

# Options\_Call

September 29, 2021

## 1 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]: ('2020-04-16',
      '2021-01-14',
      '2020-03-19',
      '2022-06-16',
      '2020-04-30',
      '2020-09-17',
      '2020-04-02',
      '2020-07-16',
      '2021-06-17',
      '2020-04-08',
      '2022-01-20',
      '2020-03-26',
      '2021-09-16',
      '2020-04-23',
      '2020-12-17',
      '2020-10-15',
      '2020-06-18',
      '2020-05-14')
```

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

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

```
[5]:
```

	contractSymbol	lastTradeDate	strike	lastPrice	bid	\
0	AAPL200320C00105000	2020-03-13 19:40:46	105.0	156.25	142.50	
1	AAPL200320C00110000	2020-03-09 19:58:08	110.0	169.85	139.30	
2	AAPL200320C00115000	2020-03-12 17:45:02	115.0	141.55	134.30	

3	AAPL200320C00120000	2020-02-06	20:17:34	120.0	178.10	166.40
4	AAPL200320C00125000	2020-03-12	18:00:58	125.0	132.90	123.65
5	AAPL200320C00130000	2020-03-12	18:28:45	130.0	124.30	119.35
6	AAPL200320C00135000	2020-03-03	14:56:09	135.0	158.40	113.40
7	AAPL200320C00140000	2020-02-20	20:03:54	140.0	180.57	107.80
8	AAPL200320C00145000	2020-03-13	18:30:04	145.0	114.75	102.45
9	AAPL200320C00150000	2020-03-16	19:46:24	150.0	101.90	99.70
10	AAPL200320C00155000	2020-03-12	16:59:41	155.0	104.20	103.85
11	AAPL200320C00160000	2020-03-06	16:07:56	160.0	93.00	87.55
12	AAPL200320C00165000	2020-03-16	14:59:41	165.0	87.30	82.85
13	AAPL200320C00170000	2020-03-16	19:39:43	170.0	77.40	80.05
14	AAPL200320C00175000	2020-03-16	19:43:18	175.0	74.40	74.65
15	AAPL200320C00180000	2020-03-16	15:42:08	180.0	77.55	68.85
16	AAPL200320C00185000	2020-03-13	19:46:10	185.0	83.00	63.50
17	AAPL200320C00190000	2020-03-16	19:39:43	190.0	58.15	60.10
18	AAPL200320C00195000	2020-03-16	19:49:13	195.0	57.00	55.60
19	AAPL200320C00200000	2020-03-16	19:32:09	200.0	51.60	49.90
20	AAPL200320C00205000	2020-03-16	19:29:53	205.0	47.60	45.10
21	AAPL200320C00210000	2020-03-16	19:45:02	210.0	43.85	42.40
22	AAPL200320C00215000	2020-03-16	19:42:16	215.0	36.20	37.10
23	AAPL200320C00220000	2020-03-16	19:46:27	220.0	34.55	33.15
24	AAPL200320C00225000	2020-03-16	19:49:46	225.0	29.80	29.25
25	AAPL200320C00230000	2020-03-16	19:46:27	230.0	26.55	25.45
26	AAPL200320C00235000	2020-03-16	19:46:47	235.0	21.85	21.55
27	AAPL200320C00240000	2020-03-16	19:48:10	240.0	18.00	18.10
28	AAPL200320C00245000	2020-03-16	19:50:05	245.0	14.56	15.05
29	AAPL200320C00250000	2020-03-16	19:50:26	250.0	11.55	11.75
..	...	...	...	...	...	...
52	AAPL200320C00327500	2020-03-16	19:29:55	327.5	0.01	0.01
53	AAPL200320C00330000	2020-03-16	18:16:30	330.0	0.01	0.01
54	AAPL200320C00332500	2020-03-16	15:56:09	332.5	0.01	0.01
55	AAPL200320C00335000	2020-03-16	19:49:55	335.0	0.01	0.01
56	AAPL200320C00337500	2020-03-16	13:47:11	337.5	0.01	0.00
57	AAPL200320C00340000	2020-03-16	19:49:55	340.0	0.01	0.00
58	AAPL200320C00345000	2020-03-16	19:40:24	345.0	0.01	0.00
59	AAPL200320C00350000	2020-03-16	19:37:28	350.0	0.01	0.02
60	AAPL200320C00355000	2020-03-13	18:04:53	355.0	0.01	0.01
61	AAPL200320C00360000	2020-03-13	19:57:03	360.0	0.01	0.01
62	AAPL200320C00365000	2020-03-16	18:29:53	365.0	0.01	0.01
63	AAPL200320C00370000	2020-03-16	18:29:53	370.0	0.01	0.00
64	AAPL200320C00375000	2020-03-10	19:57:44	375.0	0.01	0.02
65	AAPL200320C00380000	2020-03-12	18:35:58	380.0	0.01	0.00
66	AAPL200320C00385000	2020-03-16	13:45:45	385.0	0.01	0.00
67	AAPL200320C00390000	2020-03-12	14:08:46	390.0	0.04	0.00
68	AAPL200320C00395000	2020-03-16	13:45:35	395.0	0.01	0.00
69	AAPL200320C00400000	2020-03-16	13:45:22	400.0	0.01	0.00
70	AAPL200320C00405000	2020-03-12	16:45:06	405.0	0.03	0.00

71	AAPL200320C00410000	2020-03-12 16:59:56	410.0	0.02	0.00
72	AAPL200320C00415000	2020-03-11 14:18:22	415.0	0.04	0.00
73	AAPL200320C00420000	2020-03-06 20:45:35	420.0	0.01	0.00
74	AAPL200320C00430000	2020-02-28 19:54:26	430.0	0.01	0.00
75	AAPL200320C00440000	2020-03-16 13:48:45	440.0	0.01	0.00
76	AAPL200320C00450000	2020-03-13 13:30:03	450.0	0.01	0.00
77	AAPL200320C00460000	2020-02-27 17:56:55	460.0	0.01	0.00
78	AAPL200320C00470000	2020-02-28 15:41:20	470.0	0.02	0.00
79	AAPL200320C00480000	2020-03-16 13:48:51	480.0	0.01	0.02
80	AAPL200320C00490000	2020-03-16 13:54:24	490.0	0.01	0.00
81	AAPL200320C00500000	2020-03-13 13:30:02	500.0	0.01	0.00

	ask	change	percentChange	volume	openInterest \
0	146.50	0.000000	0.000000	1.0	11
1	141.90	0.000000	0.000000	3.0	50
2	136.90	0.000000	0.000000	1.0	9
3	167.70	0.000000	0.000000	2.0	0
4	127.15	0.000000	0.000000	NaN	1
5	121.95	0.000000	0.000000	NaN	1
6	116.15	0.000000	0.000000	10.0	12
7	111.75	0.000000	0.000000	2.0	4
8	106.00	0.000000	0.000000	1.0	2
9	100.85	-20.849998	-16.985740	164.0	61
10	107.70	0.000000	0.000000	274.0	0
11	91.45	-33.650000	-26.569286	4.0	15
12	86.30	-5.699997	-6.129029	1.0	10
13	80.80	-7.250000	-8.564678	125.0	121
14	75.40	-28.049995	-27.379206	218.0	113
15	69.85	-5.879997	-7.047822	4.0	3
16	67.10	0.000000	0.000000	15.0	20
17	61.75	-8.599998	-12.883893	16.0	8
18	56.10	-3.700001	-6.095553	131.0	10
19	51.00	-23.130005	-30.951430	205.0	186
20	46.05	-10.230003	-17.689787	233.0	251
21	43.50	-10.150002	-18.796299	158.0	389
22	38.75	-16.500000	-31.309298	202.0	1014
23	34.05	-16.800000	-32.716650	509.0	1542
24	29.90	-10.650002	-26.328806	401.0	1137
25	25.90	-22.050000	-45.370373	1143.0	3015
26	21.80	-19.339998	-46.953144	802.0	1879
27	18.35	-21.900002	-54.887222	2029.0	2047
28	15.30	-17.699997	-54.866703	2648.0	3767
29	12.20	-17.450000	-60.172417	17857.0	3324
..	...	...	...	...	...
52	0.04	0.000000	0.000000	39.0	2666
53	0.01	0.000000	0.000000	150.0	16235
54	0.02	-0.020000	-66.666670	41.0	565

55	0.02	-0.010000	-50.000000	2.0	6501
56	0.08	-0.030000	-75.000000	5.0	542
57	0.01	0.000000	0.000000	93.0	6306
58	0.01	0.000000	0.000000	502.0	3985
59	0.01	-0.010000	-50.000000	1053.0	10227
60	0.02	-2.070000	-99.519226	43.0	2355
61	0.01	0.000000	0.000000	1946.0	1916
62	0.01	0.000000	0.000000	3.0	1405
63	0.02	0.000000	0.000000	1.0	2466
64	0.32	0.000000	0.000000	2.0	2061
65	0.01	0.000000	0.000000	46.0	1705
66	0.01	0.000000	0.000000	200.0	1262
67	0.05	0.000000	0.000000	82.0	960
68	0.01	0.000000	0.000000	2.0	10342
69	0.01	0.000000	0.000000	4.0	8856
70	0.01	0.000000	0.000000	21.0	335
71	0.02	0.000000	0.000000	1.0	7137
72	0.11	0.000000	0.000000	5.0	290
73	0.02	0.000000	0.000000	100.0	13499
74	0.02	0.000000	0.000000	1.0	4367
75	0.02	-0.010000	-50.000000	1.0	1669
76	0.76	0.000000	0.000000	1.0	19356
77	0.01	0.000000	0.000000	2.0	2249
78	0.01	0.000000	0.000000	5.0	1949
79	0.05	0.000000	0.000000	1.0	264
80	0.01	-0.010000	-50.000000	8.0	392
81	0.01	0.000000	0.000000	1.0	5935

	impliedVolatility	inTheMoney	contractSize	currency
0	7.065919	True	REGULAR	USD
1	7.047853	True	REGULAR	USD
2	6.719240	True	REGULAR	USD
3	14.028810	True	REGULAR	USD
4	6.056643	True	REGULAR	USD
5	5.830569	True	REGULAR	USD
6	5.349613	True	REGULAR	USD
7	5.090336	True	REGULAR	USD
8	4.716801	True	REGULAR	USD
9	4.702153	True	REGULAR	USD
10	6.323977	True	REGULAR	USD
11	4.078130	True	REGULAR	USD
12	3.871826	True	REGULAR	USD
13	3.810059	True	REGULAR	USD
14	3.523927	True	REGULAR	USD
15	3.199221	True	REGULAR	USD
16	3.152346	True	REGULAR	USD
17	3.043215	True	REGULAR	USD

18	2.827151	True	REGULAR	USD
19	2.568363	True	REGULAR	USD
20	2.386723	True	REGULAR	USD
21	2.489506	True	REGULAR	USD
22	2.276127	True	REGULAR	USD
23	2.142583	True	REGULAR	USD
24	2.033208	True	REGULAR	USD
25	1.925293	True	REGULAR	USD
26	1.792970	True	REGULAR	USD
27	1.700197	True	REGULAR	USD
28	1.626955	False	REGULAR	USD
29	1.515627	False	REGULAR	USD
..	...	...	...	...
52	1.039067	False	REGULAR	USD
53	0.968750	False	REGULAR	USD
54	1.031255	False	REGULAR	USD
55	1.054692	False	REGULAR	USD
56	1.179692	False	REGULAR	USD
57	1.000005	False	REGULAR	USD
58	1.031255	False	REGULAR	USD
59	1.187504	False	REGULAR	USD
60	1.218754	False	REGULAR	USD
61	1.218754	False	REGULAR	USD
62	1.250004	False	REGULAR	USD
63	1.296879	False	REGULAR	USD
64	1.769532	False	REGULAR	USD
65	1.312503	False	REGULAR	USD
66	1.312503	False	REGULAR	USD
67	1.554690	False	REGULAR	USD
68	1.406253	False	REGULAR	USD
69	1.437503	False	REGULAR	USD
70	1.468753	False	REGULAR	USD
71	1.578127	False	REGULAR	USD
72	1.867188	False	REGULAR	USD
73	1.640627	False	REGULAR	USD
74	1.703126	False	REGULAR	USD
75	1.765626	False	REGULAR	USD
76	2.628910	False	REGULAR	USD
77	1.812501	False	REGULAR	USD
78	1.843751	False	REGULAR	USD
79	2.210942	False	REGULAR	USD
80	1.937500	False	REGULAR	USD
81	2.000005	False	REGULAR	USD

[82 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					
2020-03-10	285.339996	285.339996	286.440002	269.369995	277.140015
2020-03-11	275.429993	275.429993	281.220001	271.859985	277.390015
2020-03-12	248.229996	248.229996	270.000000	248.000000	255.940002
2020-03-13	277.970001	277.970001	279.920013	252.949997	264.890015
2020-03-16	242.210007	242.210007	259.079987	240.000000	241.949997

	Volume
Date	
2020-03-10	71322500
2020-03-11	63899700
2020-03-12	104618500
2020-03-13	92683000
2020-03-16	80414800

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

```
[9]: 242.2100067138672
```

```
[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.calls['strike'][27] # exercise price of an options that
→ is fixed price
call_price = dfo_exp.calls['lastPrice'][27] # price of an option or premium
```

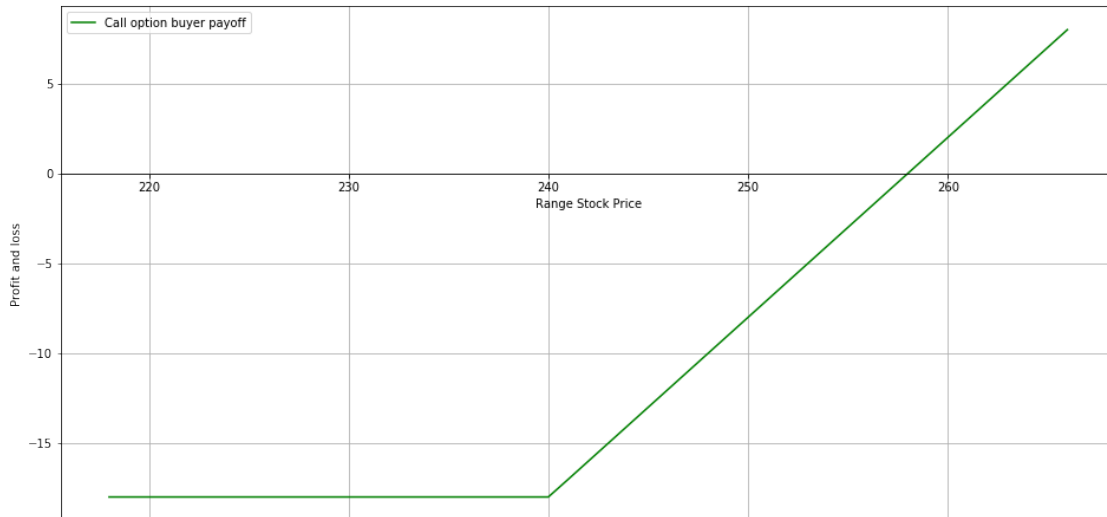
```
[11]: def call_option(share_price, strike_price, call_price):
    pnl = np.where(share_price > strike_price, share_price - strike_price, 0)
    return pnl - call_price
```

```
[12]: payoff_long_call = call_option(share_price, strike_price, call_price)
# Plot the graph
plt.subplots(figsize=(16,8))
```

```

plt.gca().spines['bottom'].set_position('zero')
plt.plot(share_price, payoff_long_call, label='Call option buyer_1',
        color='g')
plt.xlabel('Range Stock Price')
plt.ylabel('Profit and loss')
plt.grid(which='both')
plt.legend()
plt.show()

```



```

[13]: payoff_short_call = payoff_long_call * -1.0
      # Plot
      plt.subplots(figsize=(16,8))
      plt.gca().spines['bottom'].set_position('zero')
      plt.plot(share_price, payoff_short_call, label='Short 240 Strike Call', color='r')
      plt.xlabel('Range Stock Price')
      plt.ylabel('Profit and loss')
      plt.grid(which='both')
      plt.legend()
      plt.show()

```

