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A Data-Oriented Approach to Options Trading

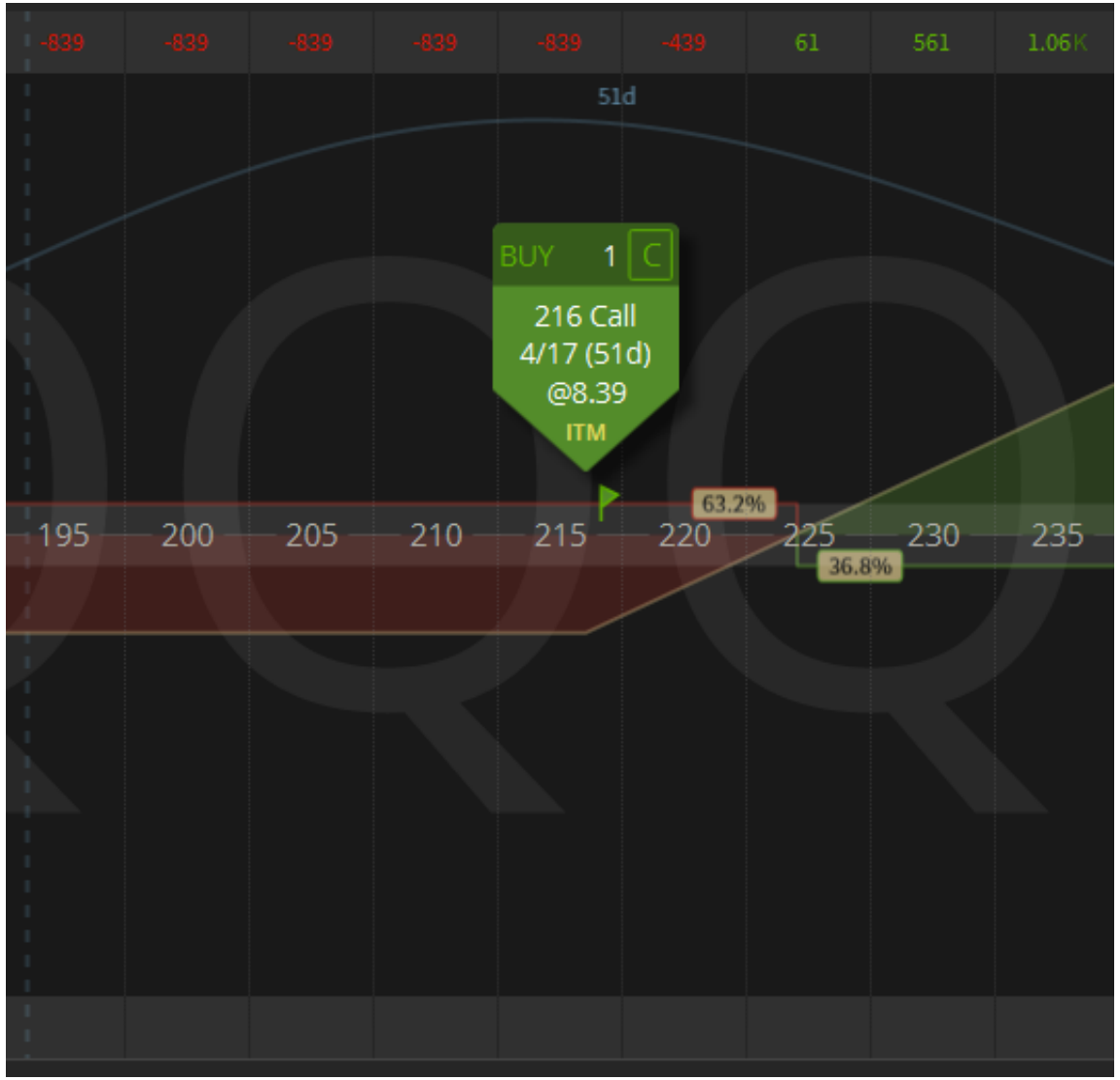
What Are Options?

- Contracts that give the owner a right to buy or sell shares of a stock at a given price.
- Have Expiration Dates
- "Strike Prices“
- Represent 100 shares of stock

- **Calls**
  - Give holder right to buy shares at a given price.
  - Can be bought if belief is that stock price will increase
  - Can be sold if belief is that stock price will decrease or remain the same.
- **Puts**
  - Give holder right to sell shares at a given price.
  - Can be bought if belief is that stock price will decrease.
  - Can be sold if belief is that stock price will increase or stay the same.

Buying Calls

- Max Profit: $100 for every $1 increase in stock price, less premium paid for contract.
- Max Loss: Premium paid for contract
- Profitable if:
  - Stock price goes up beyond premium
- Unprofitable if:
  - Stock price remains the same
  - Stock price decreases
  - Stock price increases below premium paid

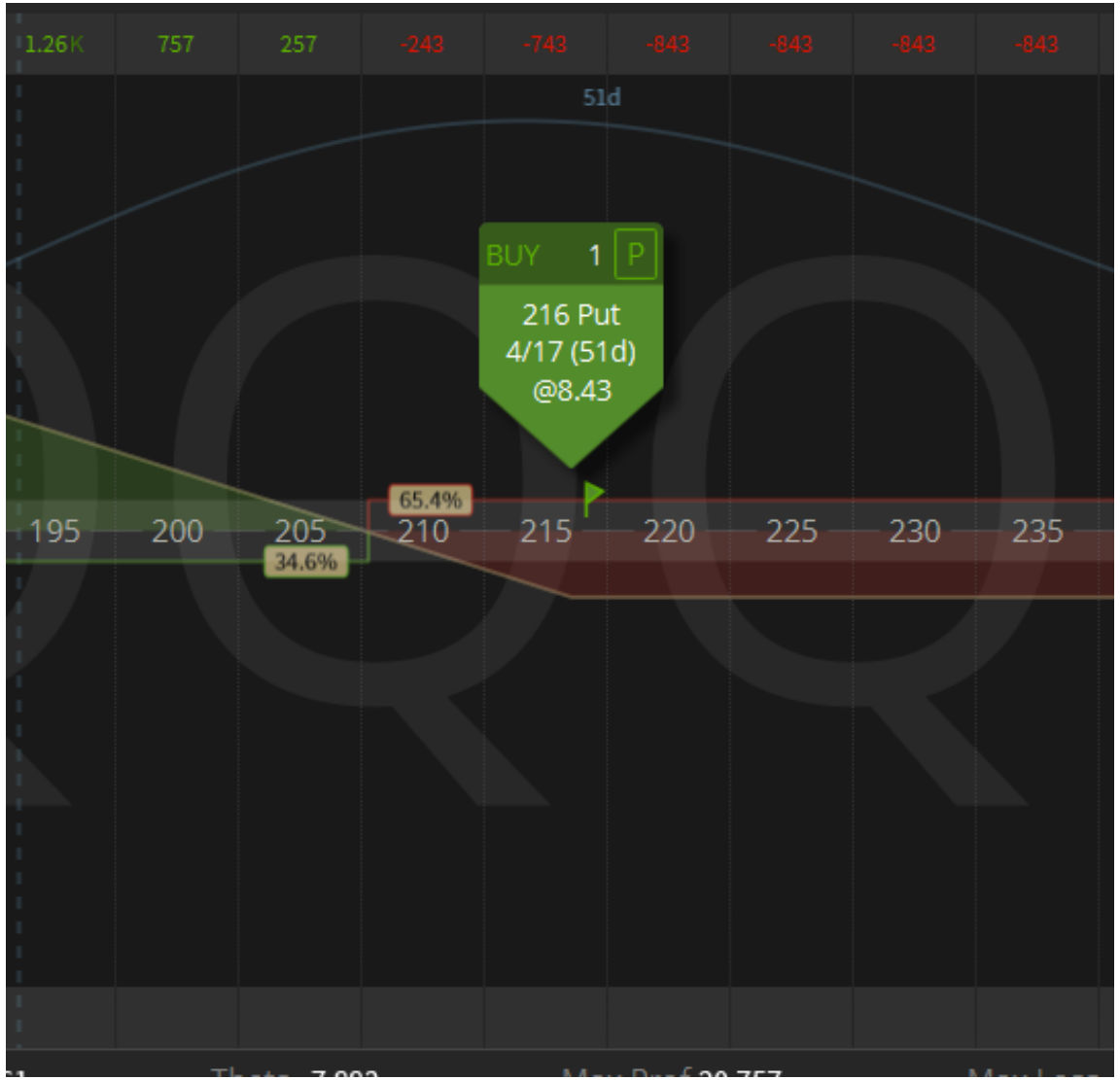


Selling Calls

- Max Profit: Price call is sold for
- Max Loss: $100 for every $1 increase in stock price, less premium collected by selling call.
- Profitable if:
  - Stock price goes down
  - Stock price remains the same
  - Stock price goes up slightly
- Unprofitable if:
  - Stock price goes up beyond premium collected by selling call.

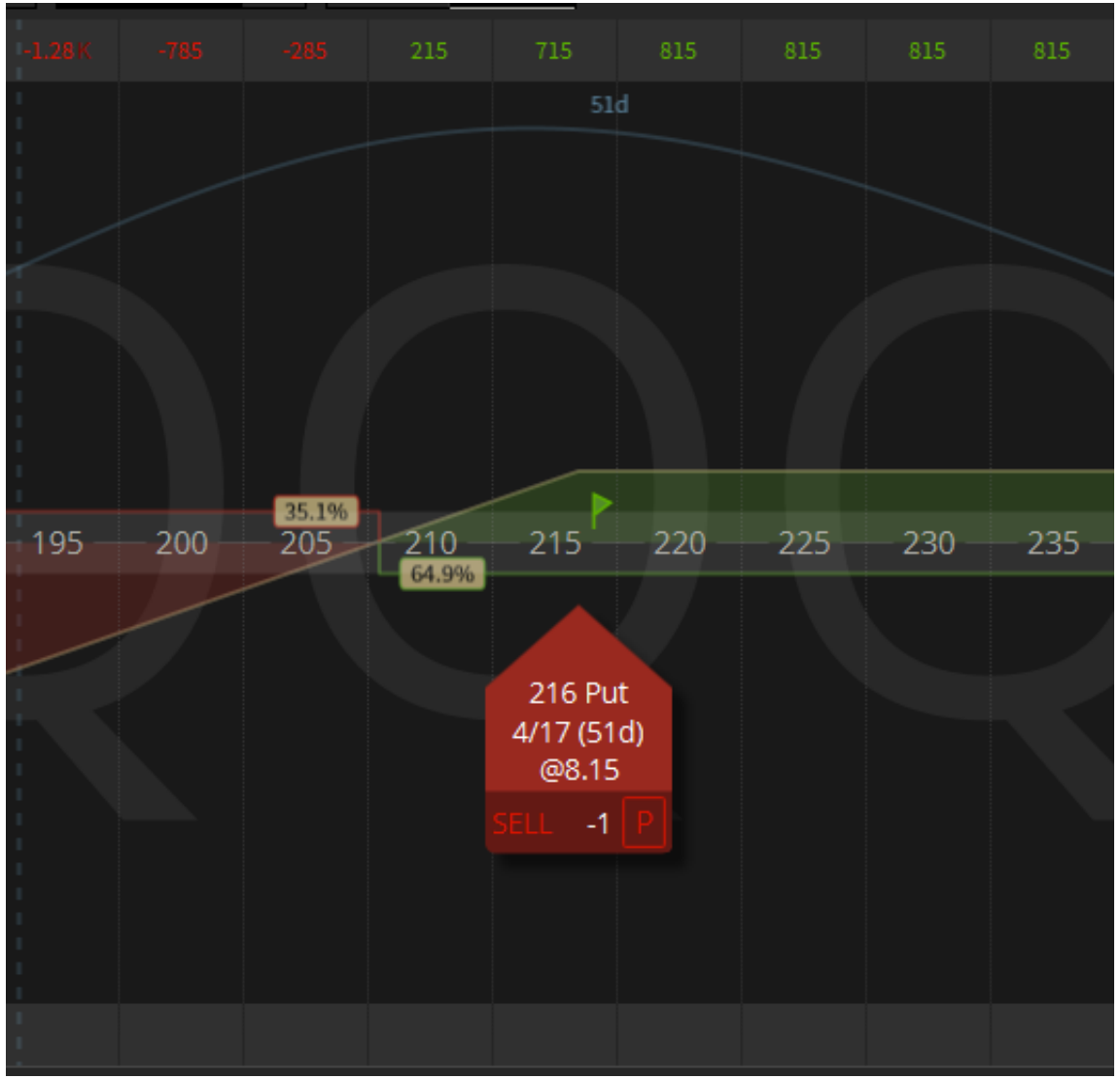
Buying Puts

- Max Profit: $100 for every $1 drop in stock price, less premium paid to buy put.
- Max Loss: Premium paid to buy put
- Profitable if:
  - Stock price goes down beyond amount paid to buy put
- Unprofitable if
  - Stock price goes up
  - Stock price remains the same
  - Stock price goes down less than premium paid to buy put.



Selling Puts

- Max Profit: Price put is sold for
- Max Loss: $100 for every $1 drop in stock price, less premium collected by selling put.
- Profitable if:
  - Stock price goes up
  - Stock price remains the same
  - Stock price goes down slightly
- Unprofitable if:
  - Stock price goes down beyond amount collected by selling put.



Objective

- Simulate historical option trades.
  - Initial focus on selling puts only.
- Use data from historical trades to inform regression model.
- Use regression model to select best choice on a given day.

The Data

- Daily options records from 2002 to end of 2019.
- Input variables:
  - Open Price – price of option at time trade is opened
  - Open DTE – Days until Expiration of option
  - Open Theta – Theta value, the amount an option decays in value each day
  - Open Delta – Delta value, the amount an option price changes due to stock price changes
  - Open Gamma – Gamma value, the first derivative of Delta, the change in change of delta
  - Open Vega – Vega value, the amount an option price changes due to changes in the implied volatility of a stock
  - Open IV – the implied volatility of an option, how much the stock is expected to move based on the option price
  - ATM IV – At the Money Implied Volatility – How much a stock is expected to move over the next 30 days based on the prices of options with strikes closest to the current stock price.

Process

- Establish benchmarks for test
  - Symbol: SPY – ETF tracking S&P 500 price
  - Two strategies for benchmark:
    - Buy and hold SPY stock
      - 2006-2019 results: Starting balance of $10,000 resulted in end balance of $34,316
    - Selling 50 delta puts as close to 45 days to expiration as possible
      - 2006-2019 results: Starting balance of $10,000 resulted in end balance of $26,669

Process

- Starting with the first trading day of 2006
- Focused on selling puts only, retrieved 10,000 contracts at random from dates prior to test date.
- Simulated trades of these 10,000 contracts, used results to train regression model.
- Had model predict all possible trades for current day, moved forward with trade with highest potential profit.
- Simulated selected trade, moved to day after that trade closed, repeat.

Results

- Selling SPY puts using model resulted in an ending balance of $23,789.
- Not as good as benchmark of $34,316, but profitable.
- Moving Forward:
  - Add more strategic possibilities
    - Add buying of puts and buying/selling of calls.
    - Additional strategies
    - More complex, but potentially better results.
  - Consider additional features
  - Consider strategies as part of a whole portfolio

Conclusion

- Not there yet!
- Room for growth!
- Never done!