

# Options\_Payoff\_Put

September 29, 2021

## 1 Payoff for a Put Option

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

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

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

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

```
[4]: dfo_exp = dfo.option_chain('2020-04-16')
```

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

```
[5]:
```

	contractSymbol	lastTradeDate	strike	lastPrice	bid	\
0	AAPL200417P00105000	2020-03-27 19:56:00	105.0	0.09	0.06	
1	AAPL200417P00110000	2020-03-27 19:39:42	110.0	0.10	0.08	
2	AAPL200417P00115000	2020-03-27 19:04:49	115.0	0.11	0.08	
3	AAPL200417P00120000	2020-03-27 19:55:38	120.0	0.20	0.12	

4	AAPL200417P00125000	2020-03-27	19:53:38	125.0	0.19	0.19
5	AAPL200417P00130000	2020-03-27	19:35:28	130.0	0.23	0.20
6	AAPL200417P00135000	2020-03-27	17:13:27	135.0	0.28	0.26
7	AAPL200417P00140000	2020-03-27	19:56:30	140.0	0.44	0.34
8	AAPL200417P00145000	2020-03-27	19:50:00	145.0	0.49	0.42
9	AAPL200417P00150000	2020-03-27	19:59:12	150.0	0.63	0.46
10	AAPL200417P00155000	2020-03-27	19:49:44	155.0	0.69	0.58
11	AAPL200417P00160000	2020-03-27	19:50:07	160.0	0.88	0.84
12	AAPL200417P00165000	2020-03-27	19:52:48	165.0	1.05	0.87
13	AAPL200417P00170000	2020-03-27	19:56:50	170.0	1.22	1.06
14	AAPL200417P00175000	2020-03-27	19:54:50	175.0	1.40	1.28
15	AAPL200417P00180000	2020-03-27	19:57:54	180.0	1.65	1.53
16	AAPL200417P00185000	2020-03-27	19:51:49	185.0	2.03	1.84
17	AAPL200417P00190000	2020-03-27	19:56:57	190.0	2.34	2.20
18	AAPL200417P00195000	2020-03-27	19:58:32	195.0	2.79	2.53
19	AAPL200417P00200000	2020-03-27	19:59:32	200.0	3.29	3.00
20	AAPL200417P00205000	2020-03-27	19:56:06	205.0	4.00	3.90
21	AAPL200417P00210000	2020-03-27	19:58:09	210.0	4.60	4.20
22	AAPL200417P00215000	2020-03-27	19:58:00	215.0	5.54	5.05
23	AAPL200417P00220000	2020-03-27	19:58:41	220.0	6.65	6.50
24	AAPL200417P00225000	2020-03-27	19:59:20	225.0	7.79	7.70
25	AAPL200417P00230000	2020-03-27	19:59:33	230.0	9.05	9.05
26	AAPL200417P00235000	2020-03-27	19:59:51	235.0	10.73	10.15
27	AAPL200417P00240000	2020-03-27	19:59:52	240.0	12.60	12.40
28	AAPL200417P00242500	2020-03-27	19:57:18	242.5	13.57	12.75
29	AAPL200417P00245000	2020-03-27	19:56:19	245.0	14.65	14.45
..	...		...	...	...	...
41	AAPL200417P00280000	2020-03-27	19:29:33	280.0	29.73	34.60
42	AAPL200417P00285000	2020-03-27	19:41:43	285.0	37.75	38.95
43	AAPL200417P00290000	2020-03-27	19:57:46	290.0	43.75	43.05
44	AAPL200417P00295000	2020-03-27	18:36:39	295.0	48.22	47.55
45	AAPL200417P00300000	2020-03-27	19:28:55	300.0	50.00	51.95
46	AAPL200417P00305000	2020-03-27	19:28:55	305.0	50.45	57.00
47	AAPL200417P00310000	2020-03-27	19:13:37	310.0	56.00	61.25
48	AAPL200417P00315000	2020-03-27	14:37:14	315.0	66.01	66.10
49	AAPL200417P00320000	2020-03-27	14:37:14	320.0	72.12	71.30
50	AAPL200417P00325000	2020-03-25	19:37:48	325.0	73.99	76.45
51	AAPL200417P00330000	2020-03-27	19:07:20	330.0	76.05	81.40
52	AAPL200417P00335000	2020-03-09	19:59:33	335.0	92.17	85.85
53	AAPL200417P00340000	2020-03-27	19:07:20	340.0	86.00	90.90
54	AAPL200417P00345000	2020-03-23	16:24:31	345.0	125.58	96.10
55	AAPL200417P00350000	2020-03-25	15:26:20	350.0	95.80	101.00
56	AAPL200417P00355000	2020-03-25	15:26:20	355.0	100.78	106.10
57	AAPL200417P00360000	2020-02-27	20:33:16	360.0	67.40	111.25
58	AAPL200417P00365000	2020-03-16	18:21:46	365.0	114.74	116.25
59	AAPL200417P00370000	2020-03-02	17:05:04	370.0	114.23	121.25
60	AAPL200417P00375000	2020-03-27	08:14:35	375.0	57.62	125.85

61	AAPL200417P00380000	2020-02-26 20:47:14	380.0	87.30	131.25
62	AAPL200417P00385000	2020-03-27 08:59:55	385.0	105.40	135.65
63	AAPL200417P00390000	2020-02-20 20:33:27	390.0	69.30	143.05
64	AAPL200417P00395000	2020-02-12 17:01:32	395.0	70.48	137.20
65	AAPL200417P00400000	2020-03-06 20:19:48	400.0	115.72	149.00
66	AAPL200417P00405000	2020-01-29 15:04:19	405.0	82.90	139.30
67	AAPL200417P00410000	2020-03-05 16:08:26	410.0	111.94	161.25
68	AAPL200417P00415000	2020-03-20 19:09:03	415.0	172.00	166.25
69	AAPL200417P00420000	2020-03-02 15:08:12	420.0	140.00	169.10
70	AAPL200417P00425000	2020-03-11 13:41:54	425.0	147.80	176.25

	ask	change	percentChange	volume	openInterest	impliedVolatility \
0	0.11	-0.030000	-24.999996	211.0	6364	1.425784
1	0.18	-0.030000	-23.076920	29.0	2077	1.419925
2	0.20	-0.090000	-45.000000	13.0	790	1.359378
3	0.26	-0.020000	-9.090907	61.0	1373	1.339847
4	0.30	-0.130000	-40.625000	230.0	1342	1.314457
5	0.40	-0.170000	-42.500000	171.0	656	1.281254
6	0.47	-0.140000	-33.333332	16.0	413	1.249027
7	0.55	-0.010000	-2.222220	73.0	3481	1.217777
8	0.64	-0.030000	-5.769226	134.0	1536	1.184574
9	0.63	0.020000	3.278685	4201.0	8309	1.123051
10	0.79	-0.040000	-5.479455	165.0	1350	1.102055
11	0.88	0.080000	9.999998	514.0	1767	1.082036
12	1.06	0.140000	15.384607	119.0	3511	1.040044
13	1.24	0.130000	11.926605	189.0	4453	1.011724
14	1.46	0.150000	11.999998	936.0	6473	0.983887
15	1.72	0.180000	12.244894	1796.0	4612	0.956299
16	2.22	0.280000	15.999998	481.0	3464	0.941895
17	2.62	0.240000	11.428573	1807.0	4881	0.916505
18	2.84	0.450000	19.230772	389.0	2412	0.875245
19	3.35	0.640000	24.150938	4715.0	7785	0.849855
20	4.00	0.850000	26.984123	234.0	3043	0.840212
21	4.75	1.000000	27.777779	1274.0	7131	0.804079
22	5.70	1.170000	26.773458	519.0	3827	0.786745
23	6.70	1.700000	34.343440	2447.0	12513	0.779787
24	7.90	1.990000	34.310340	851.0	6304	0.761599
25	9.35	2.300000	34.074078	3228.0	5198	0.744631
26	11.25	2.829999	35.822777	672.0	4892	0.723452
27	12.80	3.400001	36.956528	2380.0	12233	0.711185
28	14.20	2.040000	17.692974	214.0	457	0.698001
29	14.80	4.000000	37.558685	468.0	3759	0.694400
..	...	...	...	...	...	...
41	36.15	1.990000	7.173756	35.0	16432	0.551274
42	40.00	5.740002	17.931902	36.0	5608	0.536382
43	45.00	7.700001	21.359226	188.0	11707	0.543462
44	49.20	8.220001	20.550003	37.0	7104	0.520024

45	53.70	5.570000	12.536573	125.0	12566	0.592045
46	58.45	-3.489998	-6.470148	28.0	7216	0.601322
47	63.30	2.900002	5.461397	9.0	9110	0.617435
48	68.05	3.390003	5.413611	1.0	8182	0.614750
49	72.95	2.520004	3.620696	20.0	7724	0.629398
50	78.15	-0.810005	-1.082895	1.0	3722	0.692386
51	82.90	-5.199997	-6.399997	1.0	1973	0.679202
52	88.20	0.000000	0.000000	1.0	497	0.759768
53	93.20	-3.940002	-4.380701	1.0	552	0.788576
54	98.00	0.000000	0.000000	4.0	357	0.781496
55	103.10	0.000000	0.000000	2.0	675	0.827150
56	108.00	0.000000	0.000000	1.0	98	0.834474
57	113.00	0.000000	0.000000	12.0	1	0.860353
58	117.95	0.000000	0.000000	5.0	13	0.875001
59	122.95	0.000000	0.000000	50.0	2	0.899415
60	127.45	0.000000	0.000000	1.0	0	0.765627
61	132.95	0.000000	0.000000	1100.0	0	0.946778
62	137.60	0.000000	0.000000	NaN	0	0.871095
63	144.95	0.000000	0.000000	35.0	0	1.173588
64	139.00	0.000000	0.000000	100.0	7	0.000010
65	150.85	0.000000	0.000000	1.0	2	0.000010
66	140.60	0.000000	0.000000	NaN	0	0.000010
67	162.90	0.000000	0.000000	1.0	0	1.066899
68	167.90	0.000000	0.000000	NaN	7	1.087895
69	170.90	0.000000	0.000000	1.0	0	0.000010
70	177.90	0.000000	0.000000	NaN	11	1.127934

	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
..	...	...	...
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	True	REGULAR	USD
68	True	REGULAR	USD
69	True	REGULAR	USD
70	True	REGULAR	USD

[71 rows x 14 columns]

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

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

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

```
[7]:
```

	Adj Close	Close	High	Low	Open	Volume
Date						
1980-12-12	0.406782	0.513393	0.515625	0.513393	0.513393	117258400
1980-12-15	0.385558	0.486607	0.488839	0.486607	0.488839	43971200
1980-12-16	0.357260	0.450893	0.453125	0.450893	0.453125	26432000
1980-12-17	0.366103	0.462054	0.464286	0.462054	0.462054	21610400
1980-12-18	0.376715	0.475446	0.477679	0.475446	0.475446	18362400

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

```
[8]:
```

	Adj Close	Close	High	Low	Open \
Date					
2020-03-23	224.369995	224.369995	228.500000	212.610001	228.080002
2020-03-24	246.880005	246.880005	247.690002	234.300003	236.360001
2020-03-25	245.520004	245.520004	258.250000	244.300003	250.750000
2020-03-26	258.440002	258.440002	258.679993	246.360001	246.520004
2020-03-27	247.740005	247.740005	255.869995	247.050003	252.750000

  

	Volume
Date	
2020-03-23	84188200
2020-03-24	71882800
2020-03-25	75900500
2020-03-26	63021800
2020-03-27	51007500

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

```
[9]: 247.74000549316406
```

```
[10]: dfo_exp.puts['strike'][29]
```

```
[10]: 245.0
```

```
[11]: def payoff_puts(St, X):  
      pop = (X-St+abs(X-St)) / 2  
      return pop
```

```
[12]: St = df['Adj Close'][-1] # Current Price  
      X = dfo_exp.puts['strike'][29] # Strike Price
```

```
[13]: payoff_puts(St, X)
```

[13]: 0.0

```
[14]: St = df['Adj Close'][-1] # Current Price  
      X = dfo_exp.puts['strike'][30] # Strike Price
```

```
[15]: payoff_puts(St, X)
```

[15]: 0.0