Howard Holmes, CFA hholmes@hhria.com, 508-941-5888, www.hhria.com

Guy Tomase, CFP, CRPC gtomase@hhria.com

Common Option Trading Formulas and Questions

1. Probability of Success.
2. Rate of Change of Probability of Success
3. Margin Requirement for Naked Put [at Fidelity]
4. Margin Requirement for Naked Put [at Schwab]
5. Estimated Non-Margin Buying Power
6. Annualized Return on Investment (ROI) of a long call.
7. Annualized Return on Investment (ROI) of a short put.
8. Future Value (FV) of an Option Account
9. How to calculate delta?
10. How to calculate Gamma.
11. The impact of Theta on short positions.
12. Black Scholes Option Pricing Formula: Assumptions and Formula

Key Three Points:

A. How do I measure the return and probability of achieving it?
B. How do I quantify, measure and mitigate the risk?
C. What is the short-term capital gain tax liability?

1. **How do I determine the probability that the position will be successful?**

A. 1 minus delta, delta obtained at https://oic.ivolatility.com/oic_adv_options.j;jsessionid=bGuZCsrC9J2h

B. 1 - Δp = probability OTM, where OTM = Out of the Money

C. Example: If the delta, Δp = .1, the probability of success is 90%

2. **How do I determine if the probability of success can change?**

A. Use the Gamma (rate of change of delta), also obtained at https://oic.ivolatility.com/oic_adv_options.j;jsessionid=bGuZCsrC9J2h,

B. D2 = -g X S2 +g X S1 + d1

C. Example: QQQ 7/21/2021, strike 325, delta = .1747, gamma = .0116, QQQ = $344.36 (S1), if the stock rises by $10 to $354.36 (S2), the new probability of success (d2) = -.0116 X 354.36 + .0116 X 344.36 + .1747 = -4.11 + 3.99 + .1747 = .0593, 1 - .0593 = 94.07%

3. **How do I calculate the Margin Requirement for a short (naked) put [at Fidelity]? (retail) [Note formulas at other brokers-custodians differ and at the institutional-RIA level it could be different.]**

Take the biggest result from the following formulas:

A. 0.15 X Strike + Put bid
B. 0.25 X Strike – OTM (Stock – Strike) + Put bid
C. Flat $1,000 dollars (retail)

Example: QQQ short put Margin Requirement (retrieved from OIC)

Price: $360.19 Strike: $342 Bid: $2.41 Ask: $2.45

0.15*342+2.41=53.71*100 = $5,371

0.25*342-(360.19-342) +2.41=69.72*100=$6,972 ANSWER

Flat $1,000 dollars (retail)

4. **How do I calculate the Margin Requirement for a short (naked) put [at Charles Schwab]?**

Take the bigger result from the following formulas:

A.0.10 X Strike + Put bid

B. 0.15 X Strike – OTM (Stock – Strike) + Put bid

C. Flat $100 (retail)

Example: QQQ short put Margin Requirement (retrieved from OIC)

Price: $349.67 Strike: $329 Bid: $1.78 Ask: $1.79

0.10*329+1.78=34.68*100 = $3,468 ANSWER

0.15*329-(349.67-329) +1.78=30.46*100=3046

Flat $100 for retail clients

5. **How Do I calculate the Non-Margin Buying Power (NMBP)?**

Assumptions: Equity 70.00% (estimated), Cash 100.00%

Example: Client with $4,000,000 portfolio value, 50% in cash and 50% in equity

$4,000,000*50% = $2,000,000 in cash & $2,000,000 in equity

NMBP = $2,000,000*70.00% + $2,000,000*100% = $3,400,000

6. **How do I calculate the annualized Return on Investment [ROI] of a long call?**

Return on Investment (ROI) = Total Profit/ Cost Basis/ # of days until expiration X 365

Example: For an QQQ long call option, the current price is $24.31 and it is expiring at 3/31/2022, which is 280 days until expiration (as of 06/25/2021).

7. How do I calculate the projected Profit of a Short [naked] put?

The ROI assumption for short put position (QQQ) is 60.00%

The monthly projected profit from QQQ is Total investment *60%

Example: Maximum Profit.

Client A has a current option trading account with $300,000 can be invested. The project profit from option trading is: $300,000*60%=$180,000

Example: Using Option Greeks (Short put)

Note: For short position, Gamma is negative, theta is positive.

Delta = ΔOption / ΔStock

Gamma = ΔDelta / ΔStock

ΔS X delta + ½ X Gamma X ΔS^2 - # days X theta = ΔOption

[Note: we are excluding the Vega (volatility) and Rho (risk-free interest rate) effects]

Symbol: QQQ Current Price: $361.15 (Stock Price)

Strike: $344

Bid: 2.53 Ask: 2.56

Delta: 0.2039 Gamma: -0.0131 Theta = 0.1092

Assume 10 days go by and the stock rises $8

8*0.2039-(1/2*0.0131*8^2) -(10*0.1092) = 0.12*100=$12 per contract.

8. How do I calculate the Future Value [FV] of an Option Account?

Future Value = Present Value X (1 + r) ^N [or simply use a financial calculator Texas Instrument BA II Plus, or excel]

R = rate of return (in the period)

N = the number of periods

Example: The current value of the option account is $500,000.

The predicted rate of return from the trading is 60% per month.

What is the future value of the account after 3 month and 5 months?

3 months: $500,000*(1+0.6) ^3 = $2,048,000

5 months: $500,000*(1+0.6) ^5= $5,242,880

The important concept here is compounding effect.

9. How do I calculate the Delta?

Delta is the ratio the reflects the relationship between the change in the price of an underlying marketable securities and the corresponding change in the price of its derivative (option contract).

Delta = ΔOption/ ΔStock

Example: For a long call option, if the delta is 0.35, it means $1 change in the stock price will result in a $0.35 change in the option contract.

10. How do I calculate the Gamma?

Gamma measures the price movement of an option by the amount of ITM or OTM.

Gamma = ΔDelta/ ΔStock

Example: If an option's price is $10, and the delta is 0.5. If the price of the stock moves up to $11, and the delta becomes 0.6, the gamma is (0.6- 0.5)/($11-$10) =0.1

EXPLAIN ITM/ OTM

Calls are In the Money when the strike price < current stock price

Example: $50 strike call, the stock is $70, in the money for $20

Puts are In the Money when the strike price > current stock price

Example: $50 strike put, the stock is $30, in the money for $20

Calls are Out the money when the strike price > current stock price

Example: $70 strike call, the stock price is $50, out of the money for $20

Put are Out of the money when the strike price < current stock price

Example: $70 strike put, the strike price is $90, out of the money for $20

AT THE MONEY: For BOTH calls and puts, when Strike Price = Stock price, it is at the money.

11. What is the impact of Theta (Time Decay) on short positions?

Theta indicated the time effect of an option value. For long positions, it has a negative effect, but for short put, it has a positive effect on the overall value of the option contract.

12. Black Scholes Option Pricing Formula, [written by Fisher Black, Myron Scholes, and Robert Merton-they won the Nobel Prize Award in Economics in 1997, Fisher Black died in 1995.]

Assumptions:

1. Short term market interest rate is flat.
2. The distribution of underlying asset (stock usually) is lognormal. It assumes stock prices are following normal distribution.
3. The variance is constant.
4. There are no transaction costs in buying and selling stock and options.
5. Fractional holding is allowed in this model.
6. There are no limited on short selling.

$$C = N(d_1)S_t - N(d_2)Ke^{-rt}$$

$$\text{where } d_1 = \frac{\ln \frac{S_t}{K} + (r + \frac{\sigma^2}{2})t}{\sigma\sqrt{t}}$$

$$\text{and } d_2 = d_1 - \sigma\sqrt{t}$$