

# Options\_Payoff\_Call

September 29, 2021

## 1 Payoff for a Call Option

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

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

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

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

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

```
[5]: dfo_exp.calls
```

```
[5]:
```

	contractSymbol	lastTradeDate	strike	lastPrice	bid	\
0	AAPL200417C00105000	2020-03-27 17:37:20	105.0	147.80	141.75	
1	AAPL200417C00110000	2020-02-26 20:10:39	110.0	142.00	137.25	
2	AAPL200417C00115000	2020-03-23 16:49:39	115.0	107.00	134.35	
3	AAPL200417C00120000	2020-03-23 17:14:03	120.0	107.00	127.05	

4	AAPL200417C00125000	2020-03-24	15:24:26	125.0	115.64	122.15
5	AAPL200417C00130000	2020-03-23	18:08:40	130.0	91.25	117.45
6	AAPL200417C00135000	2020-03-02	05:08:27	135.0	110.95	112.05
7	AAPL200417C00140000	2020-03-20	17:11:59	140.0	114.53	107.30
8	AAPL200417C00145000	2020-02-06	20:20:21	145.0	179.50	141.55
9	AAPL200417C00150000	2020-03-27	13:35:07	150.0	104.65	97.50
10	AAPL200417C00155000	2020-02-18	16:24:14	155.0	162.60	91.50
11	AAPL200417C00160000	2020-03-25	14:26:51	160.0	87.76	87.70
12	AAPL200417C00165000	2020-03-24	18:40:29	165.0	77.58	82.85
13	AAPL200417C00170000	2020-03-27	13:51:53	170.0	81.39	78.05
14	AAPL200417C00175000	2020-03-27	17:14:29	175.0	77.09	73.40
15	AAPL200417C00180000	2020-03-25	19:16:03	180.0	78.00	68.60
16	AAPL200417C00185000	2020-03-23	19:33:15	185.0	67.80	63.90
17	AAPL200417C00190000	2020-03-27	14:38:14	190.0	61.44	59.30
18	AAPL200417C00195000	2020-03-24	19:17:40	195.0	63.95	55.00
19	AAPL200417C00200000	2020-03-27	17:31:46	200.0	57.00	50.45
20	AAPL200417C00205000	2020-03-26	18:26:55	205.0	49.39	45.90
21	AAPL200417C00210000	2020-03-27	16:21:03	210.0	47.40	41.80
22	AAPL200417C00215000	2020-03-27	19:47:00	215.0	41.27	37.65
23	AAPL200417C00220000	2020-03-27	19:50:55	220.0	35.40	33.65
24	AAPL200417C00225000	2020-03-27	19:55:02	225.0	30.40	30.25
25	AAPL200417C00230000	2020-03-27	19:54:45	230.0	26.55	26.00
26	AAPL200417C00235000	2020-03-27	19:37:29	235.0	26.27	22.60
27	AAPL200417C00240000	2020-03-27	19:56:00	240.0	20.40	19.50
28	AAPL200417C00242500	2020-03-27	19:54:50	242.5	19.35	17.80
29	AAPL200417C00245000	2020-03-27	19:58:01	245.0	17.70	17.30
..	...		...	...	...	...
49	AAPL200417C00320000	2020-03-27	19:58:00	320.0	0.25	0.20
50	AAPL200417C00325000	2020-03-27	19:50:10	325.0	0.19	0.15
51	AAPL200417C00330000	2020-03-27	19:48:52	330.0	0.15	0.12
52	AAPL200417C00335000	2020-03-27	19:56:47	335.0	0.11	0.10
53	AAPL200417C00340000	2020-03-27	19:45:04	340.0	0.09	0.05
54	AAPL200417C00345000	2020-03-27	19:50:49	345.0	0.10	0.05
55	AAPL200417C00350000	2020-03-27	19:52:37	350.0	0.06	0.05
56	AAPL200417C00355000	2020-03-27	19:33:40	355.0	0.06	0.01
57	AAPL200417C00360000	2020-03-27	19:33:37	360.0	0.05	0.00
58	AAPL200417C00365000	2020-03-27	17:09:22	365.0	0.01	0.00
59	AAPL200417C00370000	2020-03-27	18:23:33	370.0	0.04	0.00
60	AAPL200417C00375000	2020-03-25	19:48:44	375.0	0.09	0.00
61	AAPL200417C00380000	2020-03-27	19:42:56	380.0	0.03	0.03
62	AAPL200417C00385000	2020-03-26	16:10:28	385.0	0.03	0.00
63	AAPL200417C00390000	2020-03-25	16:08:11	390.0	0.02	0.00
64	AAPL200417C00395000	2020-03-24	13:42:52	395.0	0.07	0.00
65	AAPL200417C00400000	2020-03-27	19:30:17	400.0	0.03	0.01
66	AAPL200417C00405000	2020-03-25	19:42:11	405.0	0.02	0.00
67	AAPL200417C00410000	2020-03-06	18:37:02	410.0	0.04	0.00
68	AAPL200417C00415000	2020-03-05	18:38:27	415.0	0.06	0.00

69	AAPL200417C00420000	2020-03-26 15:49:48	420.0	0.06	0.00
70	AAPL200417C00425000	2020-03-24 14:00:21	425.0	0.05	0.00
71	AAPL200417C00430000	2020-03-25 15:02:35	430.0	0.05	0.00
72	AAPL200417C00440000	2020-03-27 14:09:01	440.0	0.01	0.00
73	AAPL200417C00450000	2020-03-27 19:54:10	450.0	0.03	0.00
74	AAPL200417C00460000	2020-03-24 16:14:15	460.0	0.15	0.00
75	AAPL200417C00470000	2020-03-25 14:44:27	470.0	0.03	0.00
76	AAPL200417C00480000	2020-03-27 17:57:18	480.0	0.01	0.00
77	AAPL200417C00490000	2020-03-27 14:35:05	490.0	0.01	0.00
78	AAPL200417C00500000	2020-03-27 15:00:31	500.0	0.02	0.00

	ask	change	percentChange	volume	openInterest	impliedVolatility \
0	144.35	13.800003	10.298510	2.0	19	1.671877
1	139.45	0.000000	0.000000	5.0	6	1.757814
2	136.20	0.000000	0.000000	12.0	1	2.198247
3	129.45	0.000000	0.000000	NaN	48	1.541994
4	124.50	0.000000	0.000000	1.0	1	1.495608
5	119.55	0.000000	0.000000	8.0	16	1.482913
6	114.60	0.000000	0.000000	NaN	8	1.344730
7	109.65	7.930000	7.439025	1.0	27	1.323734
8	143.40	0.000000	0.000000	6.0	0	4.752568
9	99.85	2.790001	2.739054	9.0	279	1.236820
10	93.55	0.000000	0.000000	4.0	2	1.135747
11	90.05	0.000000	0.000000	4.0	96	1.143071
12	85.30	0.000000	0.000000	25.0	29	1.112797
13	80.45	1.690002	2.120455	10.0	192	1.073735
14	75.70	-2.710007	-3.395998	1.0	496	1.050054
15	70.95	0.000000	0.000000	101.0	168	1.010991
16	66.35	-0.299995	-0.440522	7.0	2360	0.983154
17	61.75	-4.189999	-6.384273	2.0	159	0.955079
18	57.25	0.000000	0.000000	4.0	252	0.939942
19	52.35	-3.000000	-5.000000	21.0	874	0.890504
20	48.05	-2.610001	-5.019232	5.0	377	0.861574
21	43.75	-0.099998	-0.210523	7.0	560	0.842165
22	39.60	-1.430000	-3.348947	11.0	897	0.818239
23	35.90	-3.049999	-7.932378	36.0	1485	0.804323
24	31.45	-8.199999	-21.243520	23.0	1154	0.777834
25	28.10	-6.500000	-19.667171	302.0	2307	0.750003
26	24.50	-4.729999	-15.258063	71.0	1697	0.728518
27	21.25	-7.000000	-25.547445	297.0	3011	0.712710
28	20.05	-5.600000	-22.444891	170.0	363	0.707217
29	18.30	-6.019999	-25.379423	190.0	2530	0.713382
..	...	...	...	...	...	...
49	0.26	-0.200000	-44.444443	593.0	21316	0.523442
50	0.20	-0.130000	-40.625000	123.0	15207	0.528813
51	0.16	-0.090000	-37.499996	245.0	14938	0.537114
52	0.13	-0.040000	-26.666672	92.0	5790	0.547856

53	0.10	-0.040000	-30.769226	161.0	13240	0.542973
54	0.14	0.000000	0.000000	182.0	6493	0.580082
55	0.09	-0.010000	-14.285716	431.0	6542	0.580082
56	0.14	-0.030000	-33.333336	96.0	1227	0.605473
57	0.05	-0.050000	-50.000000	191.0	1933	0.558598
58	0.10	-0.040000	-79.999990	1.0	1468	0.619144
59	0.06	-0.010000	-20.000004	13.0	2064	0.605473
60	0.13	0.000000	0.000000	3.0	1165	0.675784
61	0.04	0.000000	0.000000	1.0	1773	0.652347
62	0.13	0.010000	50.000000	10.0	626	0.710940
63	0.05	-0.040000	-66.666670	200.0	610	0.664066
64	0.05	0.000000	0.000000	1.0	876	0.679691
65	0.05	-0.010000	-25.000000	2.0	14217	0.710940
66	0.02	-0.020000	-50.000000	1.0	378	0.664066
67	0.07	0.000000	0.000000	100.0	4775	0.753909
68	0.10	0.000000	0.000000	3.0	90	0.796877
69	0.10	0.000000	0.000000	26.0	1545	0.812502
70	0.13	0.000000	0.000000	4.0	68	0.849611
71	0.05	0.000000	0.000000	280.0	4895	0.789065
72	0.03	-0.010000	-50.000000	1.0	913	0.789065
73	0.03	0.020000	200.000000	185.0	9130	0.812502
74	0.13	0.000000	0.000000	30.0	1271	0.957032
75	0.10	0.000000	0.000000	10.0	1298	0.960938
76	0.02	0.000000	0.000000	101.0	2405	0.859376
77	0.02	-0.010000	-50.000000	87.0	1096	0.890626
78	0.01	0.010000	100.000000	452.0	7084	0.875001

	inTheMoney	contractSize	currency
0	True	REGULAR	USD
1	True	REGULAR	USD
2	True	REGULAR	USD
3	True	REGULAR	USD
4	True	REGULAR	USD
5	True	REGULAR	USD
6	True	REGULAR	USD
7	True	REGULAR	USD
8	True	REGULAR	USD
9	True	REGULAR	USD
10	True	REGULAR	USD
11	True	REGULAR	USD
12	True	REGULAR	USD
13	True	REGULAR	USD
14	True	REGULAR	USD
15	True	REGULAR	USD
16	True	REGULAR	USD
17	True	REGULAR	USD
18	True	REGULAR	USD

19	True	REGULAR	USD
20	True	REGULAR	USD
21	True	REGULAR	USD
22	True	REGULAR	USD
23	True	REGULAR	USD
24	True	REGULAR	USD
25	True	REGULAR	USD
26	True	REGULAR	USD
27	True	REGULAR	USD
28	True	REGULAR	USD
29	True	REGULAR	USD
..	...	...	...
49	False	REGULAR	USD
50	False	REGULAR	USD
51	False	REGULAR	USD
52	False	REGULAR	USD
53	False	REGULAR	USD
54	False	REGULAR	USD
55	False	REGULAR	USD
56	False	REGULAR	USD
57	False	REGULAR	USD
58	False	REGULAR	USD
59	False	REGULAR	USD
60	False	REGULAR	USD
61	False	REGULAR	USD
62	False	REGULAR	USD
63	False	REGULAR	USD
64	False	REGULAR	USD
65	False	REGULAR	USD
66	False	REGULAR	USD
67	False	REGULAR	USD
68	False	REGULAR	USD
69	False	REGULAR	USD
70	False	REGULAR	USD
71	False	REGULAR	USD
72	False	REGULAR	USD
73	False	REGULAR	USD
74	False	REGULAR	USD
75	False	REGULAR	USD
76	False	REGULAR	USD
77	False	REGULAR	USD
78	False	REGULAR	USD

[79 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
```

```
[11]: dfo_exp.calls['strike'][31]
```

```
[11]: 250.0
```

```
[12]: def payoff_call(St, X):  
      poc = (St-X+abs(St-X)) / 2  
      return poc
```

```
[13]: St = df['Adj Close'][-1] # Current Price  
      X = dfo_exp.calls['strike'][31] # Strike Price
```

```
[14]: payoff_call(St, X)
```

[14]: 0.0

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

```
[16]: payoff_call(St, X)
```

[16]: 2.7400054931640625