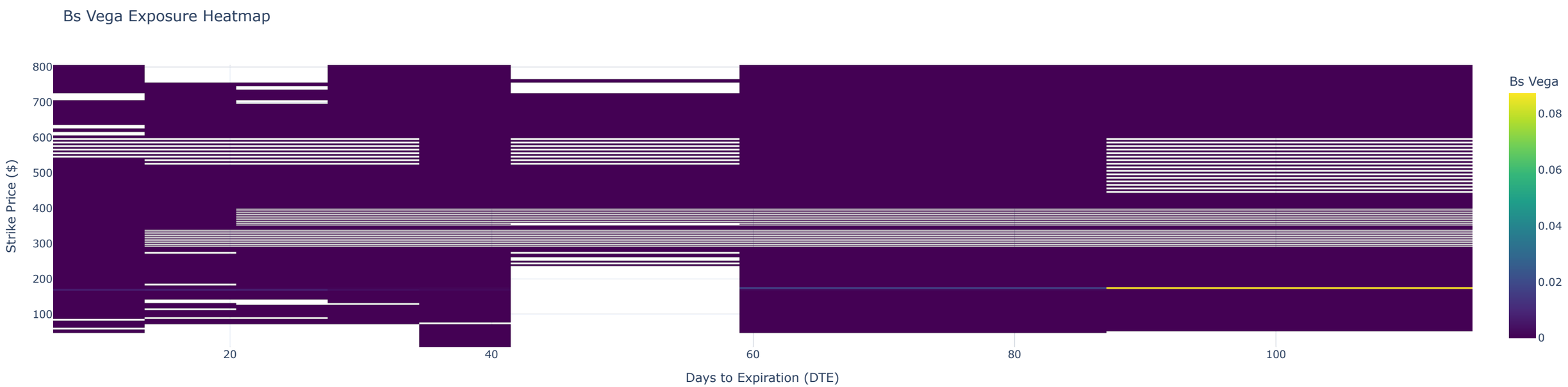
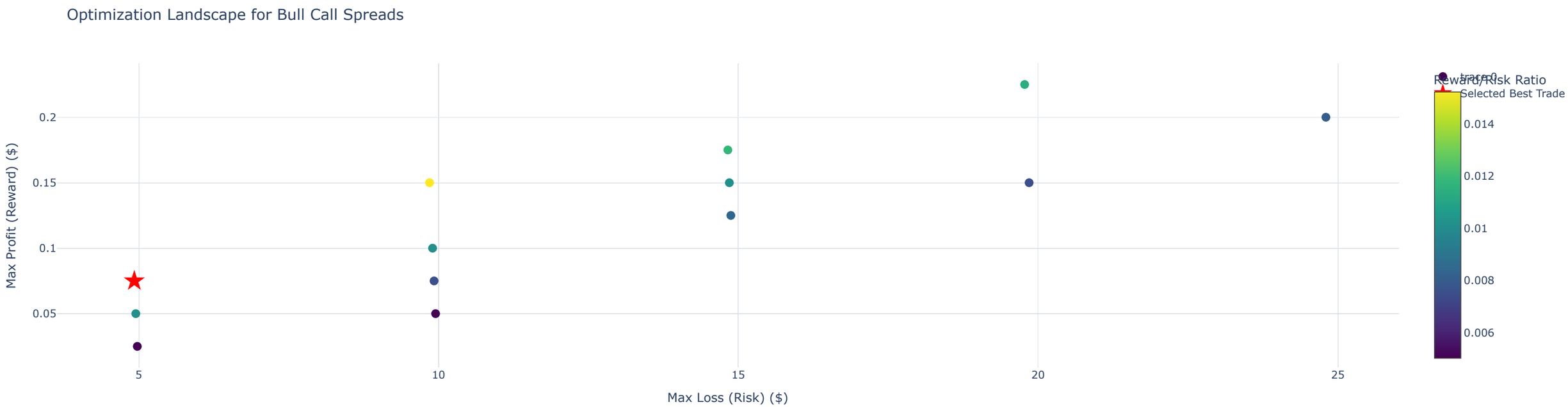
```
Attempting to load data from: 2024-12-10_option_chain_120days_student6.csv
Original DataFrame columns:
Index(['option_type', 'strike', 'expiration_date', 'yearstoexp', 'bid', 'ask',
       'volume', 'open_interest', 'mid_iv', 'delta', 'gamma', 'theta', 'vega'],
      dtype='object')

Standardized DataFrame columns (pass 1):
Index(['option_type', 'strike', 'expiration_date', 'yearstoexp', 'bid', 'ask',
       'volume', 'open_interest', 'mid_iv', 'delta', 'gamma', 'theta', 'vega'],
      dtype='object')

Using provided underlying price: $171.71
Assigned quote date from filename: 2024-12-10

Standardized DataFrame columns (after rename):
Index(['optiontype', 'strike', 'expirationdate', 'yearstoexp', 'bid', 'ask',
       'volume', 'open_interest', 'impliedvolatility_market', 'delta', 'gamma',
       'theta', 'vega', 'underlying_last', 'quotedate'],
      dtype='object')

Removed 143 rows with zero/NaN bid/ask or TTE effectively zero.
Liquidity Filter: Removed 494 rows with poor liquidity.
  (Max Absolute Spread > $2.50 or Relative Spread > 50%)
<ipython-input-1-18b0984f7dd1>:117: FutureWarning:

A value is trying to be set on a copy of a DataFrame or Series through chained assignment using an inplace method.
The behavior will change in pandas 3.0. This inplace method will never work because the intermediate object on which we are setting values always behaves as a copy.

For example, when doing 'df[col].method(value, inplace=True)', try using 'df.method({col: value}, inplace=True)' or df[col] = df[col].method(value) instead, to perform the operation inplace on the original object.



Filtered DataFrame shape after DTE > 7: (1540, 25)

Successfully loaded and processed data.

--- Generating Greek Heatmaps ---
```




```
--- Selecting Strategies with DTE 30-75 ---

--- Optimizing Bullish Strategy: Bull Call Spread ---
```

Selected expiration date for strategies: 2025-01-10 (DTE: 31)




--- Strategy Summary: Bull Call 180.00/185.00 ---
Net Cost (Market Prices): $4.93 (Debit)

Legs:
  Leg 1:  1 x CALL @ 180.00 | Mkt Price: $222.18 | IV: 1.62%
  Leg 2: -1 x CALL @ 185.00 | Mkt Price: $217.25 | IV: 1.60%

Overall Position (Calculated from B-S on legs):
  Combined Delta: 0.000
  Combined Gamma: 0.0000
  Combined Theta: -0.0000 (per day)
  Combined Vega: 0.000 (per 1% IV change)

At Expiration:
  Max Profit: $0.07
  Max Loss: $4.93
  Reward/Risk Ratio: 0.02
  Breakeven: $184.93

P&L Evolution Over Time (assuming 0% IV shock from current levels):

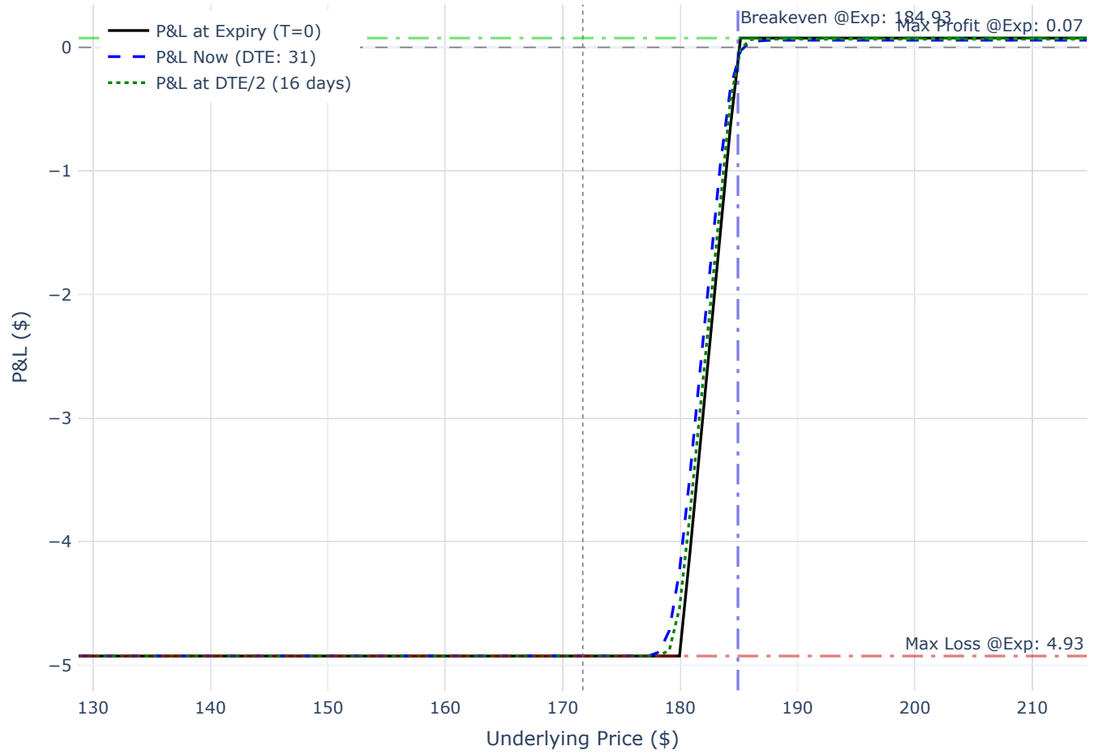
| Time Scenario | $154.54 (-10%) | $163.12 (-5%) | $171.71 (0%) | $180.30 (5%) | $188.88 (10%) |
|---|---|---|---|---|---|
| **0 days passed (DTE: 31)** | $-4.93 | $-4.93 | $-4.93 | $-3.96 | $0.06 |
| **7 days passed (DTE: 24)** | $-4.93 | $-4.93 | $-4.93 | $-4.10 | $0.06 |
| **15 days passed (DTE: 16)** | $-4.93 | $-4.93 | $-4.93 | $-4.26 | $0.07 |
| **30 days passed (DTE: 1)** | $-4.93 | $-4.93 | $-4.93 | $-4.61 | $0.07 |
| **31 days passed (DTE: 0)** | $-4.93 | $-4.93 | $-4.93 | $-4.63 | $0.07 |

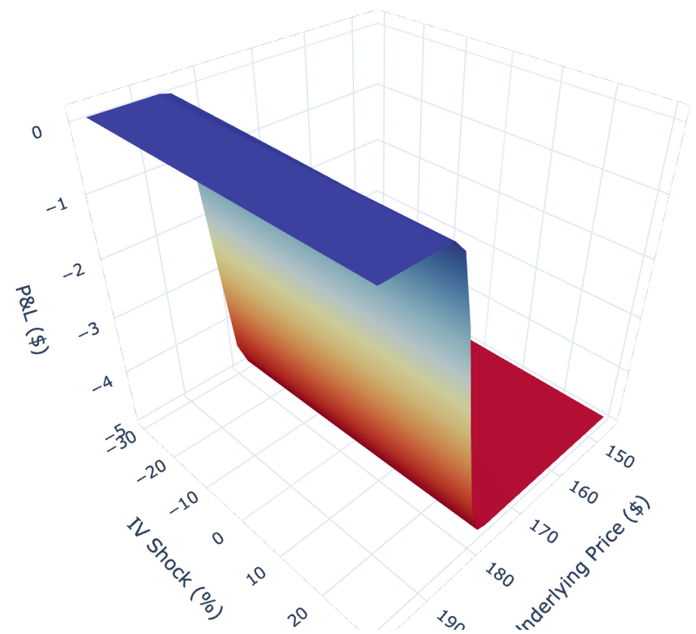
---

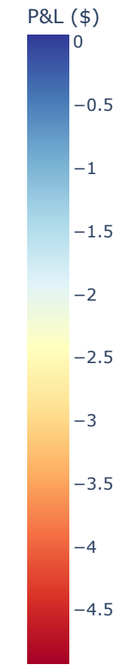
Risk Analysis: Bull Call 180.00/185.00

Bull Call 180.00/185.00
P&L Profile Over Time

3D P&L Surface (Price vs. IV Shock Today)

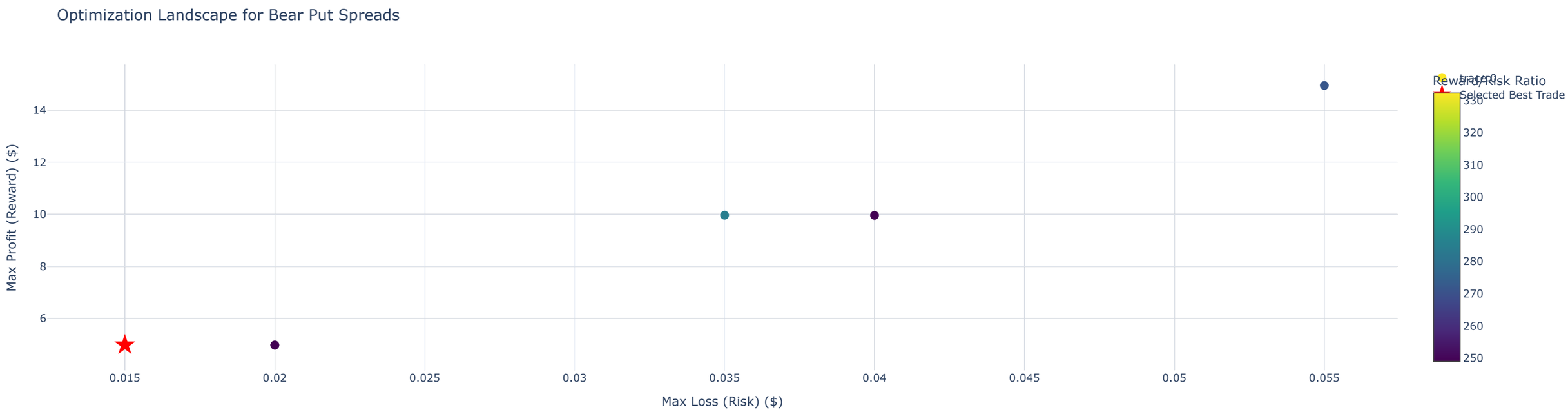



--- Optimizing Bearish Strategy: Bear Put Spread ---

Selected expiration date for strategies: 2025-01-10 (DTE: 31)



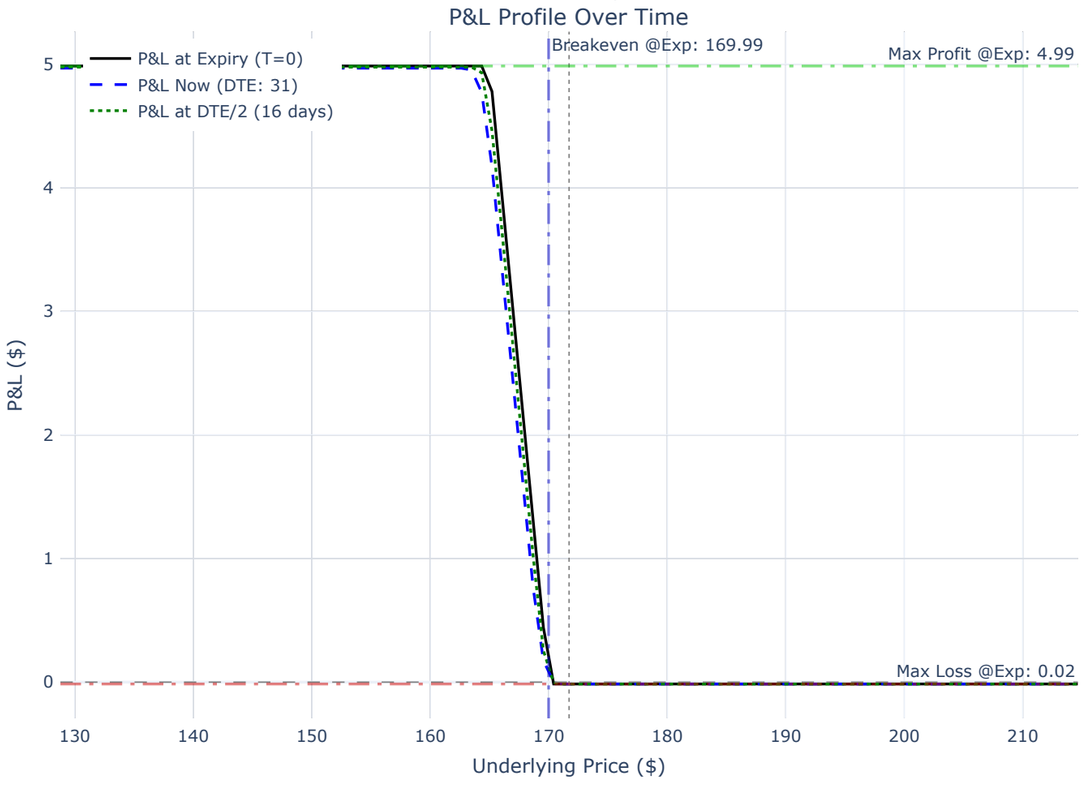

--- Strategy Summary: Bear Put 170.00/165.00 ---

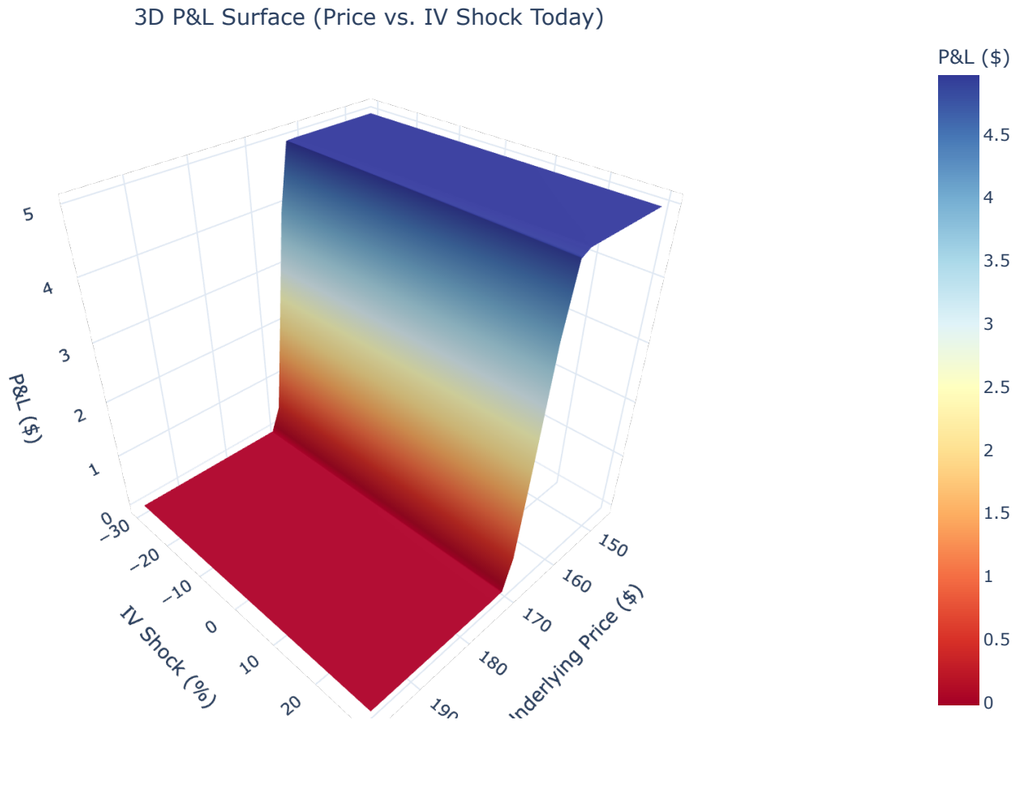
```
Net Cost (Market Prices): $0.02 (Debit)

Legs:
  Leg 1:  1 x PUT  @ 170.00 | Mkt Price: $0.27 | IV: 1.24%
  Leg 2: -1 x PUT  @ 165.00 | Mkt Price: $0.25 | IV: 1.28%

Overall Position (Calculated from B-S on legs):
  Combined Delta: -0.000
  Combined Gamma: 0.0007
  Combined Theta: -0.0000 (per day)
  Combined Vega: 0.000 (per 1% IV change)

At Expiration:
  Max Profit: $4.99
  Max Loss: $0.02
  Reward/Risk Ratio: 332.33
  Breakeven: $169.99

P&L Evolution Over Time (assuming 0% IV shock from current levels):
```

| Time Scenario | $154.54 (-10%) | $163.12 (-5%) | $171.71 (0%) | $180.30 (5%) | $188.88 (10%) |
|---|---|---|---|---|---|
| **0 days passed (DTE: 31)** | $4.97 | $4.96 | $-0.01 | $-0.02 | $-0.02 |
| **7 days passed (DTE: 24)** | $4.97 | $4.97 | $-0.01 | $-0.02 | $-0.02 |
| **15 days passed (DTE: 16)** | $4.98 | $4.98 | $-0.01 | $-0.02 | $-0.02 |
| **30 days passed (DTE: 1)** | $4.98 | $4.98 | $-0.02 | $-0.02 | $-0.02 |
| **31 days passed (DTE: 0)** | $4.99 | $4.99 | $-0.02 | $-0.02 | $-0.02 |

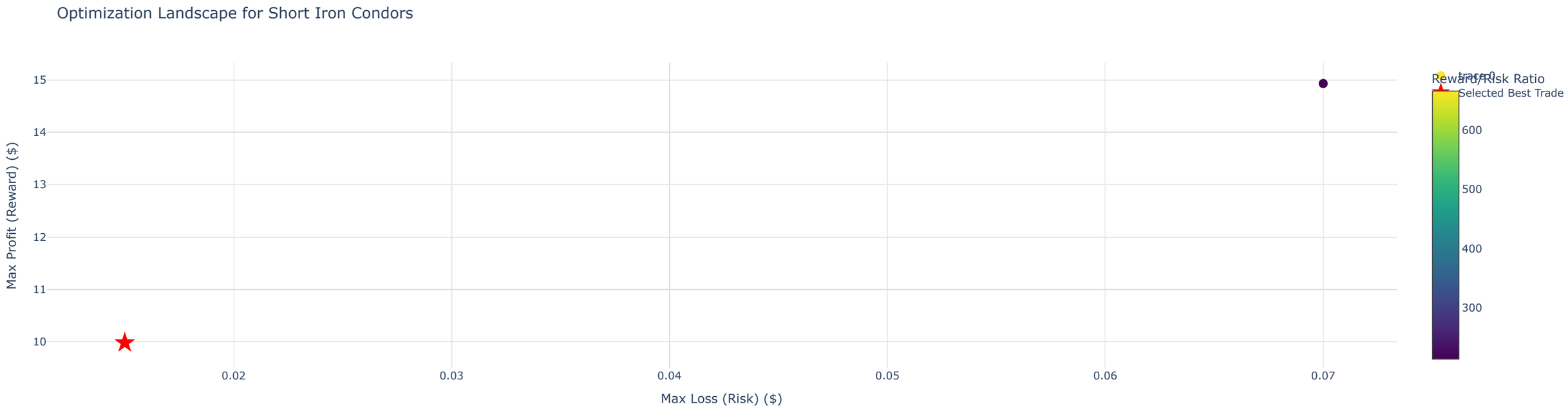
```
--------------------------------------------------
```

## Risk Analysis: Bear Put 170.00/165.00



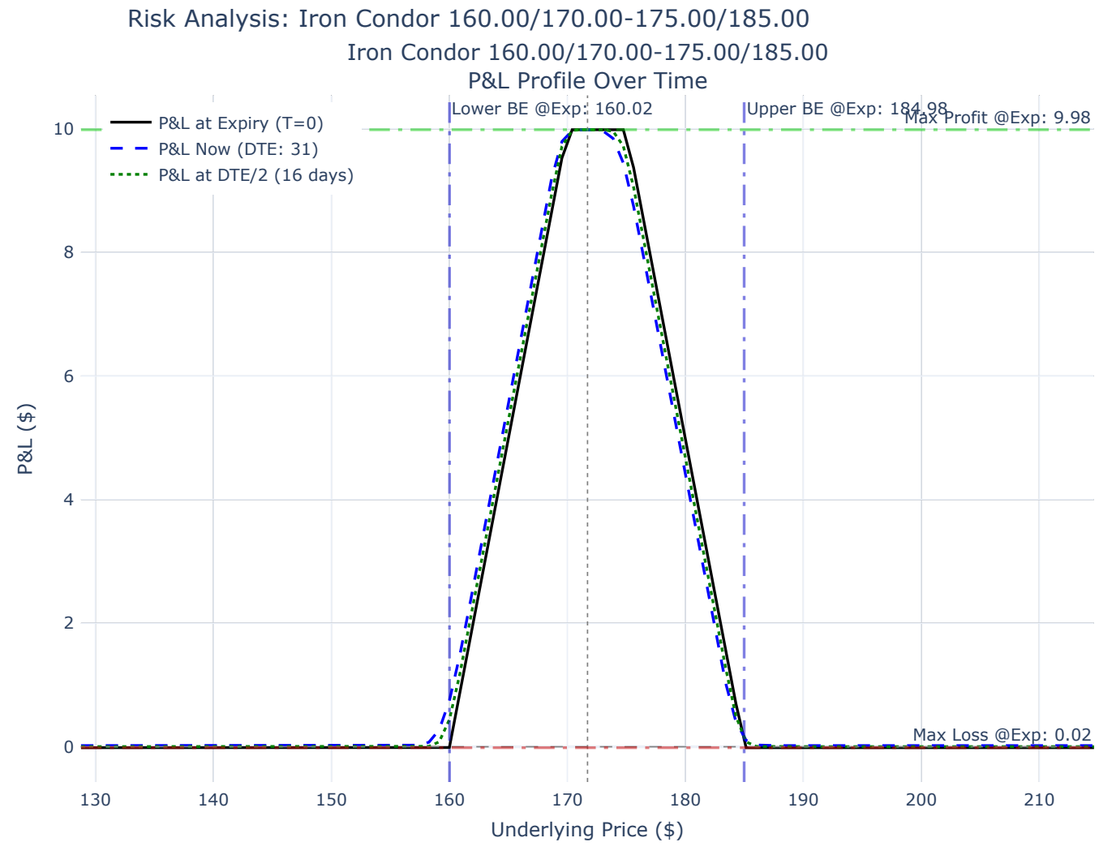



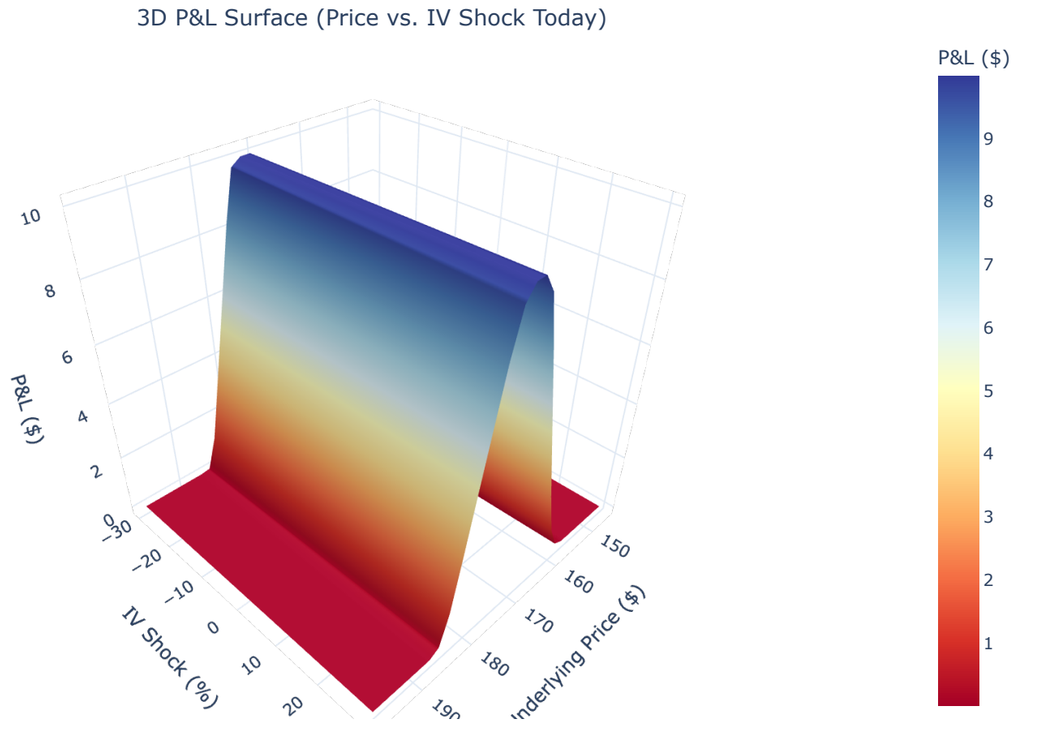
```
--- Optimizing Neutral Strategy: Short Iron Condor ---
Selected expiration date for strategies: 2025-01-10 (DTE: 31)
```




```
--- Strategy Summary: Iron Condor 160.00/170.00-175.00/185.00 ---
Net Credit (Market Prices): $9.98

Legs:
  Leg 1: -1 x CALL @ 175.00 | Mkt Price: $227.20 | IV: 1.69%
  Leg 2:  1 x CALL @ 185.00 | Mkt Price: $217.25 | IV: 1.60%
  Leg 3: -1 x PUT  @ 170.00 | Mkt Price: $0.27 | IV: 1.24%
  Leg 4:  1 x PUT  @ 160.00 | Mkt Price: $0.23 | IV: 2.13%

Overall Position (Calculated from B-S on legs):
  Combined Delta: -0.001
  Combined Gamma: -0.0039
  Combined Theta: 0.0001 (per day)
  Combined Vega: -0.002 (per 1% IV change)

At Expiration:
  Max Profit: $9.98
  Max Loss: $0.02
  Reward/Risk Ratio: 665.67
  Upper Breakeven: $184.98
  Lower Breakeven: $160.02

P&L Evolution Over Time (assuming 0% IV shock from current levels):
```

| Time Scenario | $154.54 (-10%) | $163.12 (-5%) | $171.71 (0%) | $180.30 (5%) | $188.88 (10%) |
|---|---|---|---|---|---|
| **0 days passed (DTE: 31)** | $0.02 | $3.69 | $9.98 | $4.10 | $0.02 |
| **7 days passed (DTE: 24)** | $0.01 | $3.56 | $9.98 | $4.23 | $0.01 |
| **15 days passed (DTE: 16)** | $0.00 | $3.41 | $9.98 | $4.38 | $0.00 |
| **30 days passed (DTE: 1)** | $-0.01 | $3.13 | $9.98 | $4.67 | $-0.01 |
| **31 days passed (DTE: 0)** | $-0.02 | $3.11 | $9.98 | $4.69 | $-0.02 |


Risk Analysis: Iron Condor 160.00/170.00-175.00/185.00
Iron Condor 160.00/170.00-175.00/185.00
P&L Profile Over Time
P&L at Expiry (T=0)
P&L Now (DTE: 31)
P&L at DTE/2 (16 days)
Lower BE @Exp: 160.02
Upper BE @Exp: 184.98
Max Profit @Exp: 9.98
Max Loss @Exp: 0.02
P&L ($)
Underlying Price ($)


3D P&L Surface (Price vs. IV Shock Today)
P&L ($)
IV Shock (%)
Underlying Price ($)