

Options_Butterfly_Spread

September 29, 2021

1 Butterfly Spread

```
[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',
      '2020-11-19',
      '2021-09-16',
      '2022-06-16',
      '2021-04-15',
      '2022-01-20',
      '2020-12-17',
      '2020-11-12',
      '2023-01-19',
      '2020-11-05',
      '2020-12-03',
      '2022-09-15',
      '2021-03-18',
      '2020-11-26',
      '2021-01-14')
```

```
[4]: dfo_exp = dfo.option_chain('2020-11-26')
```

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

```
[5]:
```

	contractSymbol	lastTradeDate	strike	lastPrice	bid	ask	\
0	AAPL201127C00070000	2020-10-29 14:54:49	70.0	44.75	38.75	39.60	
1	AAPL201127C00080000	2020-10-29 14:44:08	80.0	29.00	28.85	29.90	
2	AAPL201127C00085000	2020-10-30 17:59:57	85.0	23.75	23.95	24.85	
3	AAPL201127C00090000	2020-10-30 18:58:52	90.0	18.91	19.15	20.05	
4	AAPL201127C00095000	2020-10-30 19:30:01	95.0	14.50	14.10	15.75	
5	AAPL201127C00100000	2020-10-30 19:46:45	100.0	10.30	10.45	11.30	

6	AAPL201127C00101000	2020-10-30	19:45:01	101.0	9.75	9.25	10.35
7	AAPL201127C00102000	2020-10-30	19:26:52	102.0	8.75	8.45	9.90
8	AAPL201127C00103000	2020-10-30	19:33:34	103.0	8.06	7.55	8.90
9	AAPL201127C00104000	2020-10-30	19:28:03	104.0	7.41	6.90	8.90
10	AAPL201127C00105000	2020-10-30	19:56:03	105.0	6.95	7.20	7.70
11	AAPL201127C00106000	2020-10-30	19:59:34	106.0	6.75	6.40	6.95
12	AAPL201127C00107000	2020-10-30	19:40:03	107.0	5.79	5.80	6.35
13	AAPL201127C00108000	2020-10-30	19:57:07	108.0	5.55	5.35	6.05
14	AAPL201127C00109000	2020-10-30	19:58:28	109.0	5.20	4.85	5.20
15	AAPL201127C00110000	2020-10-30	19:59:05	110.0	4.65	4.35	4.80
16	AAPL201127C00111000	2020-10-30	19:56:33	111.0	4.10	4.05	4.30
17	AAPL201127C00112000	2020-10-30	19:51:22	112.0	3.52	3.30	4.00
18	AAPL201127C00113000	2020-10-30	19:52:24	113.0	3.09	2.95	4.15
19	AAPL201127C00114000	2020-10-30	19:52:24	114.0	3.01	2.79	3.40
20	AAPL201127C00115000	2020-10-30	19:58:42	115.0	2.69	2.46	2.73
21	AAPL201127C00116000	2020-10-30	19:57:16	116.0	2.37	2.05	2.60
22	AAPL201127C00117000	2020-10-30	19:48:27	117.0	2.04	1.67	2.57
23	AAPL201127C00118000	2020-10-30	19:53:09	118.0	1.67	1.50	2.09
24	AAPL201127C00119000	2020-10-30	19:53:09	119.0	1.48	1.36	1.85
25	AAPL201127C00120000	2020-10-30	19:59:17	120.0	1.42	1.25	1.50
26	AAPL201127C00121000	2020-10-30	19:53:11	121.0	1.23	1.06	1.48
27	AAPL201127C00122000	2020-10-30	19:53:41	122.0	1.02	0.95	1.17
28	AAPL201127C00123000	2020-10-30	19:59:36	123.0	0.99	0.80	1.05
29	AAPL201127C00124000	2020-10-30	19:15:47	124.0	0.80	0.76	1.05
30	AAPL201127C00125000	2020-10-30	19:51:04	125.0	0.73	0.71	0.94
31	AAPL201127C00126000	2020-10-30	19:57:32	126.0	0.63	0.62	0.90
32	AAPL201127C00127000	2020-10-30	19:57:29	127.0	0.55	0.55	0.97
33	AAPL201127C00128000	2020-10-30	19:52:03	128.0	0.50	0.49	0.68
34	AAPL201127C00129000	2020-10-30	19:36:00	129.0	0.44	0.43	0.55
35	AAPL201127C00130000	2020-10-30	19:57:31	130.0	0.40	0.38	0.65
36	AAPL201127C00131000	2020-10-30	19:49:49	131.0	0.35	0.34	0.55
37	AAPL201127C00132000	2020-10-30	19:58:19	132.0	0.34	0.31	0.66
38	AAPL201127C00133000	2020-10-30	19:03:54	133.0	0.29	0.27	0.48
39	AAPL201127C00134000	2020-10-30	19:09:34	134.0	0.25	0.24	0.57
40	AAPL201127C00135000	2020-10-30	19:57:31	135.0	0.24	0.21	0.25
41	AAPL201127C00140000	2020-10-30	19:51:31	140.0	0.16	0.15	0.43
42	AAPL201127C00145000	2020-10-30	19:31:09	145.0	0.12	0.10	0.14
43	AAPL201127C00150000	2020-10-30	19:59:19	150.0	0.10	0.08	0.13
44	AAPL201127C00155000	2020-10-30	19:56:17	155.0	0.07	0.05	0.08
45	AAPL201127C00160000	2020-10-30	19:55:29	160.0	0.06	0.02	0.10
46	AAPL201127C00165000	2020-10-30	15:07:38	165.0	0.05	0.05	0.09
47	AAPL201127C00170000	2020-10-30	17:38:28	170.0	0.06	0.04	0.08
48	AAPL201127C00175000	2020-10-30	16:03:54	175.0	0.03	0.01	0.08

	change	percentChange	volume	openInterest	impliedVolatility \
0	0.000000	0.000000	202	252	0.907227
1	-5.479999	-15.893270	1	29	0.741214

2	-7.549999	-24.121403	13	466	0.627933
3	-5.190001	-21.535270	3	46	0.555180
4	-6.690001	-31.571499	65	56	0.602055
5	-6.380000	-38.249400	194	561	0.515142
6	-3.950000	-28.832117	24	7	0.488775
7	-7.090000	-44.760100	34	46	0.510991
8	-4.200000	-34.257744	34	30	0.477056
9	-4.290000	-36.666668	63	26	0.534673
10	-5.790000	-45.447410	194	178	0.479375
11	-5.400000	-44.444443	201	69	0.463628
12	-5.430000	-48.395720	194	73	0.458746
13	-4.809999	-46.428566	598	368	0.477056
14	-4.800000	-48.000000	979	110	0.446050
15	-3.850000	-45.294117	7691	23795	0.450933
16	-4.350000	-51.479294	1213	279	0.444708
17	-4.830000	-57.844310	325	523	0.453130
18	-4.060000	-56.783222	369	432	0.498418
19	-3.790000	-55.735294	1129	380	0.463384
20	-3.300000	-55.091816	2489	2172	0.431646
21	-3.300000	-58.201060	859	1124	0.446417
22	-2.960000	-59.200000	922	1127	0.469488
23	-3.080000	-64.842100	367	861	0.446783
24	-2.750000	-65.011820	143	983	0.445074
25	-2.180000	-60.555553	7091	16609	0.428473
26	-2.620000	-68.051950	336	1237	0.447027
27	-2.330000	-69.552240	775	1221	0.428961
28	-1.890000	-65.625000	317	866	0.432135
29	-1.790000	-69.111970	548	1191	0.450445
30	-1.550000	-67.982450	1538	7692	0.452642
31	-1.430000	-69.417480	249	653	0.463873
32	-1.410000	-71.938774	105	535	0.491704
33	-1.000000	-66.666670	271	401	0.459966
34	-1.220000	-73.493980	234	2518	0.450689
35	-0.800000	-66.666670	1256	9326	0.485357
36	-0.910000	-72.222220	146	244	0.480474
37	-0.840000	-71.186430	158	109	0.517583
38	-0.740000	-71.844660	107	399	0.493169
39	-0.660000	-72.527470	108	292	0.527348
40	-0.520000	-68.421050	695	1283	0.455084
41	-0.300000	-65.217390	284	1288	0.529790
42	-0.220000	-64.705880	383	1430	0.507817
43	-0.150000	-60.000004	272	780	0.546880
44	-0.110000	-61.111110	611	1993	0.556645
45	-0.080000	-57.142853	636	249	0.593754
46	-0.070000	-58.333332	18	125	0.644535
47	-0.040000	-40.000004	10	175	0.671878
48	-0.040000	-57.142853	24	31	0.687503

	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	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
30	False	REGULAR	USD
31	False	REGULAR	USD
32	False	REGULAR	USD
33	False	REGULAR	USD
34	False	REGULAR	USD
35	False	REGULAR	USD
36	False	REGULAR	USD
37	False	REGULAR	USD
38	False	REGULAR	USD
39	False	REGULAR	USD
40	False	REGULAR	USD
41	False	REGULAR	USD
42	False	REGULAR	USD
43	False	REGULAR	USD
44	False	REGULAR	USD

45	False	REGULAR	USD
46	False	REGULAR	USD
47	False	REGULAR	USD
48	False	REGULAR	USD

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

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[*****100%*****] 1 of 1 completed
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```
[7]: df.head()
```

```
[7]:
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	Adj Close	Close	High	Low	Open	Volume
Date						
1980-12-12	0.101261	0.128348	0.128906	0.128348	0.128348	469033600
1980-12-15	0.095978	0.121652	0.122210	0.121652	0.122210	175884800
1980-12-16	0.088934	0.112723	0.113281	0.112723	0.113281	105728000
1980-12-17	0.091135	0.115513	0.116071	0.115513	0.115513	86441600
1980-12-18	0.093777	0.118862	0.119420	0.118862	0.118862	73449600

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

```
[8]:
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	Adj Close	Close	High	Low	Open \
Date					
2020-10-26	115.050003	115.050003	116.550003	112.879997	114.010002
2020-10-27	116.599998	116.599998	117.279999	114.540001	115.489998
2020-10-28	111.199997	111.199997	115.430000	111.099998	115.050003
2020-10-29	115.320000	115.320000	116.930000	112.199997	112.370003
2020-10-30	108.860001	108.860001	111.989998	107.720001	111.059998


```
Volume
```

Date	Volume
2020-10-26	111850700
2020-10-27	92276800
2020-10-28	143937800
2020-10-29	146129200
2020-10-30	190272600

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

```
[9]: 108.86000061035156
```

```
[10]: K1 = dfo_exp.calls['strike'][11]
      K2 = dfo_exp.calls['strike'][13]
      K3 = dfo_exp.calls['strike'][15]
```

```
[11]: CurrentStockPrice = df['Adj Close'][-1]
```

```

[12]: i = 0
while i < 10:
    CurrentStockPrice = CurrentStockPrice + 25
    payoff = 0
    if (CurrentStockPrice > K1 and CurrentStockPrice <= K2):
        payoff = CurrentStockPrice - K1
    elif (CurrentStockPrice > K2 and CurrentStockPrice < K3):
        payoff = K3 - CurrentStockPrice
    elif (CurrentStockPrice <= K1):
        payoff = 0
    elif (CurrentStockPrice >= K3):
        payoff = 0
    else:
        payoff = 0
    print("Stock price: %2.2f"%CurrentStockPrice)
    print("Payoff from butterfly spread: %2.2f"%payoff)
    print("-"*35)
    i = i + 1

while i >= 0:
    CurrentStockPrice = CurrentStockPrice - 25
    payoff = 0
    if (CurrentStockPrice > K1 and CurrentStockPrice <= K2):
        payoff = CurrentStockPrice - K1
    elif (CurrentStockPrice > K2 and CurrentStockPrice < K3):
        payoff = K3 - CurrentStockPrice
    elif (CurrentStockPrice <= K1):
        payoff = 0
    elif (CurrentStockPrice >= K3):
        payoff = 0
    else:
        payoff = 0

    print("Stock price: %2.2f"%CurrentStockPrice)
    print("Payoff from butterfly spread: %2.2f"%payoff)
    print("-"*35)
    i = i - 1

```

```

Stock price: 133.86
Payoff from butterfly spread: 0.00
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Stock price: 158.86
Payoff from butterfly spread: 0.00
-----
Stock price: 183.86
Payoff from butterfly spread: 0.00
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```

Stock price: 208.86	Payoff from butterfly spread: 0.00

Stock price: 233.86	Payoff from butterfly spread: 0.00

Stock price: 258.86	Payoff from butterfly spread: 0.00

Stock price: 283.86	Payoff from butterfly spread: 0.00

Stock price: 308.86	Payoff from butterfly spread: 0.00

Stock price: 333.86	Payoff from butterfly spread: 0.00

Stock price: 358.86	Payoff from butterfly spread: 0.00

Stock price: 333.86	Payoff from butterfly spread: 0.00

Stock price: 308.86	Payoff from butterfly spread: 0.00

Stock price: 283.86	Payoff from butterfly spread: 0.00

Stock price: 258.86	Payoff from butterfly spread: 0.00

Stock price: 233.86	Payoff from butterfly spread: 0.00

Stock price: 208.86	Payoff from butterfly spread: 0.00

Stock price: 183.86	Payoff from butterfly spread: 0.00

Stock price: 158.86	Payoff from butterfly spread: 0.00

Stock price: 133.86	Payoff from butterfly spread: 0.00

Stock price: 108.86
Payoff from butterfly spread: 1.14

Stock price: 83.86
Payoff from butterfly spread: 0.00
