

# Options\_Put

September 29, 2021

## 1 Put Option

```
[1]: import numpy as np
import matplotlib.pyplot as plt
import yfinance as yf
```

```
[2]: dfo = yf.Ticker("MSFT")
```

```
[3]: dfo.options
```

```
[3]: ('2020-03-19',
      '2020-05-14',
      '2021-03-18',
      '2020-03-26',
      '2020-06-18',
      '2020-04-02',
      '2020-04-30',
      '2022-06-16',
      '2020-04-16',
      '2022-01-20',
      '2020-07-16',
      '2020-04-23',
      '2020-09-17',
      '2022-03-17',
      '2020-12-17',
      '2021-06-17',
      '2021-09-16',
      '2022-09-15',
      '2020-10-15',
      '2020-04-08',
      '2021-01-14')
```

```
[4]: dfo_exp = dfo.option_chain('2020-03-19')
```

```
[5]: dfo_exp.puts
```

```

[5]:      contractSymbol      lastTradeDate  strike  lastPrice    bid  \
0  MSFT200320P00075000  2020-03-17 14:01:50    75.0      0.02    0.01
1  MSFT200320P00080000  2020-03-16 19:40:22    80.0      0.04    0.03
2  MSFT200320P00085000  2020-03-17 14:10:11    85.0      0.09    0.05
3  MSFT200320P00090000  2020-03-16 19:43:21    90.0      0.10    0.09
4  MSFT200320P00095000  2020-03-17 14:13:23    95.0      0.16    0.06
5  MSFT200320P00100000  2020-03-17 14:12:50   100.0      0.29    0.25
6  MSFT200320P00105000  2020-03-16 19:59:50   105.0      0.35    0.39
7  MSFT200320P00110000  2020-03-17 14:11:40   110.0      0.77    0.68
8  MSFT200320P00115000  2020-03-17 14:13:01   115.0      1.16    1.11
9  MSFT200320P00119000  2020-03-17 14:11:25   119.0      1.75    1.56
10 MSFT200320P00120000  2020-03-17 14:10:09   120.0      2.09    1.73
11 MSFT200320P00121000  2020-03-16 19:57:12   121.0      2.45    0.87
12 MSFT200320P00122000  2020-03-17 13:55:06   122.0      2.75    2.05
13 MSFT200320P00123000  2020-03-17 14:08:13   123.0      2.65    2.09
14 MSFT200320P00124000  2020-03-17 14:06:21   124.0      3.00    2.41
15 MSFT200320P00125000  2020-03-17 14:12:58   125.0      2.70    2.70
16 MSFT200320P00126000  2020-03-17 14:09:03   126.0      3.40    2.60
17 MSFT200320P00127000  2020-03-17 14:13:39   127.0      3.13    3.10
18 MSFT200320P00128000  2020-03-17 14:10:08   128.0      4.05    3.30
19 MSFT200320P00129000  2020-03-16 19:38:33   129.0      3.20    3.15
20 MSFT200320P00130000  2020-03-17 14:13:49   130.0      4.04    3.00
21 MSFT200320P00131000  2020-03-17 14:05:36   131.0      5.15    4.15
22 MSFT200320P00132000  2020-03-17 14:13:49   132.0      4.66    4.45
23 MSFT200320P00133000  2020-03-17 14:11:33   133.0      5.10    4.85
24 MSFT200320P00134000  2020-03-17 14:09:43   134.0      5.70    5.25
25 MSFT200320P00135000  2020-03-17 14:12:06   135.0      5.80    5.65
26 MSFT200320P00136000  2020-03-17 14:13:44   136.0      6.10    6.00
27 MSFT200320P00137000  2020-03-17 14:14:17   137.0      6.50    5.60
28 MSFT200320P00138000  2020-03-17 14:12:38   138.0      7.00    6.70
29 MSFT200320P00139000  2020-03-17 14:06:44   139.0      8.20    7.30
..      ...
37 MSFT200320P00147000  2020-03-17 14:01:40   147.0     14.00   11.60
38 MSFT200320P00148000  2020-03-17 13:58:25   148.0     13.48   12.10
39 MSFT200320P00149000  2020-03-17 13:33:59   149.0     12.20   13.15
40 MSFT200320P00150000  2020-03-17 14:08:02   150.0     14.97   13.65
41 MSFT200320P00155000  2020-03-16 19:57:29   155.0     16.57   14.80
42 MSFT200320P00157500  2020-03-16 19:57:12   157.5     20.67   17.25
43 MSFT200320P00160000  2020-03-17 13:30:52   160.0     19.50   18.60
44 MSFT200320P00162500  2020-03-16 19:38:42   162.5     21.90   24.20
45 MSFT200320P00165000  2020-03-16 19:38:45   165.0     26.25   23.70
46 MSFT200320P00167500  2020-03-17 14:08:56   167.5     31.10   29.30
47 MSFT200320P00170000  2020-03-17 14:07:08   170.0     33.86   31.85
48 MSFT200320P00172500  2020-03-16 18:55:03   172.5     30.90   34.30
49 MSFT200320P00175000  2020-03-17 14:07:08   175.0     38.84   36.80
50 MSFT200320P00177500  2020-03-16 19:45:02   177.5     36.30   39.25
51 MSFT200320P00180000  2020-03-16 19:39:09   180.0     38.85   38.45

```

52	MSFT200320P00182500	2020-03-16 18:32:54	182.5	40.55	44.25
53	MSFT200320P00185000	2020-03-16 19:21:57	185.0	42.53	43.00
54	MSFT200320P00187500	2020-03-09 19:06:10	187.5	45.75	46.30
55	MSFT200320P00190000	2020-03-16 19:45:31	190.0	49.75	51.85
56	MSFT200320P00192500	2020-03-12 17:12:14	192.5	45.65	54.30
57	MSFT200320P00195000	2020-03-16 19:39:47	195.0	56.10	56.85
58	MSFT200320P00197500	2020-03-13 15:57:13	197.5	52.65	55.80
59	MSFT200320P00200000	2020-03-16 18:52:53	200.0	60.85	58.40
60	MSFT200320P00202500	2020-03-16 19:39:09	202.5	63.20	61.00
61	MSFT200320P00205000	2020-03-13 17:03:02	205.0	60.65	63.80
62	MSFT200320P00210000	2020-03-13 19:34:01	210.0	67.80	68.30
63	MSFT200320P00220000	2020-03-16 14:37:53	220.0	72.60	78.30
64	MSFT200320P00230000	2020-03-11 18:43:16	230.0	77.35	88.30
65	MSFT200320P00240000	2020-03-11 19:54:30	240.0	85.50	97.80
66	MSFT200320P00250000	2020-03-11 19:58:52	250.0	105.75	108.30

	ask	change	percentChange	volume	openInterest	impliedVolatility \
0	0.03	-0.010000	-33.333336	884	1640.0	2.656253
1	0.05	-0.060000	-60.000000	276	1751.0	2.593754
2	0.08	-0.060000	-40.000000	190	1774.0	2.484379
3	0.12	0.000000	0.000000	382	3945.0	2.390629
4	0.30	-0.200000	-55.555557	24	701.0	2.324223
5	0.29	-0.300000	-50.847458	218	4255.0	2.222661
6	0.47	-0.490000	-58.333332	2	2961.0	2.150395
7	0.84	-0.540000	-41.221375	233	6313.0	2.144536
8	1.32	-0.560000	-32.558144	73	4519.0	2.114263
9	1.82	-0.180000	-9.326422	28	622.0	2.081059
10	1.95	-0.650000	-23.722630	13836	23146.0	2.077153
11	2.34	0.000000	0.000000	166	1144.0	1.928711
12	2.45	0.790000	40.306120	135	57.0	2.094731
13	2.48	-0.150000	-5.357138	478	1214.0	2.042974
14	2.75	-0.450000	-13.043479	216	300.0	2.071294
15	3.00	-2.150000	-44.329895	256	14682.0	2.085942
16	3.15	-0.800000	-19.047613	620	456.0	2.026860
17	3.60	-1.300000	-29.345366	154	137.0	2.091313
18	3.75	1.000000	32.786892	248	398.0	2.068852
19	3.80	1.920000	150.000000	157	233.0	1.986328
20	3.50	-1.510000	-27.207210	1099	6829.0	1.858887
21	4.55	0.060000	1.178781	209	317.0	2.061040
22	4.80	-0.840000	-15.272731	99	343.0	2.052251
23	5.20	-0.900000	-15.000001	145	190.0	2.068852
24	5.65	-1.270000	-18.220947	289	763.0	2.087163
25	5.85	-1.990000	-25.545567	1350	6497.0	2.074224
26	6.35	-2.050000	-25.153372	209	296.0	2.085454
27	6.85	-2.100000	-24.418608	173	173.0	2.014165
28	7.15	-1.750000	-20.000000	204	309.0	2.076421
29	7.75	-1.400001	-14.583339	1207	460.0	2.113286

..	...	...	...	...	...	...
37	12.45	1.700000	13.821136	637	5127.0	2.228032
38	13.05	0.080000	0.597014	445	463.0	2.227543
39	13.75	0.309999	2.607229	277	895.0	2.286137
40	14.45	-1.780000	-10.626864	650	14829.0	2.290043
41	17.35	-2.330000	-12.328043	1	17135.0	2.087895
42	19.40	0.000000	0.000000	314	4143.0	2.201665
43	21.80	-5.750000	-22.772278	30	16019.0	2.230961
44	25.90	0.000000	0.000000	134	2509.0	2.841800
45	27.10	17.250000	191.666670	158	11285.0	2.553715
46	30.90	4.380001	16.392221	373	4687.0	3.131838
47	33.60	1.920000	6.011271	291	15084.0	3.288820
48	35.90	0.000000	0.000000	35	16780.0	3.391115
49	38.45	1.700001	4.577277	480	12732.0	3.519044
50	40.95	0.000000	0.000000	41	307.0	3.633302
51	40.80	14.649998	60.537178	478	13176.0	3.109866
52	45.80	0.000000	0.000000	8	410.0	3.844727
53	45.65	12.029999	39.442620	823	32071.0	3.250002
54	48.15	0.000000	0.000000	1	299.0	3.442872
55	53.15	0.000000	0.000000	179	3053.0	4.157231
56	55.55	0.000000	0.000000	5	26.0	4.241216
57	58.15	0.000000	0.000000	252	1252.0	4.355473
58	57.45	0.000000	0.000000	4	NaN	3.674806
59	59.95	0.000000	0.000000	84	8.0	3.774903
60	65.40	9.799999	18.352058	66	NaN	4.228032
61	65.40	0.000000	0.000000	10	0.0	4.050298
62	69.95	0.000000	0.000000	4	8.0	4.094731
63	79.95	0.000000	0.000000	30	30.0	4.400883
64	89.95	0.000000	0.000000	25	1.0	4.685063
65	100.50	0.000000	0.000000	20	1.0	4.957035
66	109.95	0.000000	0.000000	7	8.0	5.199222

	inTheMoney	contractSize	currency
0	False	REGULAR	USD
1	False	REGULAR	USD
2	False	REGULAR	USD
3	False	REGULAR	USD
4	False	REGULAR	USD
5	False	REGULAR	USD
6	False	REGULAR	USD
7	False	REGULAR	USD
8	False	REGULAR	USD
9	False	REGULAR	USD
10	False	REGULAR	USD
11	False	REGULAR	USD
12	False	REGULAR	USD
13	False	REGULAR	USD

14	False	REGULAR	USD
15	False	REGULAR	USD
16	False	REGULAR	USD
17	False	REGULAR	USD
18	False	REGULAR	USD
19	False	REGULAR	USD
20	False	REGULAR	USD
21	False	REGULAR	USD
22	False	REGULAR	USD
23	False	REGULAR	USD
24	False	REGULAR	USD
25	False	REGULAR	USD
26	False	REGULAR	USD
27	False	REGULAR	USD
28	False	REGULAR	USD
29	False	REGULAR	USD
..	...	...	...
37	True	REGULAR	USD
38	True	REGULAR	USD
39	True	REGULAR	USD
40	True	REGULAR	USD
41	True	REGULAR	USD
42	True	REGULAR	USD
43	True	REGULAR	USD
44	True	REGULAR	USD
45	True	REGULAR	USD
46	True	REGULAR	USD
47	True	REGULAR	USD
48	True	REGULAR	USD
49	True	REGULAR	USD
50	True	REGULAR	USD
51	True	REGULAR	USD
52	True	REGULAR	USD
53	True	REGULAR	USD
54	True	REGULAR	USD
55	True	REGULAR	USD
56	True	REGULAR	USD
57	True	REGULAR	USD
58	True	REGULAR	USD
59	True	REGULAR	USD
60	True	REGULAR	USD
61	True	REGULAR	USD
62	True	REGULAR	USD
63	True	REGULAR	USD
64	True	REGULAR	USD
65	True	REGULAR	USD
66	True	REGULAR	USD

[67 rows x 14 columns]

```
[6]: df = yf.download("MSFT")
```

[\*\*\*\*\*100%\*\*\*\*\*] 1 of 1 completed

```
[7]: df.head()
```

```
[7]:
```

	Adj Close	Close	High	Low	Open	Volume
Date						
1986-03-13	0.062378	0.097222	0.101562	0.088542	0.088542	1031788800
1986-03-14	0.064606	0.100694	0.102431	0.097222	0.097222	308160000
1986-03-17	0.065720	0.102431	0.103299	0.100694	0.100694	133171200
1986-03-18	0.064049	0.099826	0.103299	0.098958	0.102431	67766400
1986-03-19	0.062935	0.098090	0.100694	0.097222	0.099826	47894400

```
[8]: df.tail()
```

```
[8]:
```

	Adj Close	Close	High	Low	Open \
Date					
2020-03-11	153.630005	153.630005	157.699997	151.149994	157.130005
2020-03-12	139.059998	139.059998	153.470001	138.580002	145.300003
2020-03-13	158.830002	158.830002	161.910004	140.729996	147.500000
2020-03-16	135.419998	135.419998	149.350006	135.000000	140.000000
2020-03-17	146.570007	146.570007	147.500000	135.000000	140.000000

	Volume
Date	
2020-03-11	56371600
2020-03-12	93226400
2020-03-13	92727400
2020-03-16	87905900
2020-03-17	80963800

```
[9]: df['Adj Close'][-1]
```

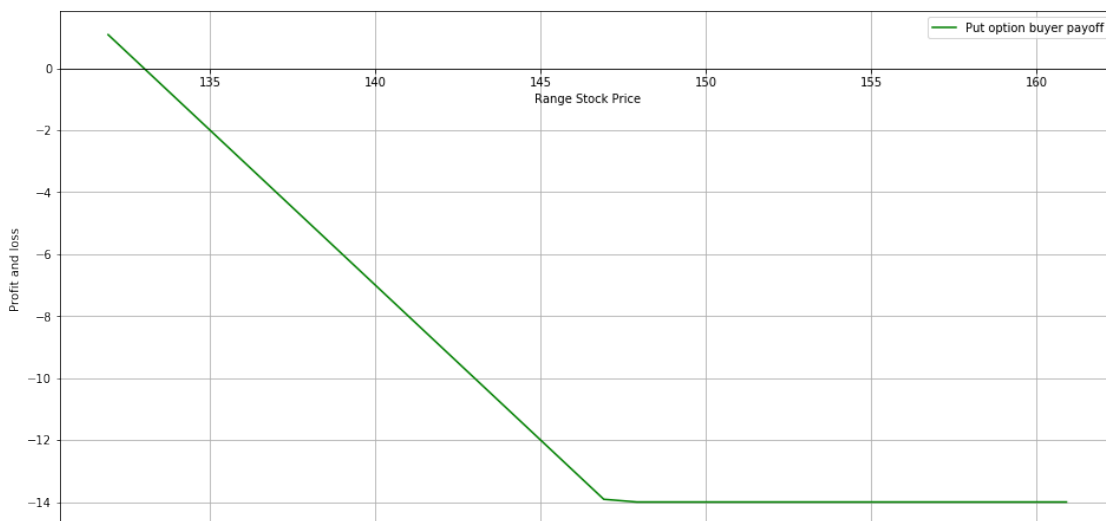
```
[9]: 146.57000732421875
```

```
[10]: spot_price = df['Adj Close'][-1] # current price
share_price = np.arange(0.9*spot_price, 1.1*spot_price)
strike_price = dfo_exp.puts['strike'][37] # exercise price of an options that
→ is fixed price
put_price = dfo_exp.puts['lastPrice'][37] # price of an option or premium
```

```
[11]: def put_option(share_price, strike_price, put_price):
    pnl = np.where(share_price < strike_price, strike_price - share_price, 0)
```

```
return pnl - put_price
```

```
[12]: payoff_long_put = put_option(share_price, strike_price, put_price)
# Plot the graph
plt.subplots(figsize=(16,8))
plt.gca().spines['bottom'].set_position('zero')
plt.plot(share_price, payoff_long_put, label='Put option buyer payoff', color='g')
plt.xlabel('Range Stock Price')
plt.ylabel('Profit and loss')
plt.grid(which='both')
plt.legend()
plt.show()
```



```
[13]: payoff_short_put = payoff_long_put * -1.0
# Plot
plt.subplots(figsize=(16,8))
plt.gca().spines['bottom'].set_position('zero')
plt.plot(share_price, payoff_short_put, label='Short 147 Strike Put', color='r')
plt.xlabel('Range Stock Price')
plt.ylabel('Profit and loss')
plt.grid(which='both')
plt.legend()
plt.show()
```

