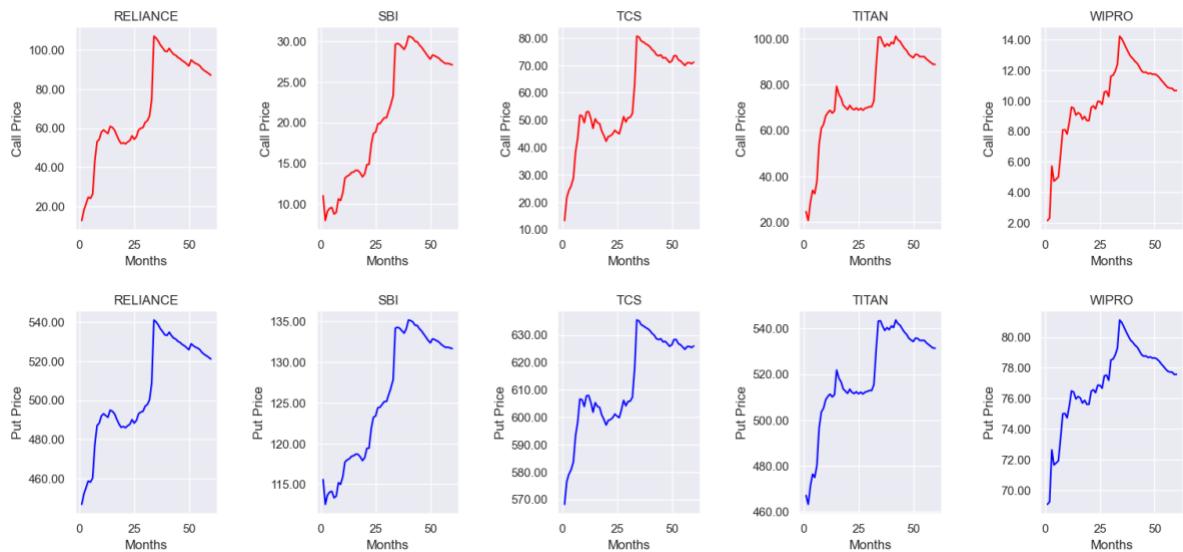
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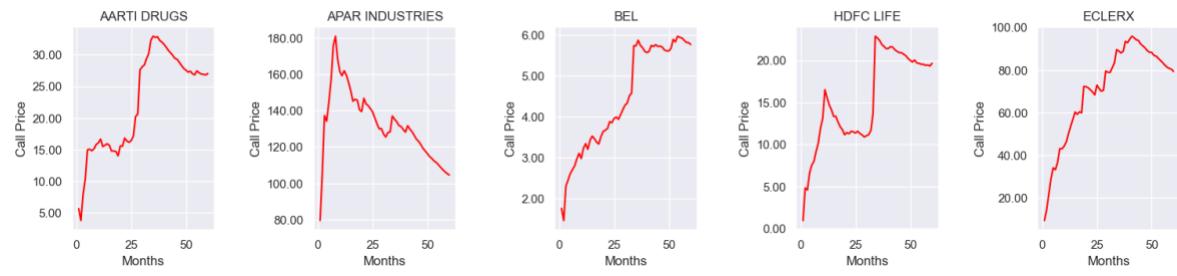
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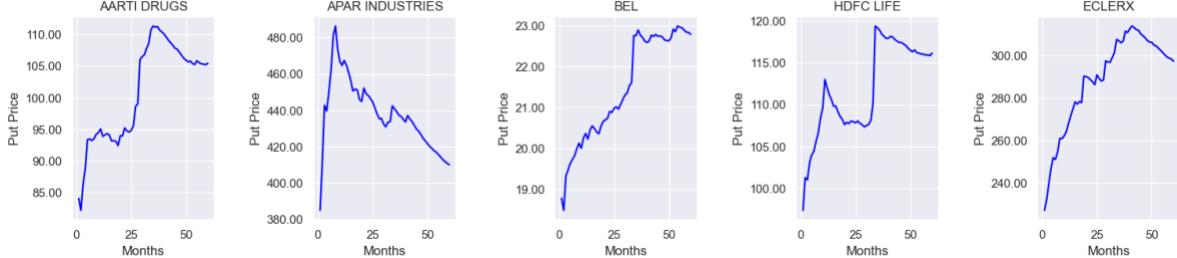
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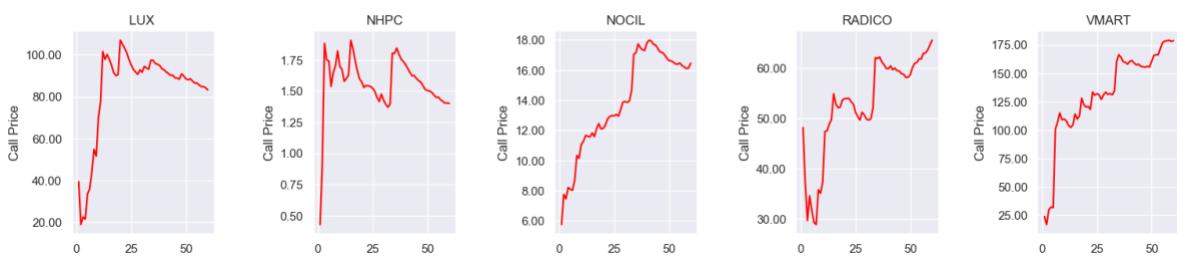
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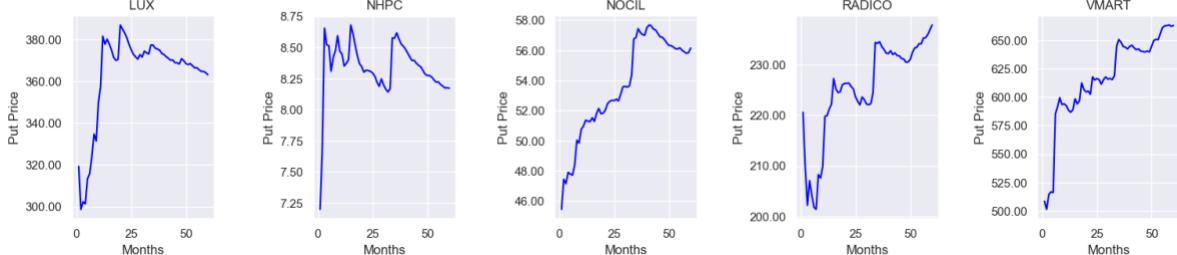
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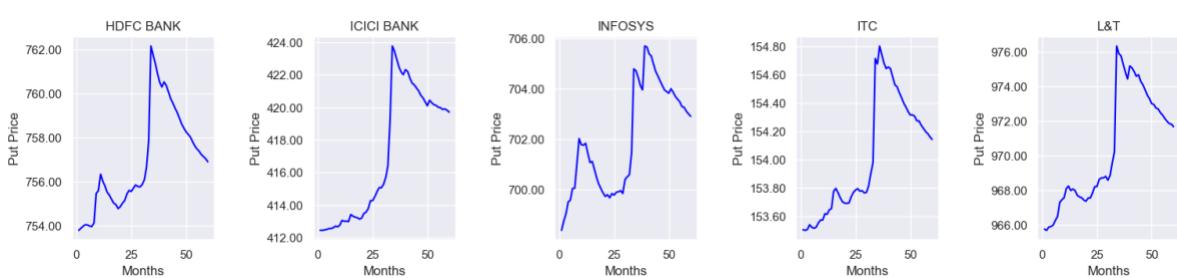
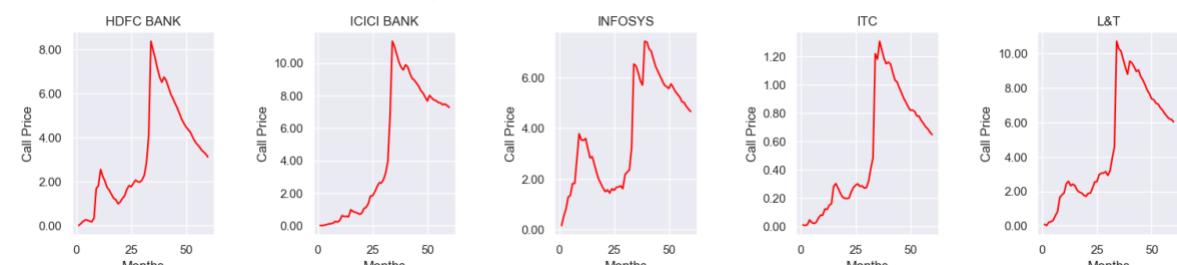
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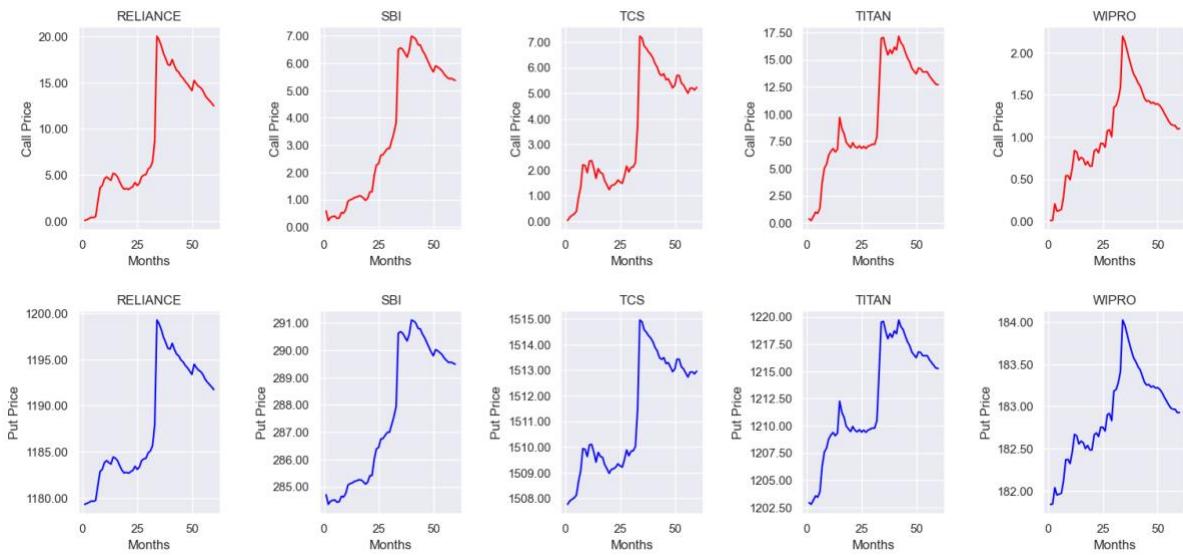
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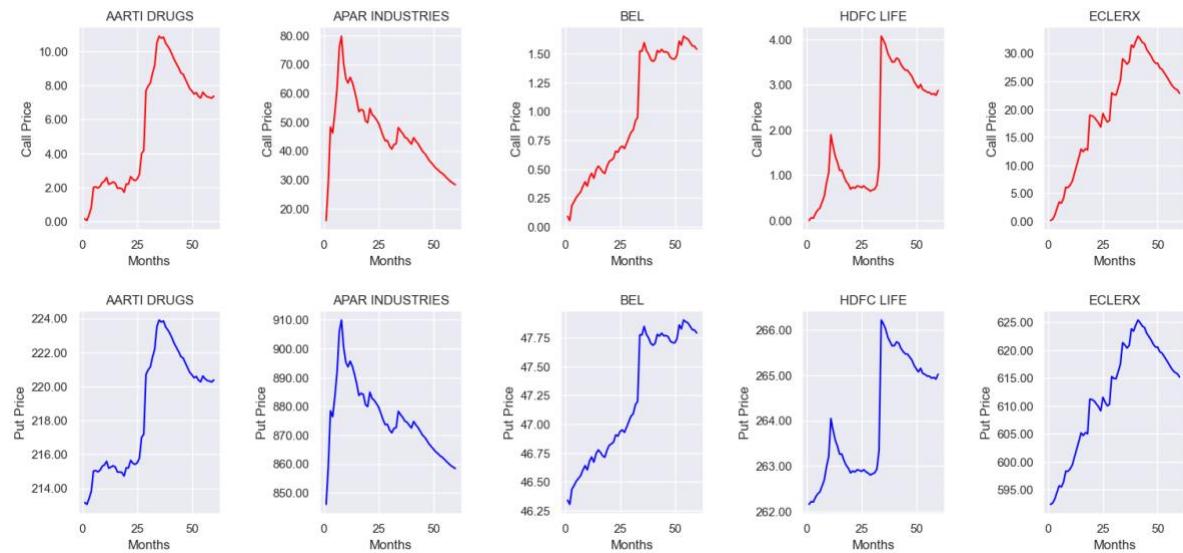
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