Options_Call

September 29, 2021

1 Call Option

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

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

```python
[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')
```

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

```python
[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␣
 ↪payoff',color='g')
plt.xlabel('Range Stock Price')
plt.ylabel('Profit and loss')
plt.grid(which='both')
plt.legend()
plt.show()
```
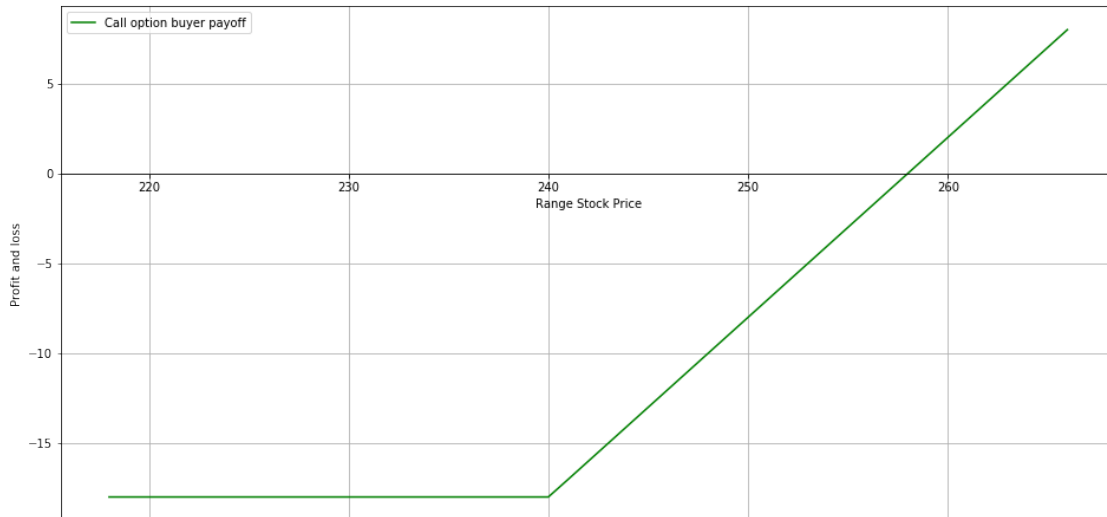


```
[13]: payoff_short_call = payoff_long_call * -1.0
      # Plot
      plt.subplots(figsize=(16,8))
      plt.gca().spines['bottom'].set_position('zero')
      plt.plot(share_price,payoff_short_call,label='Short 240 Strike Call',color='r')
      plt.xlabel('Range Stock Price')
      plt.ylabel('Profit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