Automated “Wheel” Options Momentum Strategy Using MACD

Emil Perdue, Diego Domenig

agenda

Options “Wheel” Strategy Definition

- Strategy Research / Explanation
- Selling Options Recap
- Explaining the “Wheel”
- Exploratory Data Analysis

- Backtesting Results
- Metrics of Success
- Optimization
- Conclusion / Questions

What is the options “wheel”?

Understanding the cycle of selling puts and calls

Refresher on Buying Options

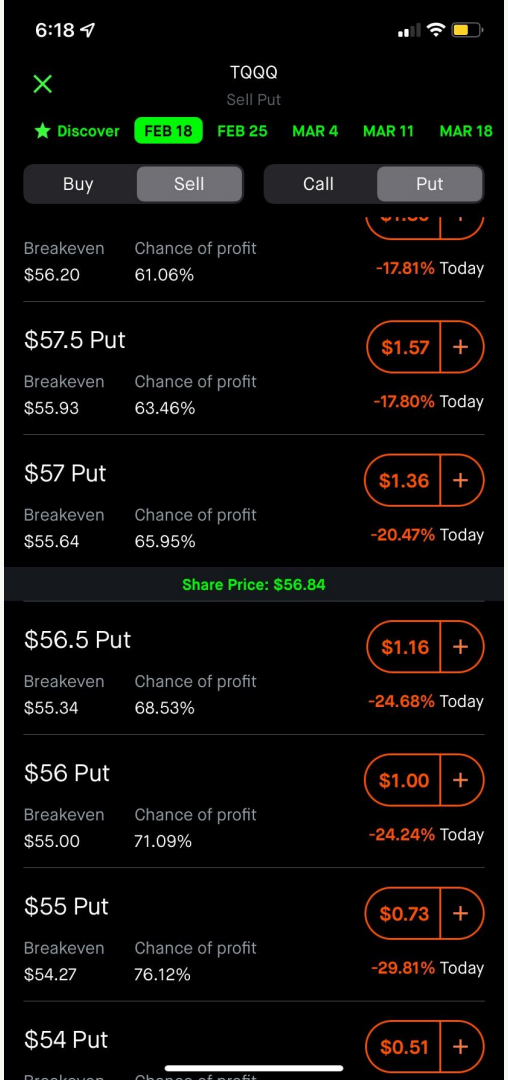
Buying a **call option** gives the buyer the right to **buy** an underlying asset at a specified price within a specific time period.

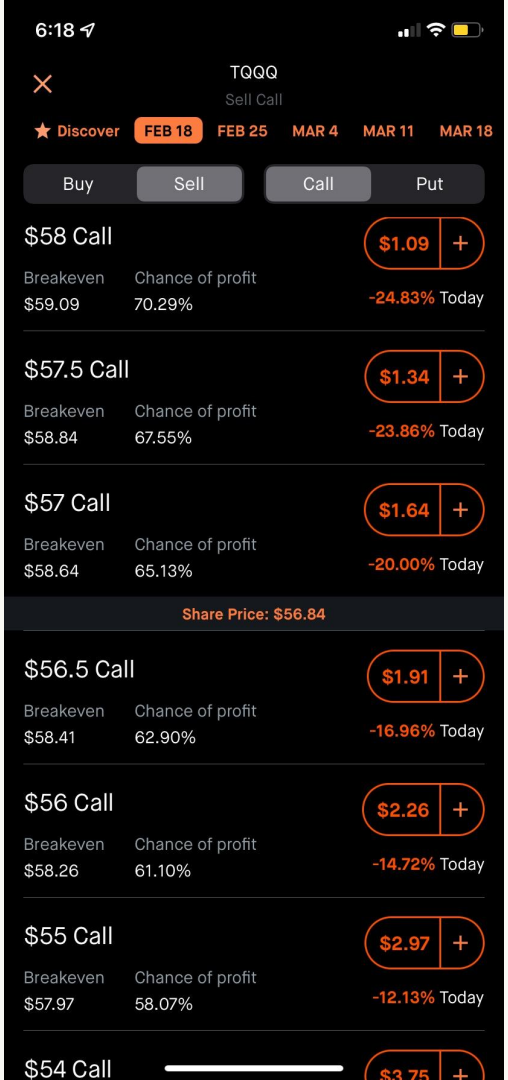
Buying a **put option** gives the buyer the right to **sell** an underlying asset at a specified price within a specific time period.

What does it mean to sell an option?

By selling a **put**, you can collect **premium** from the option buyer. The buyer pays this premium for the right to sell you shares of stock, any time before expiration, at the strike price.

When you sell a **call** (need 100 shares), you're selling the right, but not the obligation, to someone else to purchase the underlying stock at a set price before expiration. You charge a **premium** of a set amount per share.


6:18
TQQQ
Sell Put
Discover
FEB 18
FEB 25
MAR 4
MAR 11
MAR 18
Buy
Sell
Call
Put
Breakeven
$56.20
Chance of profit
61.06%
-17.81% Today
$57.5 Put
$1.57
Breakeven
$55.93
Chance of profit
63.46%
-17.80% Today
$57 Put
$1.36
Breakeven
$55.64
Chance of profit
65.95%
-20.47% Today
Share Price: $56.84
$56.5 Put
$1.16
Breakeven
$55.34
Chance of profit
68.53%
-24.68% Today
$56 Put
$1.00
Breakeven
$55.00
Chance of profit
71.09%
-24.24% Today
$55 Put
$0.73
Breakeven
$54.27
Chance of profit
76.12%
-29.81% Today
$54 Put
$0.51


6:18
TQQQ
Sell Call
Discover
FEB 18
FEB 25
MAR 4
MAR 11
MAR 18
Buy
Sell
Call
Put
$58 Call
$1.09
Breakeven
$59.09
Chance of profit
70.29%
-24.83% Today
$57.5 Call
$1.34
Breakeven
$58.84
Chance of profit
67.55%
-23.86% Today
$57 Call
$1.64
Breakeven
$58.64
Chance of profit
65.13%
-20.00% Today
Share Price: $56.84
$56.5 Call
$1.91
Breakeven
$58.41
Chance of profit
62.90%
-16.96% Today
$56 Call
$2.26
Breakeven
$58.26
Chance of profit
61.10%
-14.72% Today
$55 Call
$2.97
Breakeven
$57.97
Chance of profit
58.07%
-12.13% Today
$54 Call

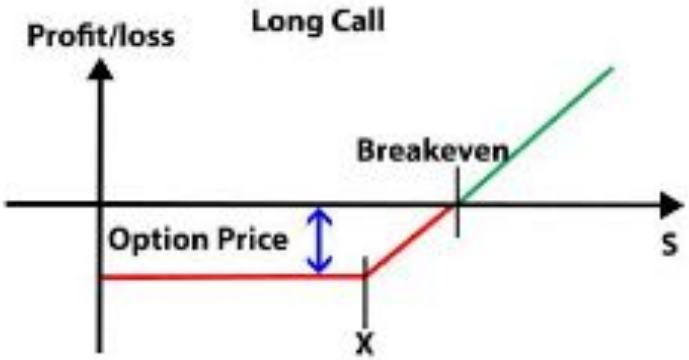
Cash-Secured Puts & Covered Calls

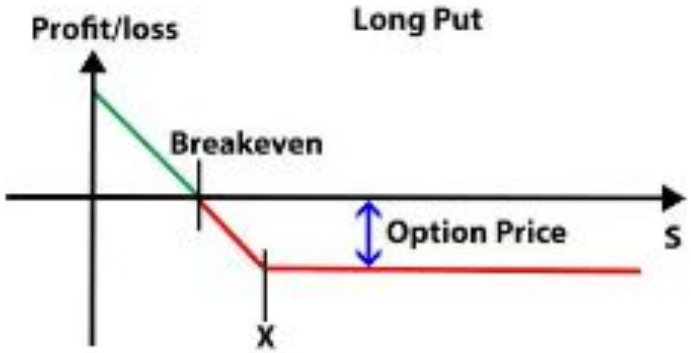
Cash-Secured Puts

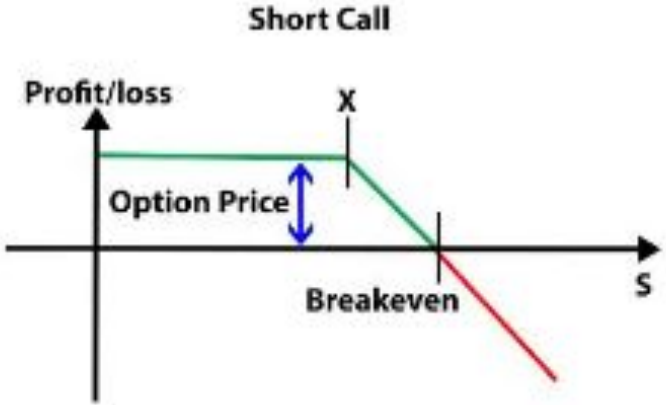
- If price doesn't reach/fall below strike, keep **premium**
- If price reaches or falls below strike, forced to **buy** 100 shares at strikes price you chose, still keeping the premium
- Risks: Forced to **buy** at a strike higher than the price of stock (if drops a lot), underlying dropping

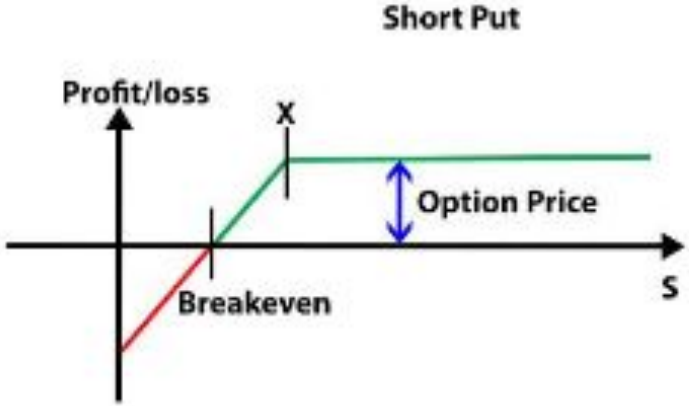
Covered Calls

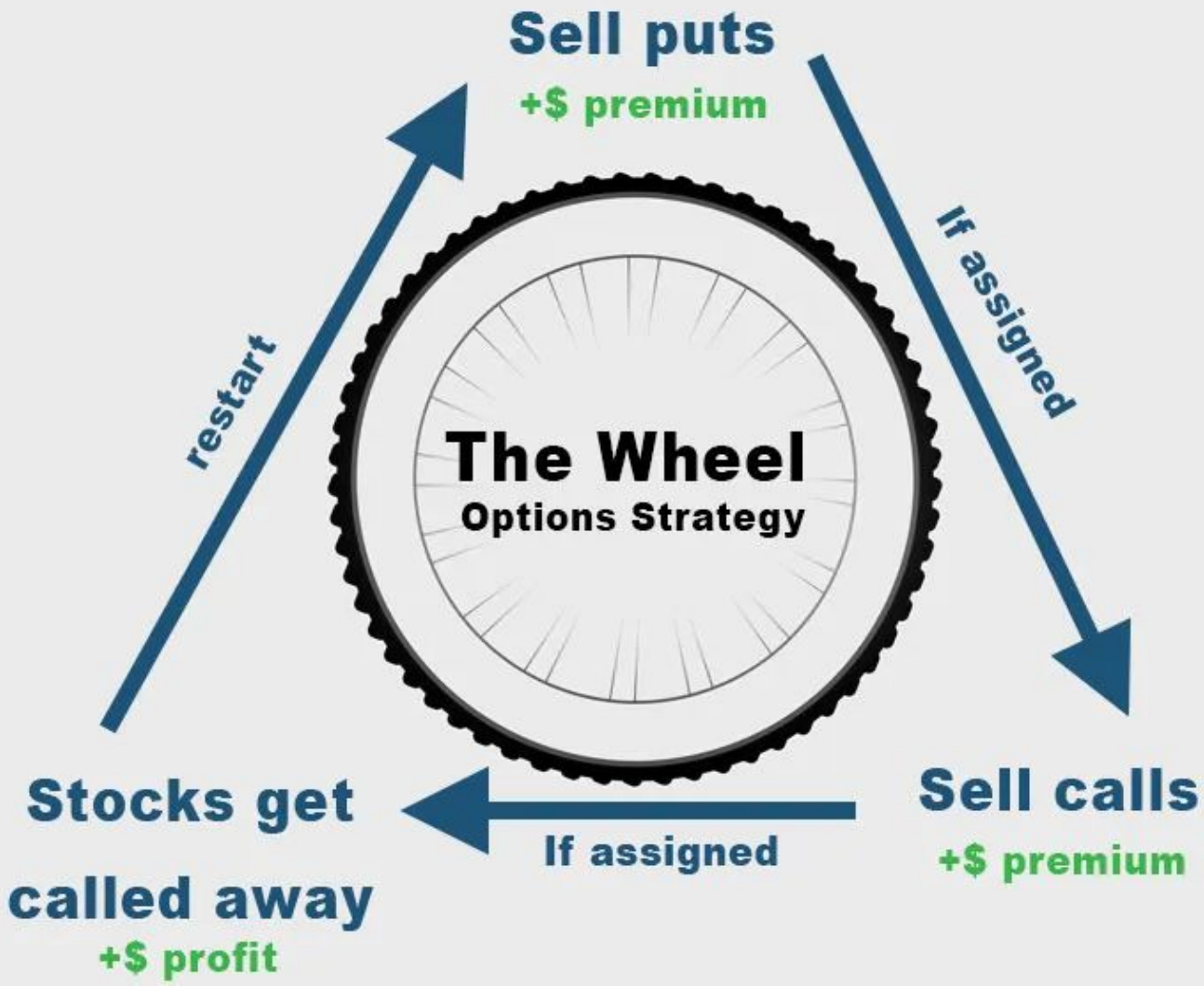
- If price doesn't reach/exceed strike, keep the **premium**
- If price reaches or exceeds strike, you **sell** the 100 shares, profiting both the premium and the profit
- Risks: "Missing out", underlying **dropping**


Long Call
Profit/loss
Breakeven
Option Price
X
S


Long Put
Profit/loss
Breakeven
Option Price
X
S


Short Call
Profit/loss
X
Option Price
Breakeven
S


Short Put
Profit/loss
X
Option Price
Breakeven
S


Sell puts
+$ premium
If assigned
Sell calls
+$ premium
If assigned
Stocks get
called away
+$ profit
restart
The Wheel
Options Strategy

Strategy Intuition

What is the importance of this?

Two immediate advantages of selling options that come to mind are:

- Selling call options when you expect stock price to go **down**
- Selling put options when you expect stock price to go **up**
- Hedge your bets / receive **premium**
- Develop a strategy utilizing these properties

MACD Momentum Strategy

- Using the **MACD** indicator from class, we hope to identify momentum
  - Signal (stock will **rise**), sell a cash-secured **put**
    - Signal (stock will **fall**), sell a covered **call**
      - Only sell call if previously sold a put and hold the 100 shares
- Maintain a zero balance: sell put -> sell call -> sell put, etc

Trading Specifications

- Hope to trade **low volatility** stocks in order to profit on the premium
  - Not get hit too hard when we sell a put and the stock price drops much further below
- Stocks that were too **expensive** lead to massive fluctuations in price
  - Looking to train/test over ~**10** years in **equities** markets

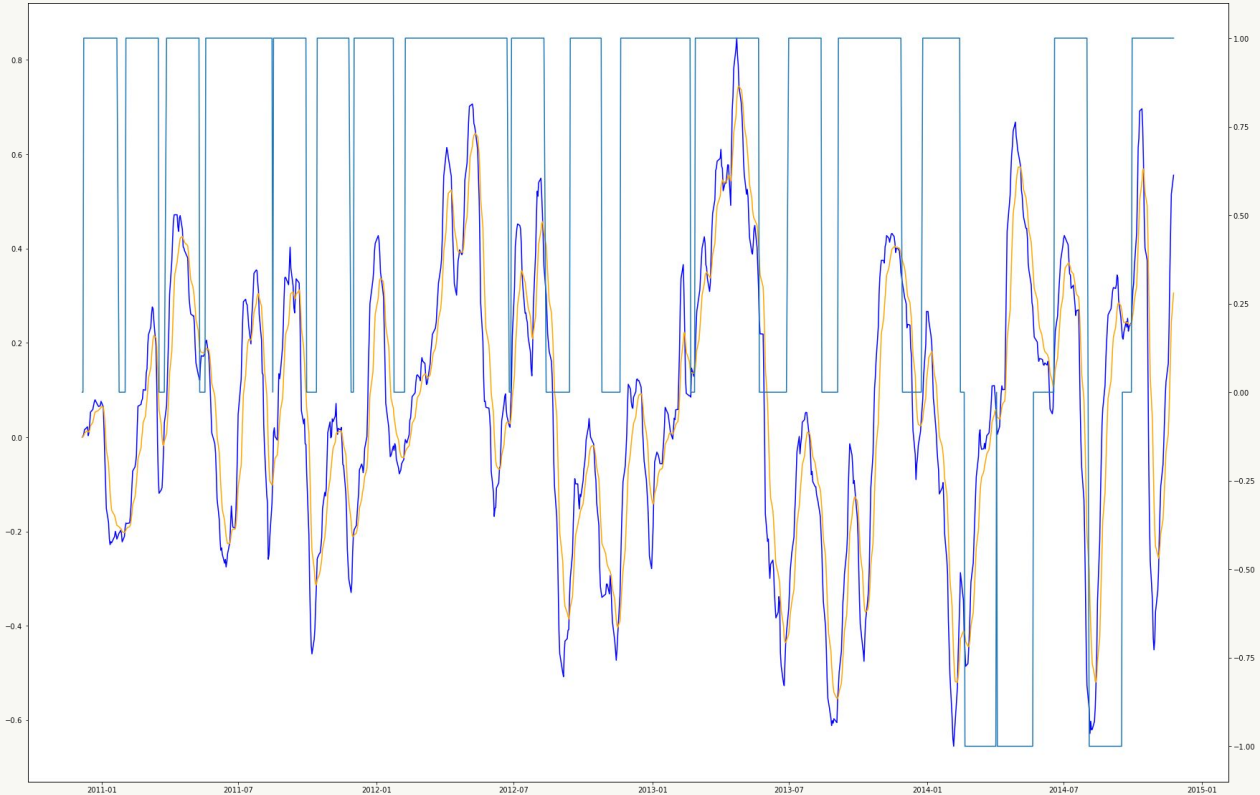
Backtesting

Pseudocode for Strategy

```
    if df.loc[date, 'signal'] < df.loc[date, 'MACD'] and
df.iloc[date_index-1]['signal'] > df.iloc[date_index-1]['MACD']:
        if can_trade and not own_stock:
        # sell cash-secured put


    elif df.loc[date, 'signal'] > df.loc[date, 'MACD'] and
df.iloc[date_index-1]['signal'] < df.iloc[date_index-1]['MACD']:
        if can_trade and own_stock:
        # sell covered call
```

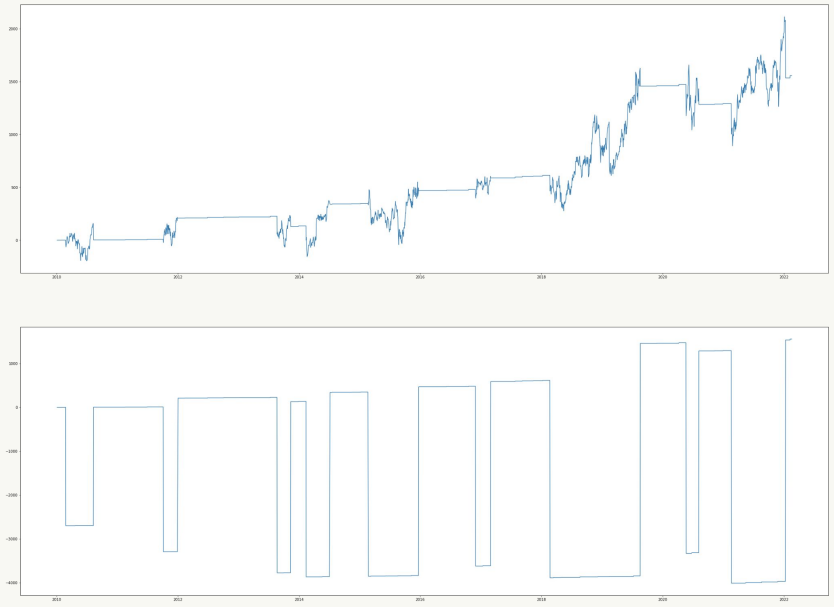
Signal Visualization

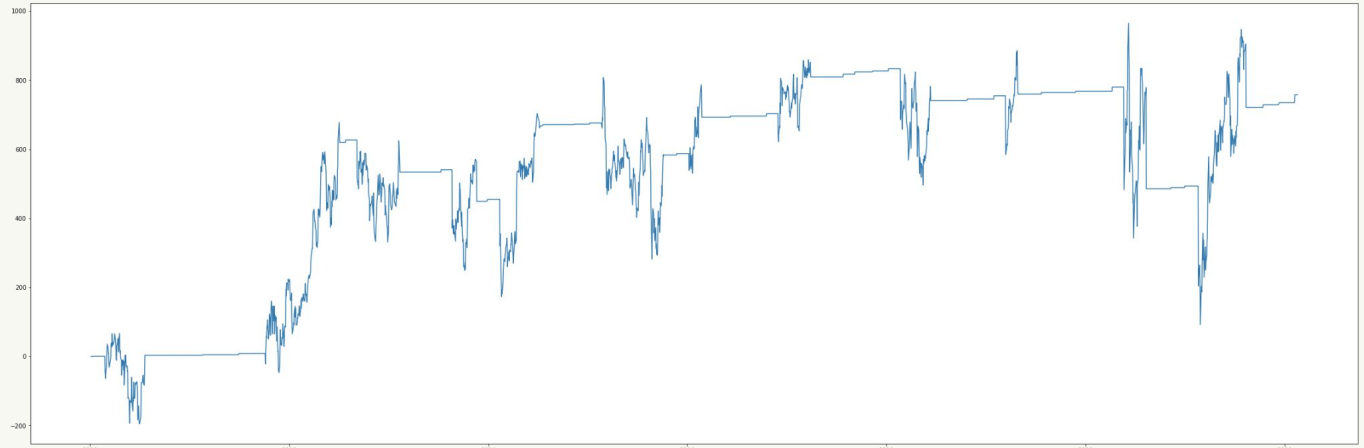


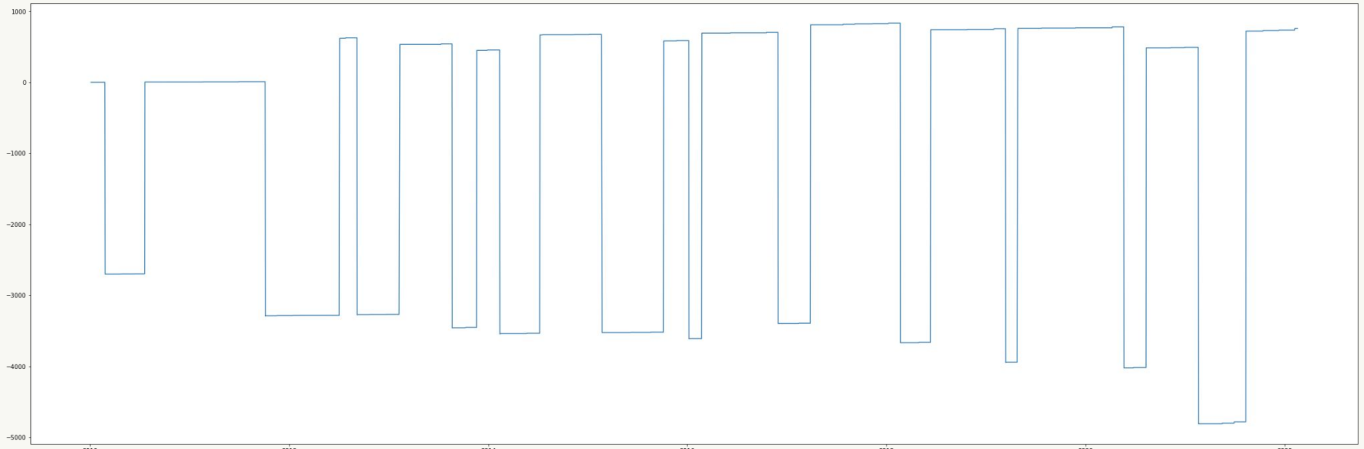
Success Metrics

P&L Metrics + Sharpe Ratio

- When looking at sold puts as losses, Sharpe of approximately **-5**
- When not including sold puts as losses, Sharpe of approximately **27**



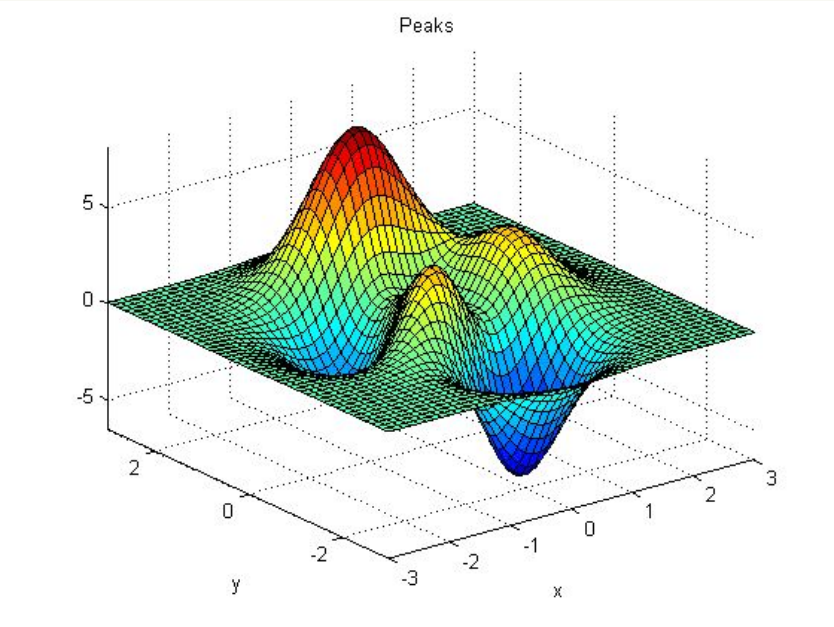

1000
800
600
400
200
0
−200
2010
2012
2014
2016
2018
2020
2022


1000
0
−1000
−2000
−3000
−4000
−5000
2010
2012
2014
2016
2018
2020
2022

Optimization

Grid Search

```
train_sharpes = []
    for short in [12, 18]:
        for long in [26, 38]:
            for signal in [9, 14]:
                for expiry in [20, 30]:
                                    df =
    run_strategy(data, short, long, signal,
                    expiry)
                    train_sharpes.append({
                          'short': short,
                           'long': long,
                         'signal': signal,
                         'expiry': expiry,
                                    'sharpe':
            get_sharpe(df['P&L'])
                                })
```



Takeaways

- Next time: See the result of **dividends** on the strategy
- More **accurate** options pricing model using real options data over time-frame
  - Difficult to compute **P&L** for options strategy
    - Can’t wait to learn more!

Questions?

Bibliography + Contributions

- **Diego:** Coded strategy and pitched strategy optimization/revisions
    - **Emil:** Pitched the idea and developed slides / intuition

Data Source:

- https://finance.yahoo.com/quote/COKE/