



# OPTIONS

What is worth investing?

Group 3 : Sungmoo Ban, Ryan Johnson, Jung Kim, Jennifer Taylor, Danica Valera

# What is Options Trading?

4 Days to expiration on 2022-06-10

Implied Volatility: 86.43%

Historic Volatility: 86.76%

Calls

Strike	Moneyness	Bid	Midpoint	Ask	Last	Change	%Chg	Volume	Open Int	Vol/OI	IV	Last Trade	Avg IV
665.00	+6.97%	56.95	58.05	59.15	60.00	5.63	+10.35%	45	56	0.80	280.71%	06/06/22	86.43%
670.00	+6.27%	53.05	54.10	55.15	56.35	6.95	+14.07%	56	300	0.19	258.18%	06/06/22	86.43%
675.00	+5.57%	49.10	50.20	51.30	52.50	4.70	+9.83%	78	448	0.17	236.03%	06/06/22	86.43%
680.00	+4.87%	45.85	46.65	47.45	47.90	5.29	+12.41%	1,442	317	4.55	215.29%	06/06/22	86.43%
685.00	+4.17%	42.20	43.00	43.80	43.73	4.18	+10.57%	86	277	0.31	196.91%	06/06/22	86.43%
690.00	+3.47%	38.55	39.80	41.05	39.12	2.53	+6.91%	616	265	2.32	172.74%	06/06/22	86.43%
695.00	+2.78%	35.50	36.28	37.05	37.92	4.27	+12.69%	216	294	0.73	154.86%	06/06/22	86.43%
700.00	+2.08%	32.45	33.03	33.60	33.00	1.98	+5.67%	3,072	1,989	2.53	135.63%	06/06/22	86.43%
705.00	+1.38%	29.55	30.03	30.50	31.06	2.81	+9.95%	1,195	822	1.45	117.29%	06/06/22	86.43%
710.00	+0.68%	26.65	27.03	27.40	27.10	1.53	+5.98%	8,453	2,072	4.08	99.15%	06/06/22	86.43%
715.00	-0.02%	24.20	24.58	24.95	24.85	1.35	+5.74%	6,043	685	8.82	83.09%	06/06/22	86.43%
720.00	-0.72%	21.50	21.98	22.45	23.02	1.87	+8.84%	10,622	1,410	7.53	64.49%	06/06/22	86.43%
725.00	-1.42%	19.20	19.58	19.95	19.61	0.45	+2.35%	5,897	1,349	4.37	46.51%	06/06/22	86.43%
730.00	-2.12%	17.20	17.45	17.70	17.70	0.45	+2.61%	8,981	1,657	5.42	26.43%	06/06/22	86.43%
735.00	-2.82%	15.05	15.40	15.75	15.40	0.00	unch	3,305	4,942	0.67	0.00%	06/06/22	86.43%
740.00	-3.52%	13.30	13.58	13.85	13.58	-0.28	-2.02%	5,617	2,501	2.25	0.00%	06/06/22	86.43%
745.00	-4.22%	11.60	11.88	12.15	12.70	0.35	+2.83%	1,439	1,081	1.33	0.00%	06/06/22	86.43%
750.00	-4.92%	10.20	10.43	10.65	10.47	-0.53	-4.82%	22,357	4,222	5.30	0.00%	06/06/22	86.43%
755.00	-5.62%	8.85	9.05	9.25	9.30	-0.61	-6.16%	1,973	1,173	1.68	0.00%	06/06/22	86.43%



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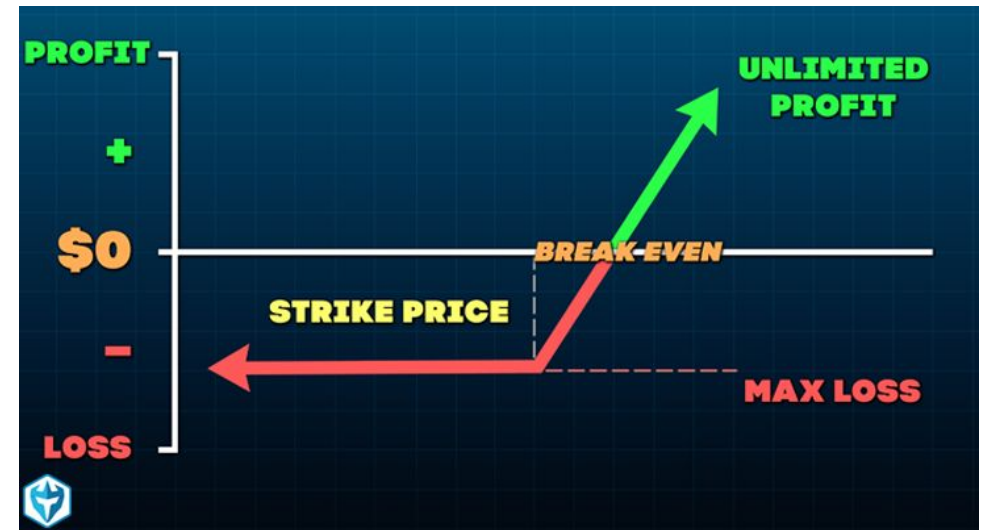
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Current Price:  
\$714.84



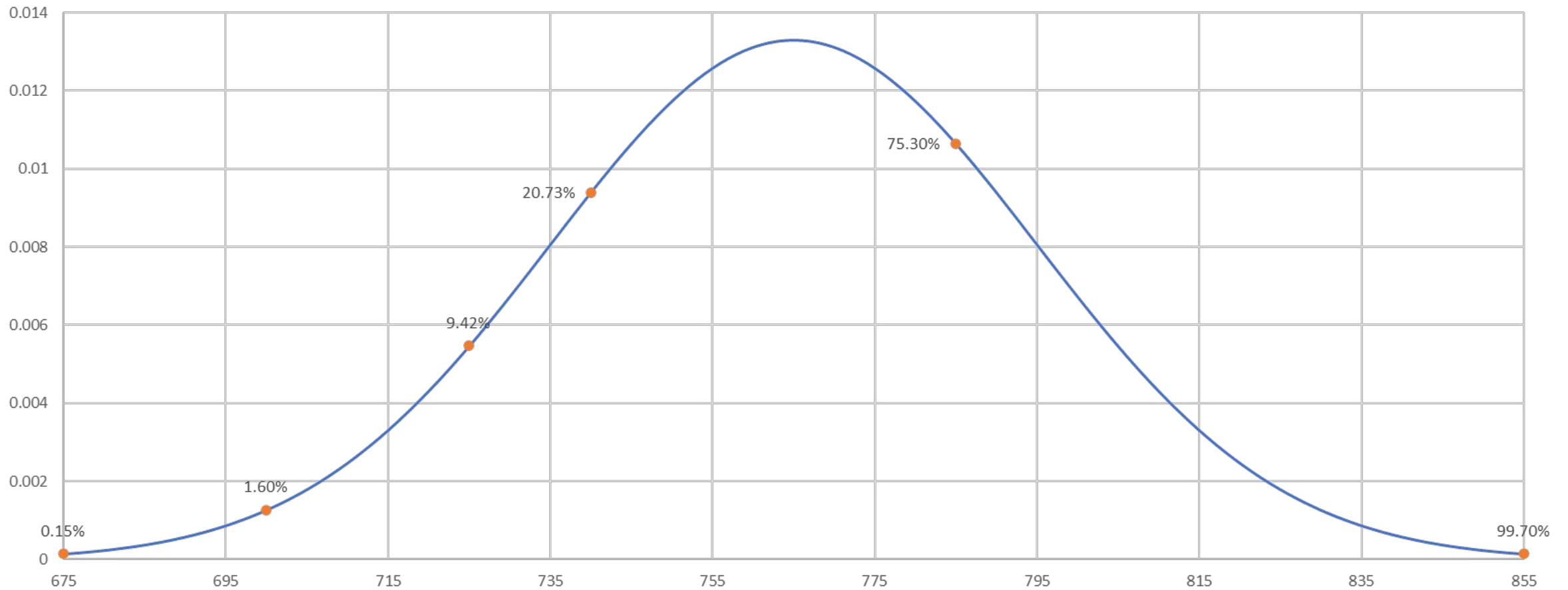
# Main Objective

- Determine whether or not a specific option is profitable for a specified window of time
- Provide the best strike price to buy in.



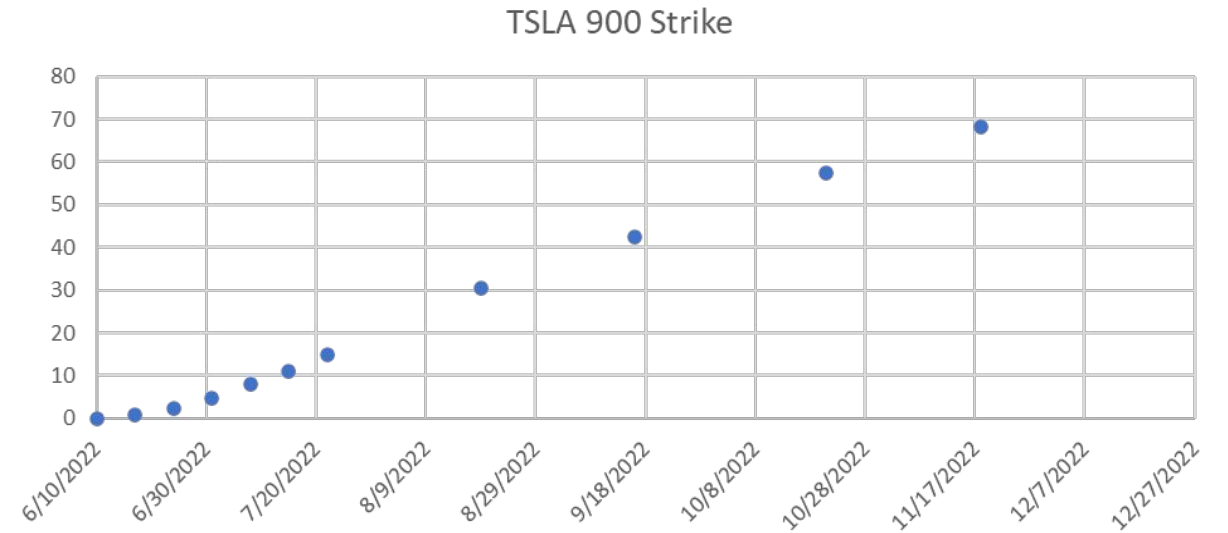
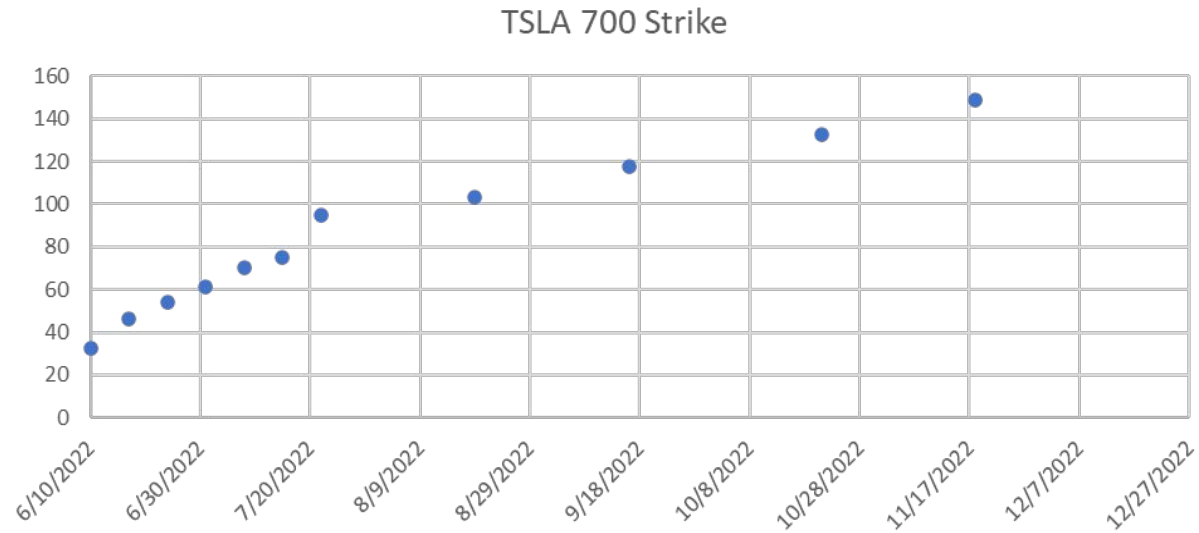
# Forecast Prediction Results

TSLA Stock Predictions



← 0.15% → 99.85% →

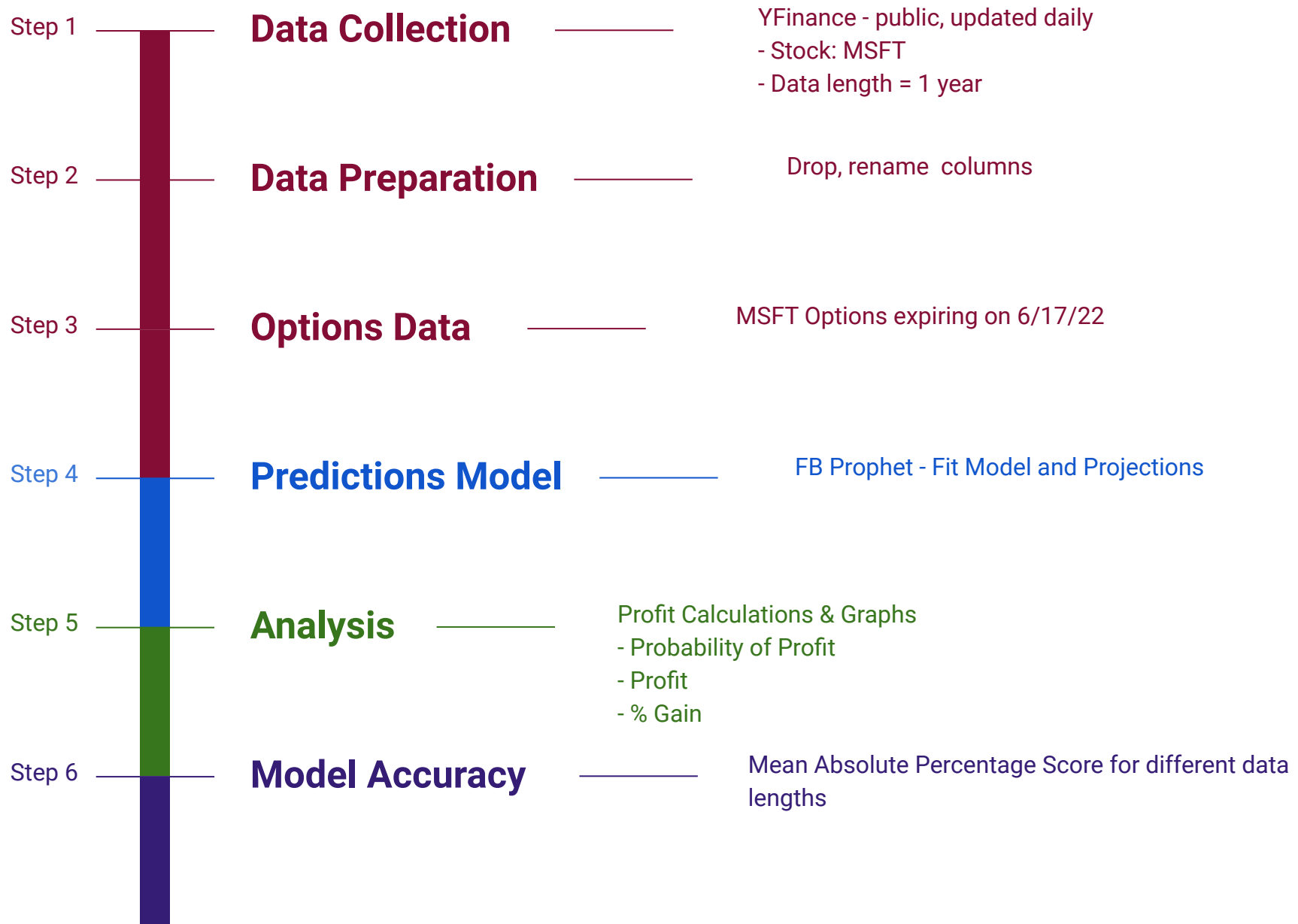
# Options Time Decay



As options near their expiration there is less time for the stock to reach the strike price which causes the option price to decrease naturally over time.

# Methods



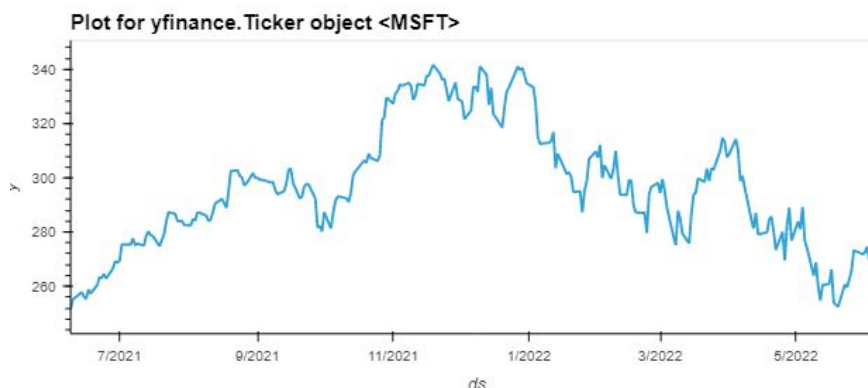


# Results

# MSFT - YFinance Data

- Data length = 1 year historical data
- Projection Period = 30 days
- Expiration date: 6/17/22

	Open	High	Low	Close	Volume
Date					
2021-06-09	251.754291	253.460361	251.159160	251.536072	17937600
2021-06-10	252.230406	255.374729	251.615432	255.156509	24563600
2021-06-11	255.900420	256.396370	254.531592	255.801254	18999700
2021-06-14	255.811162	257.844576	254.720065	257.785065	19150500
2021-06-15	257.666009	257.884228	255.592940	256.267426	18038900



ticker.options

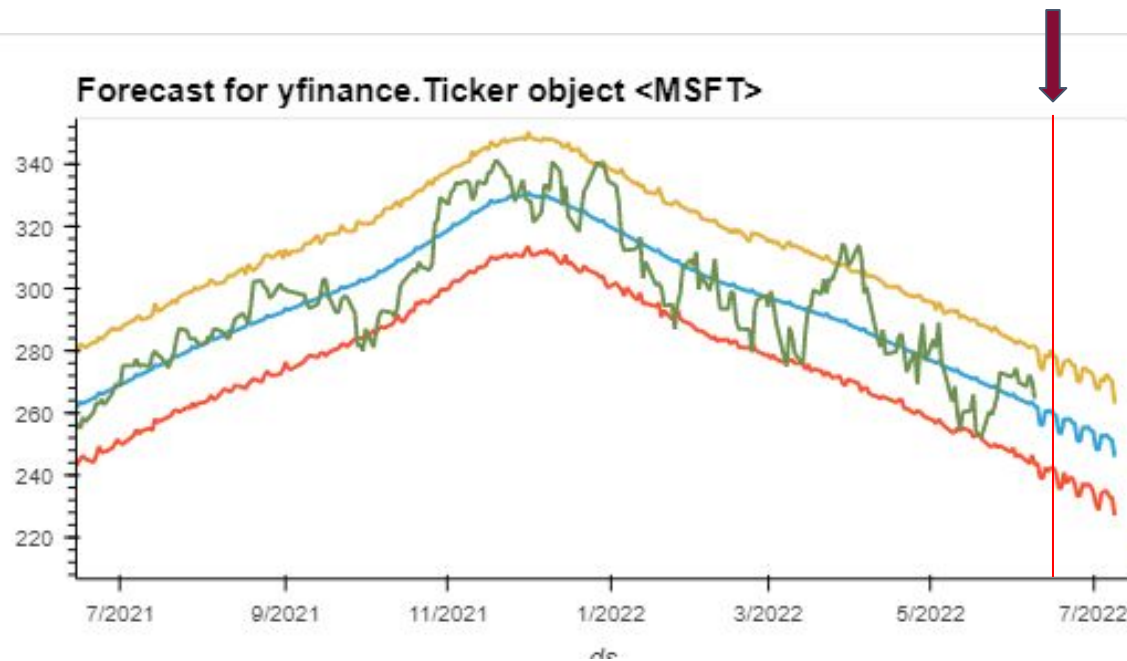
('2022-06-17',  
'2022-06-24',  
'2022-07-01',  
'2022-07-08',  
'2022-07-15',  
'2022-07-22',  
'2022-07-29',  
'2022-08-19',  
'2022-09-16',  
'2022-10-21',  
'2022-11-18',  
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opt\_calls\_df.head(20)

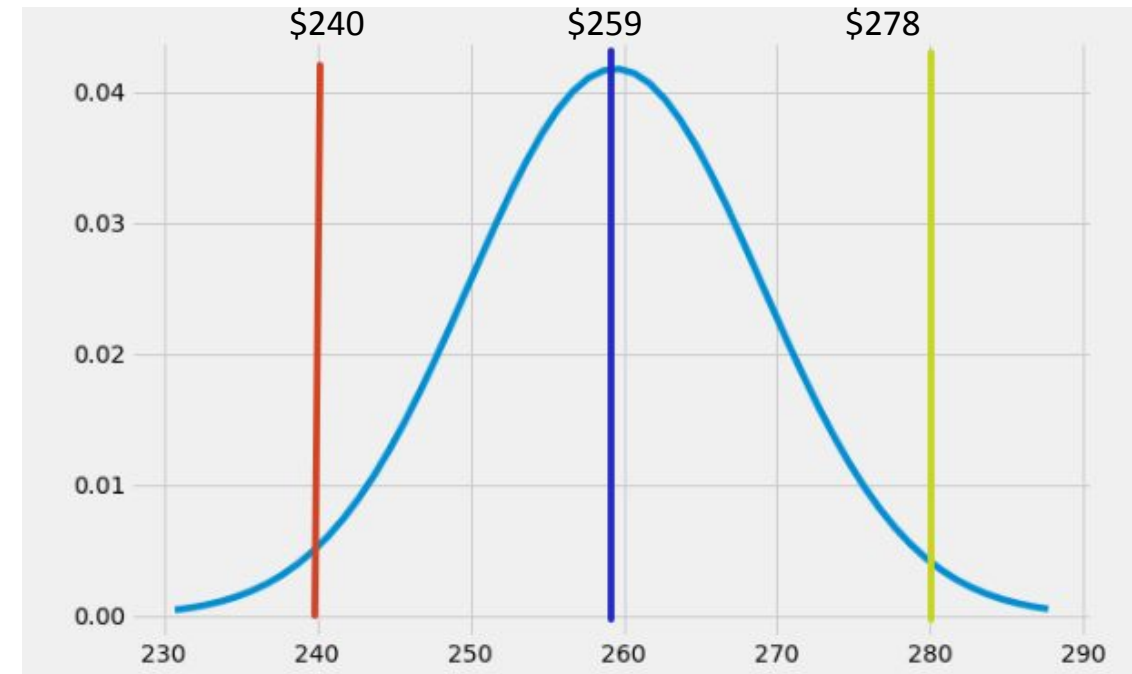
	contractSymbol	strike	lastPrice	volume
0	MSFT220617C00080000	80.0	175.27	1
1	MSFT220617C00085000	85.0	169.20	1
2	MSFT220617C00090000	90.0	181.30	1
3	MSFT220617C00095000	95.0	176.65	11
4	MSFT220617C00100000	100.0	154.50	10
5	MSFT220617C00105000	105.0	149.50	1
6	MSFT220617C00110000	110.0	144.00	2
7	MSFT220617C00115000	115.0	150.10	35
8	MSFT220617C00120000	120.0	133.30	3
9	MSFT220617C00125000	125.0	130.00	1
10	MSFT220617C00130000	130.0	137.00	1
11	MSFT220617C00135000	135.0	125.00	2
12	MSFT220617C00140000	140.0	129.11	3
13	MSFT220617C00145000	145.0	106.42	1
14	MSFT220617C00150000	150.0	124.00	5
15	MSFT220617C00155000	155.0	117.00	5
16	MSFT220617C00160000	160.0	94.70	2
17	MSFT220617C00165000	165.0	95.00	1
18	MSFT220617C00170000	170.0	85.49	2
19	MSFT220617C00175000	175.0	78.45	21

# MSFT - Projections

- Data length = 1 year historical data
- Projection Period = 30 days
- Expiration date: 6/17/22



6/17/22 Projection price

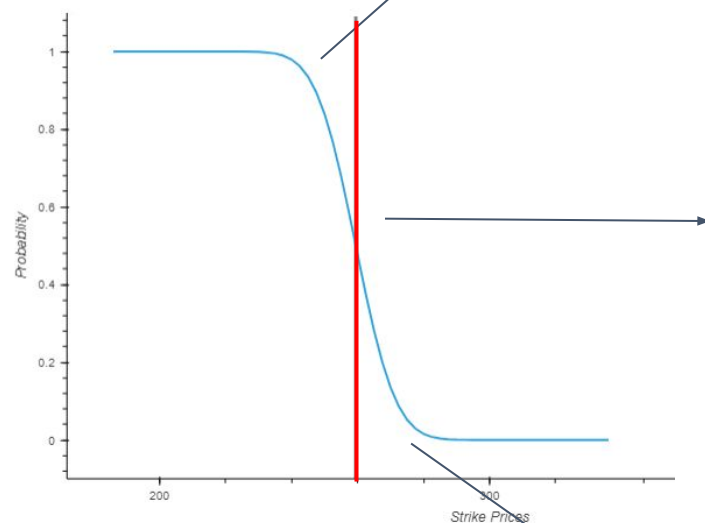


# MSFT - Probability of Profit

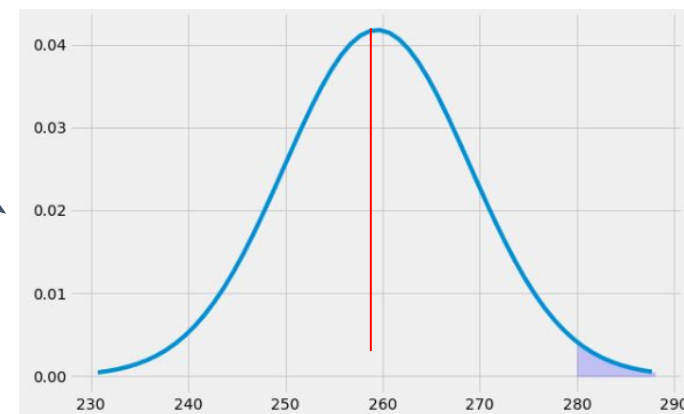
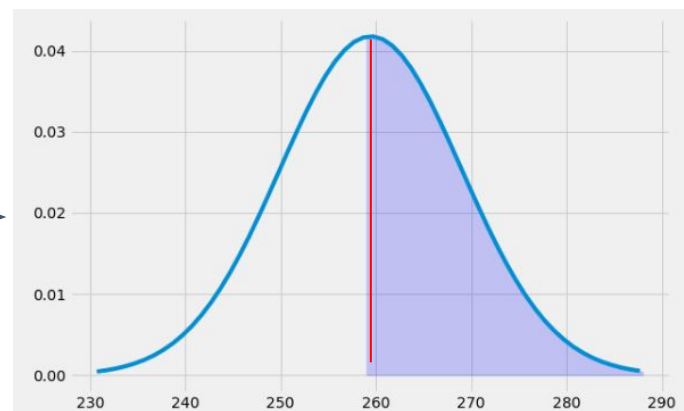
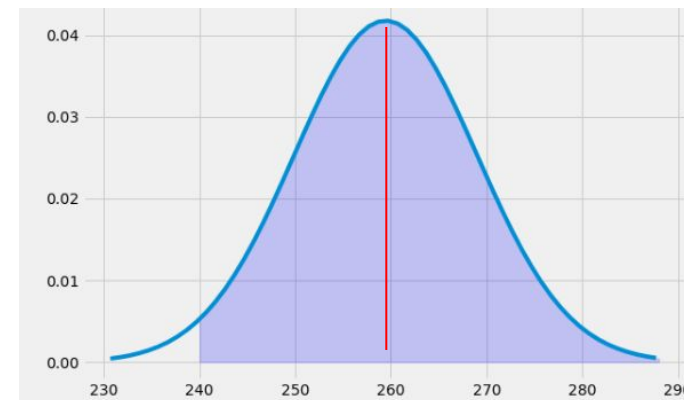
- Data length = 1 year historical data
- Projection Period = 30 days
- Expiration date: 6/17/22
- Projected Price: \$259

	contractSymbol	strike	lastPrice	sum_contribution	prob
32	MSFT220617C00237500	237.5	18.34	3.76	0.99
33	MSFT220617C00240000	240.0	14.90	4.76	0.98
34	MSFT220617C00242500	242.5	13.35	4.16	0.96
35	MSFT220617C00245000	245.0	10.80	4.60	0.93
36	MSFT220617C00247500	247.5	8.79	4.51	0.89
37	MSFT220617C00250000	250.0	7.15	4.08	0.84
38	MSFT220617C00252500	252.5	5.56	4.42	0.77
39	MSFT220617C00255000	255.0	4.35	4.38	0.68
40	MSFT220617C00257500	257.5	3.25	4.23	0.58
41	MSFT220617C00260000	260.0	2.39	3.84	0.48
42	MSFT220617C00262500	262.5	1.71	3.27	0.37
43	MSFT220617C00265000	265.0	1.20	2.53	0.28
44	MSFT220617C00267500	267.5	0.83	1.65	0.20
45	MSFT220617C00270000	270.0	0.58	0.99	0.13
46	MSFT220617C00272500	272.5	0.41	0.77	0.09
47	MSFT220617C00275000	275.0	0.29	0.50	0.05
48	MSFT220617C00277500	277.5	0.22	0.17	0.03
49	MSFT220617C00280000	280.0	0.16	0.03	0.02

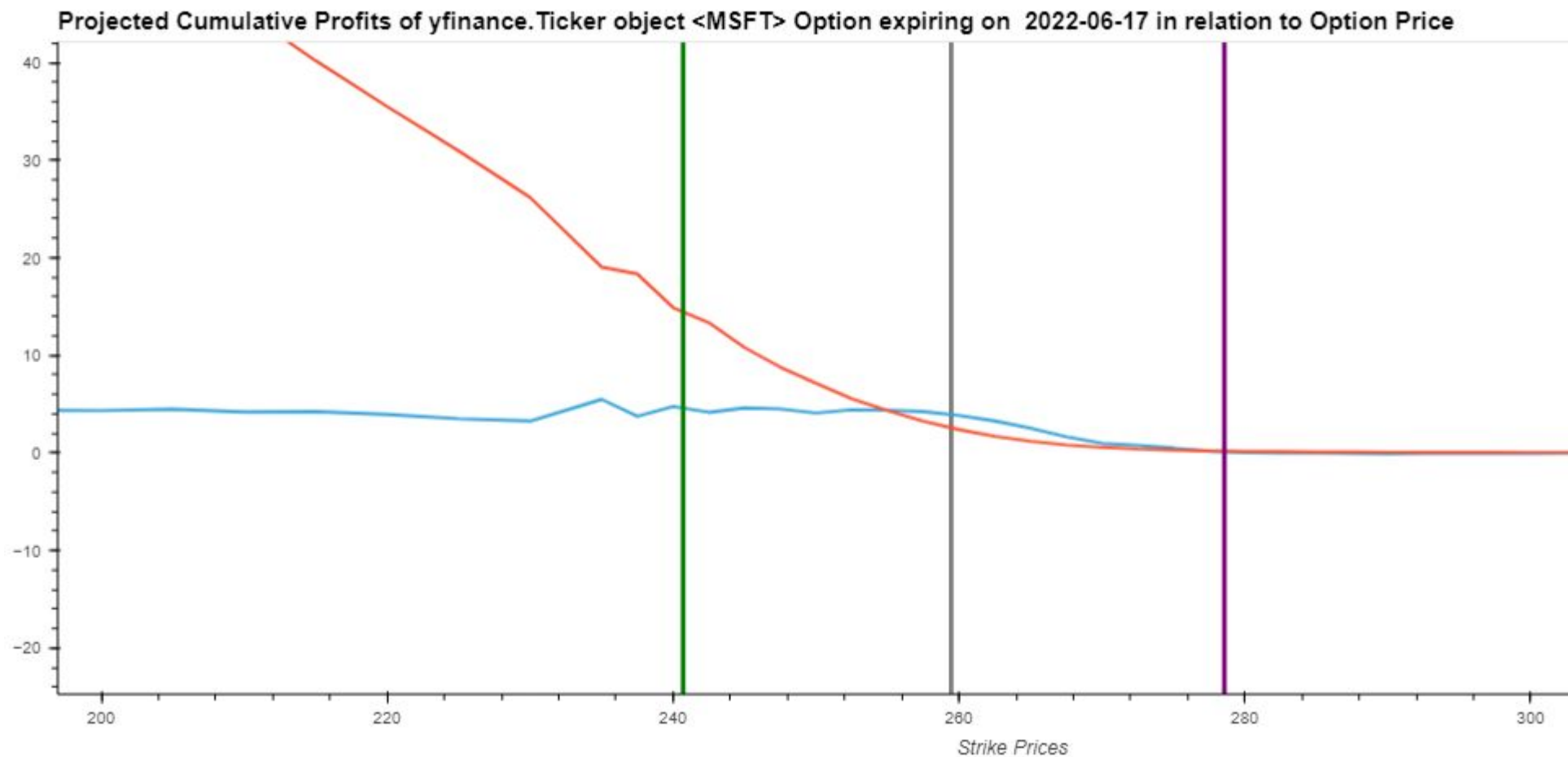
Probability of Profit by Option Strike price



\$259

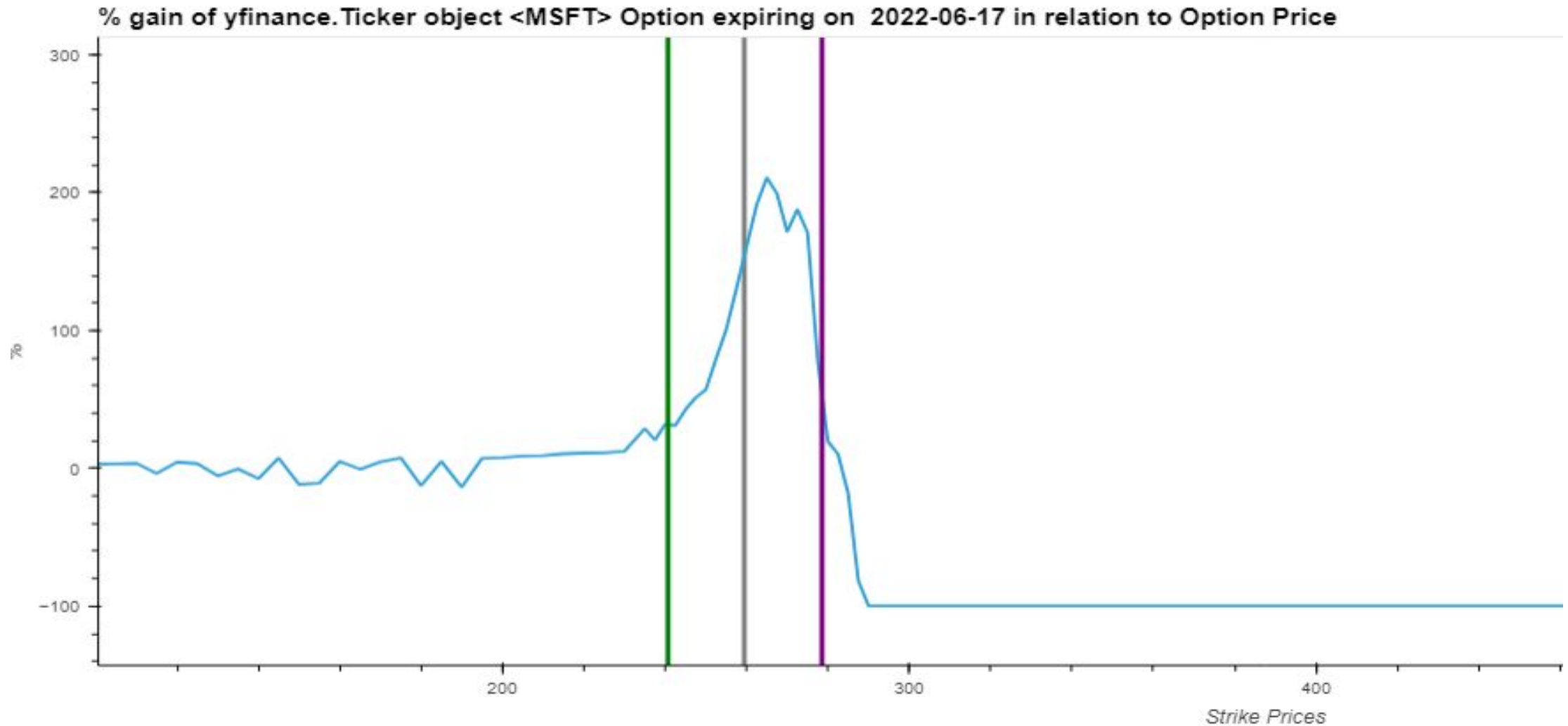


# Results - Cumulative Profit





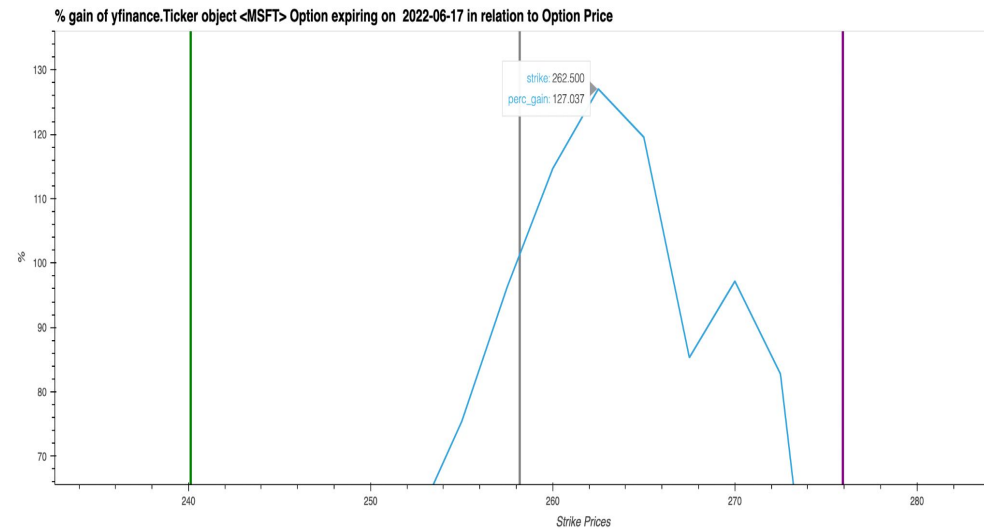
# Results - Prediction Model



# Conclusion

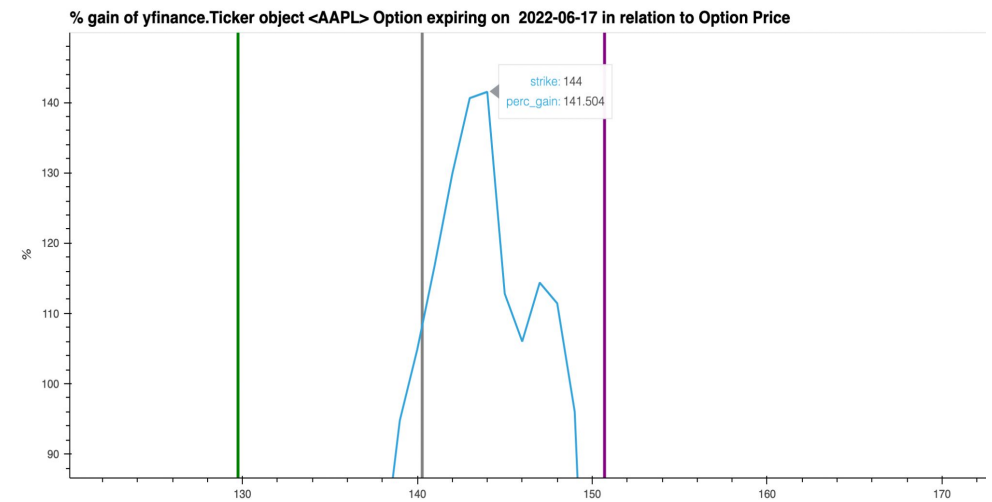
# Conclusion

- Microsoft Option
  - Most profitable strike price: \$262.50
  - Percentage gain: 127%



Indicate Ticker : 📌

```
# Indicate Ticker to pull from Yahoo Finance  
ticker = yf.Ticker("AAPL")
```



# Model Accuracy

6 months	5.52%
1 year	2.28%
5 years	6.31%

MAPE < 10% is Excellent, **MAPE < 20%** is Good

# Next Steps

- Apply to daily price of options swings
- Other machine learning models including Neural Network
- Apply more math algorithm to get different dimensions of output
- Backtest with historical option price
- Define functions to automate the process of pulling data
- Develop Robo adviser using AWS Lex, Sagemaker, S3
- Add risk tolerance inputs to adjust our predictions

Questions?