April 2020

TEXAS
The University of Texas at Austin

WOLVES OF DEAN KEETON ST

Final Presentation
ME369P

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This is not financial advice

Background

- Overview: Using Python to analysis stock market data analysis and visualization

- Selling Puts Contracts: "Agreement to buy 100 shares of a particular stock at a predetermined price by a particular date"
  - Premium - Money received or price per contract
  - Strike price - the predetermined price
  - Strike date - expiration of the contract
  - Collateral - 100*Strike Price
- Picking the right put to sell is hard!
  - Virtually infinite choices
  - Lots of variables
  - Highly risky
  - Different strategies
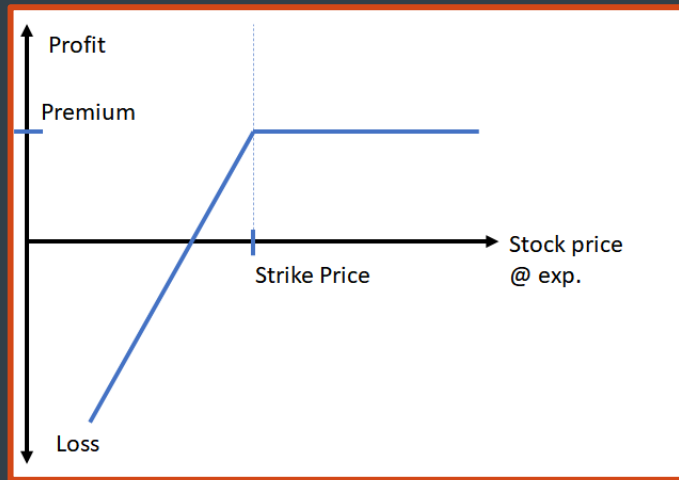
Example of an options chain

Puts for May 1, 2020

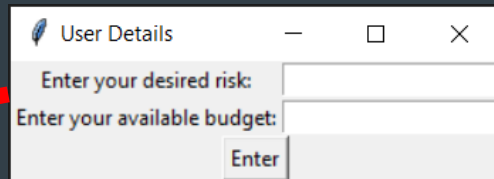| Contract Name	Last Trade Date	Strike ⌃	Last Price	Bid	Ask	Change	% Change	Volume	Open Interest	Implied Volatility
IBM200501P00050000	2020-04-16 6:24PM EDT	50.00	0.04	-	0.03	0.00	-	-	21	385.94%
IBM200501P00055000	2020-04-20 3:51PM EDT	55.00	0.30	0.00	0.03	0.00	-	-	1	325.00%
IBM200501P00070000	2020-03-20 5:52PM EDT	70.00	0.92	0.00	0.00	0.00	-	-	0	50.00%
IBM200501P00075000	2020-03-20 5:52PM EDT	75.00	4.00	0.01	0.00	0.00	-	-	0	193.75%
IBM200501P00080000	2020-04-20 3:52PM EDT	80.00	0.48	0.00	0.02	0.00	-	4	17	181.25%
IBM200501P00085000	2020-04-27 1:07PM EDT	85.00	0.06	0.00	0.03	0.00	-	105	113	165.63%
IBM200501P00090000	2020-04-29 10:16AM EDT	90.00	0.01	0.00	0.01	0.00	-	1	196	131.25%
IBM200501P00092000	2020-04-21 3:37PM EDT	92.00	0.05	0.00	0.03	0.00	-	2	6	137.50%
IBM200501P00093000	2020-04-08 10:09AM EDT	93.00	0.78	0.00	0.03	0.00	-	1	1	132.81%
IBM200501P00094000	2020-04-21 1:00PM EDT	94.00	0.15	0.00	0.03	0.00	-	28	32	128.13%
IBM200501P00095000	2020-04-28 3:12PM EDT	95.00	0.02	0.00	0.02	0.00	-	1	135	118.75%
IBM200501P00096000	2020-04-21 2:36PM EDT	96.00	0.16	0.00	0.01	0.00	-	86	102	109.38%
IBM200501P00097000	2020-04-22 10:09AM EDT	97.00	0.09	0.00	0.03	0.00	-	2	25	117.19%
IBM200501P00098000	2020-04-28 10:47AM EDT	98.00	0.02	0.00	0.03	0.00	-	2	13	112.50%
IBM200501P00099000	2020-04-23 10:44AM EDT	99.00	0.04	0.00	0.02	0.00	-	6	40	104.69%
IBM200501P00100000	2020-04-28 10:28AM EDT	100.00	0.01	0.00	0.01	0.00	-	11	655	93.75%
IBM200501P00101000	2020-04-24 2:28PM EDT	101.00	0.03	0.00	0.03	0.00	-	1	19	101.56%
IBM200501P00102000	2020-04-28 10:07AM EDT	102.00	0.13	0.00	0.02	0.00	-	10	22	93.75%
IBM200501P00103000	2020-04-27 1:32PM EDT	103.00	0.02	0.00	0.03	0.00	-	27	50	93.75%
IBM200501P00104000	2020-04-27 3:54PM EDT	104.00	0.03	0.00	0.03	0.00	-	4	42	90.63%
IBM200501P00105000	2020-04-28 10:25AM EDT	105.00	0.03	0.00	0.02	0.00	-	10	185	82.81%
IBM200501P00106000	2020-04-22 1:31PM EDT	106.00	0.34	0.00	0.03	0.00	-	18	124	82.81%

Project Objective

- Need/Mission Statement:
  - "For a given options strategy, display and analyze in real time all stock market data for a user - given budget and personal risk tolerance"
- Selected strategy: Selling put options
- Contract Selection:
  - Implement goal programming to determine the best financial decision
- Output: Create a simple GUI to display the data
- Imposed Constraints:
  - Scope limited to DOW index
  - Single expiration date

Project Requirements

- Graphical User Interface/Front End:
    - Menu to receive inputs from user:
        - Target risk (probability of profit - POP)
        - Budget (i.e. collateral required to sell put contracts)
    - Plots displaying all data within the users requirements in a clear and concise format
    - Suggests best option to user using goal programming methodology & proved contract specific details
- Data Importation/Processing Back End:
    - Retrieve real-time options data based on user input
    - Sort & filter relevant information
    - Select optimum contact based on risk tolerance of appropriate options data
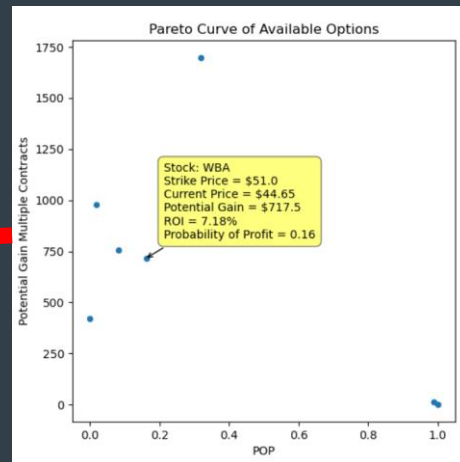
Project Approach - Packages
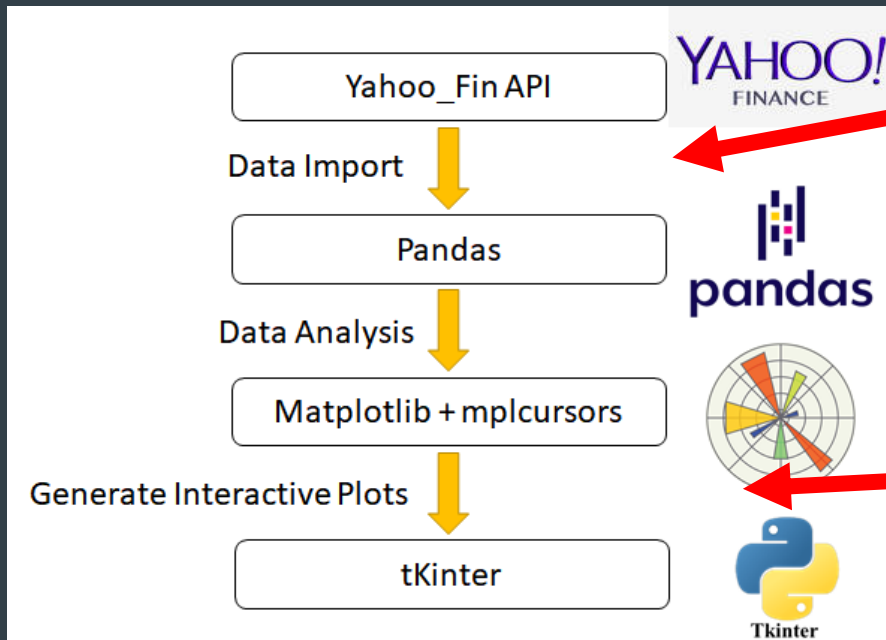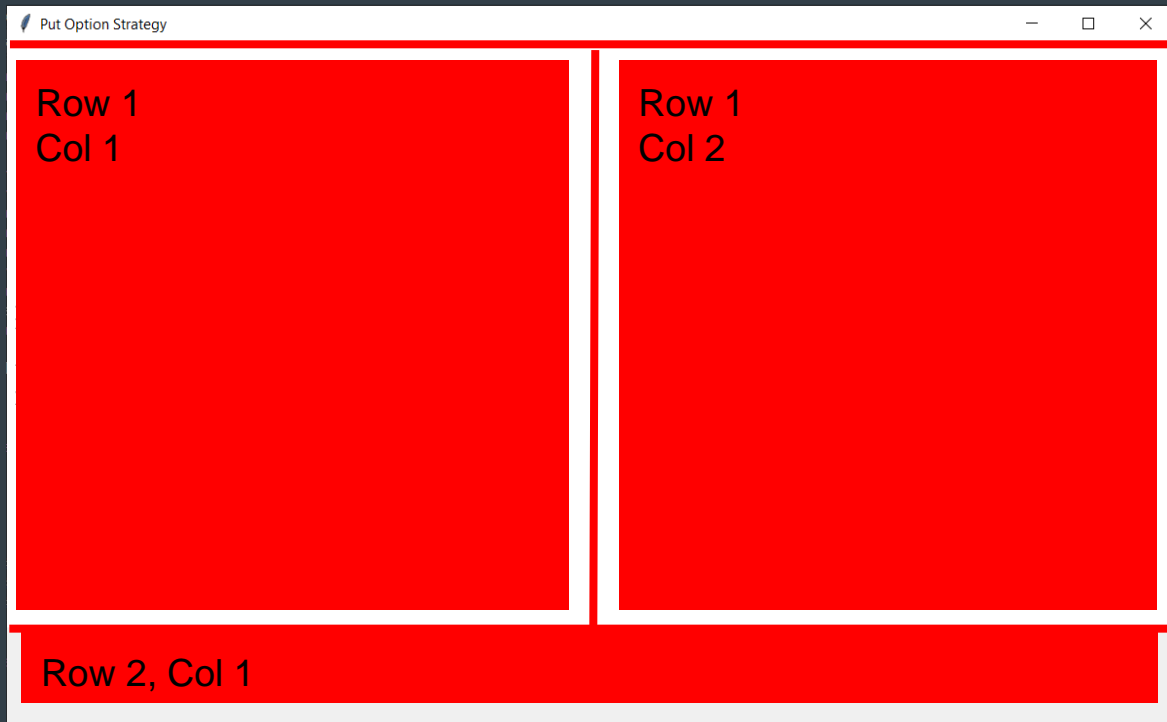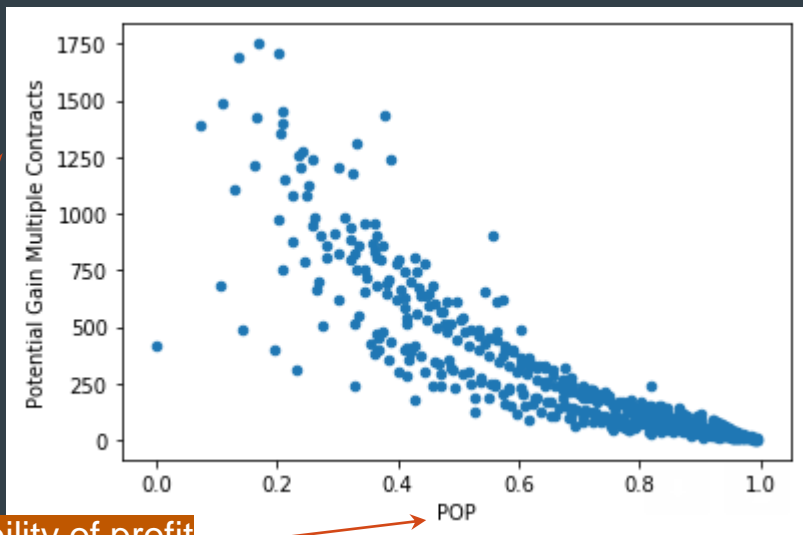
Project Approach - Tkinter Plotting

- Create Tkinter GUI window
- Create Matplotlib fig & axes objects
- Use Matplotlib backend TkAgg to draw to Tcl/Tk canvas (through Tkinter)

Put Option Strategy

Row 1
Col 1

Row 1
Col 2

Row 2, Col 1

Project Approach - Data Processing

Potential Gain

Probability of profit

Potential gain - Takes into account the live bid and ask prices, as well as the and amount of money at risk

Probability of profit - Likelihood of a profitable trade, based on the Black-Scholes Model (1-delta):

$$\delta = N(d1) - 1$$

$$where : d1 = \frac{ln\left(\frac{S}{K}\right) + \left(r + \frac{\sigma^2}{2}\right)t}{\sigma\sqrt{t}}$$

Legend

K	Option strike price
N	Standard normal cumulative distribution function
r	Risk-free interest rate
σ	Volatility of the underlying
S	Price of the underlying
t	Time to option's expiry

https://www.iotafinance.com/en/Formula-Delta-of-a-Put-Option.html

All raw data needed to perform calculations is pulled using the web-scraping capabilities of yahoo_fin

Project Results

The **bid** and **ask** prices for ALL options contracts of the company. Helps the user understand if buyers and sellers of the contract can agree on a price

Interactive chart shows all of the possible contracts within the user budget.

When bid (blue) and ask (orange) are close together, buyers and sellers CAN agree on a price

Detail about the **best** contract (based on user input) is shown below
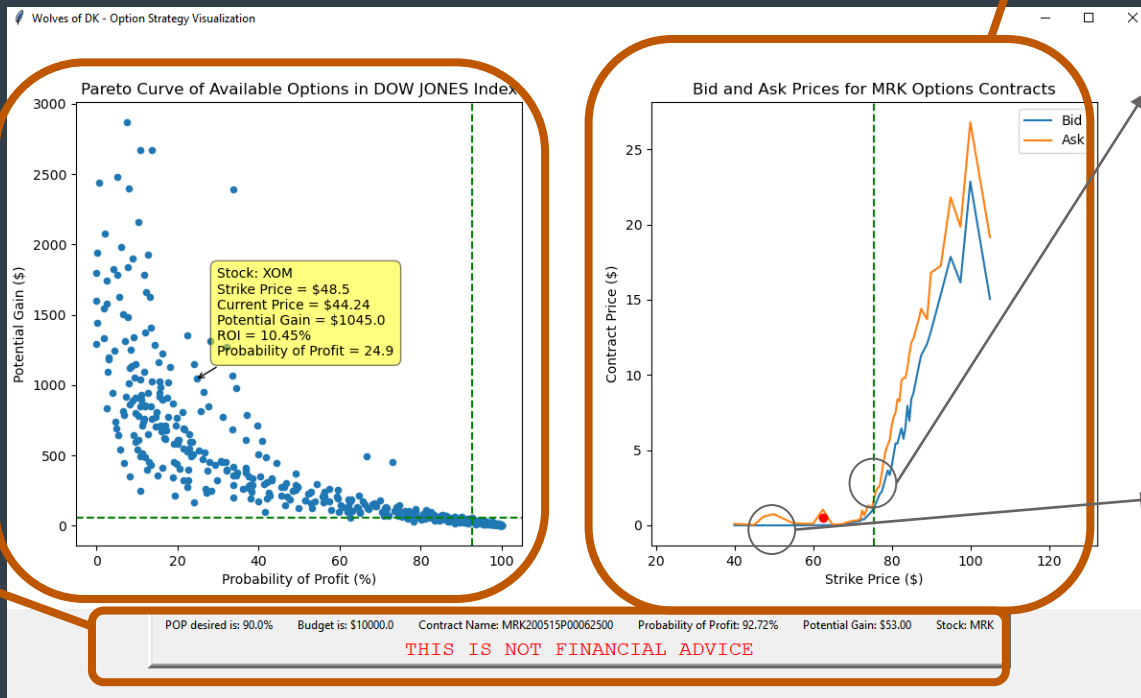
buyers and sellers CANNOT agree on a price!

Project Results

Prediction on 4/20/2020
- At 10,000 budget and 90% POP:
- IBM $96 Put Exp 5/1/2020 - Sell for $116
- As of 4/30, trade is profitable $108 (~1% return on investment in a 2 week span)
- Note -- The average yearly long term return of the S&P 500 is 9.8%
- The result is reasonable and provides a clear way to filter out maximum profit scenarios at a given level of risk

- The pareto shown aligns with the expectation of 'high risk high reward'

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Future Work

- Quicker data gathering
- Analysis of stocks outside of DOW Jones
- Other financial instruments
  - Different strategies (calls, spreads/multi-leg options)

Links

https://github.com/ME369P/wolvesOfDKSt-ClassShare

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