Option prices

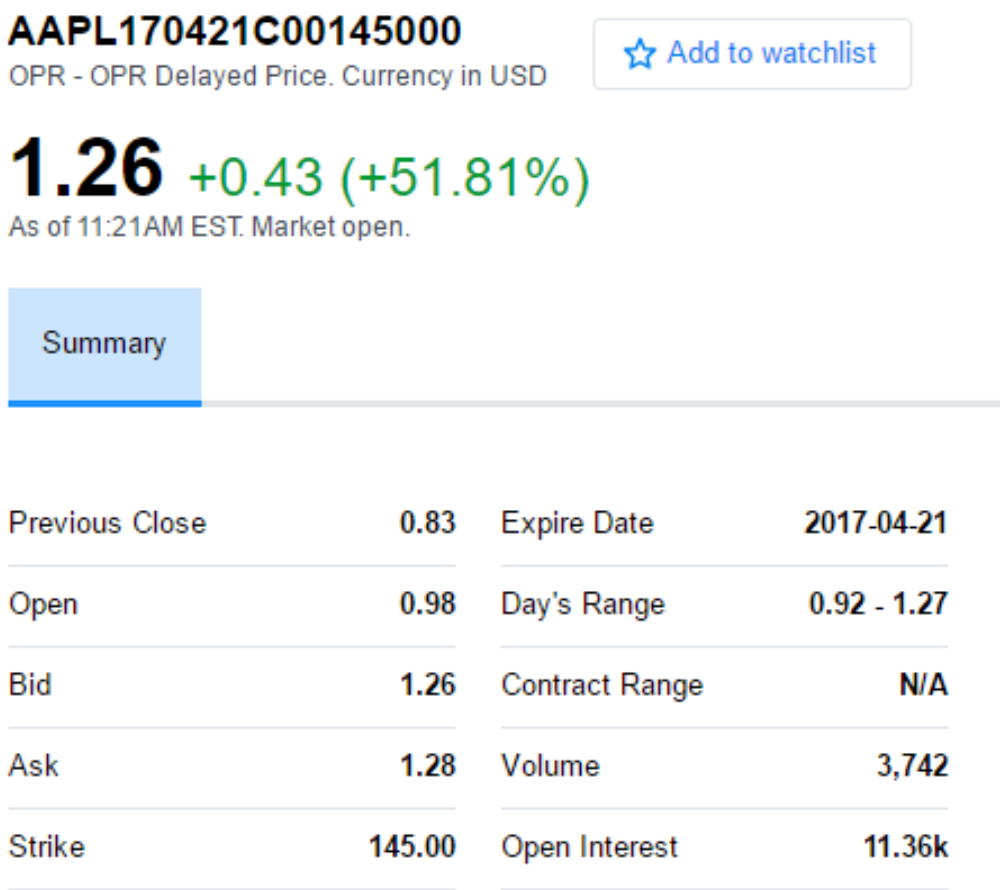
Overview

- Understanding option quotes
- Valuing options
- Using pricing models to trade options

Options: a quick summary

- An option contract provides the buyer with the right to buy or sell or a stock or ETF at a predetermined price for a specific period of time
  - Option buyers buy a right but incur no obligations
  - Option buyers always have a predetermined amount of risk in dollar terms
- Calls provide buyers with the right to buy stock
- Puts are the right to sell stock

Options quote: AAPL170421C001450000



AAPL170421C00145000

OPR - OPR Delayed Price. Currency in USD

Add to watchlist

1.26 +0.43 (+51.81%)

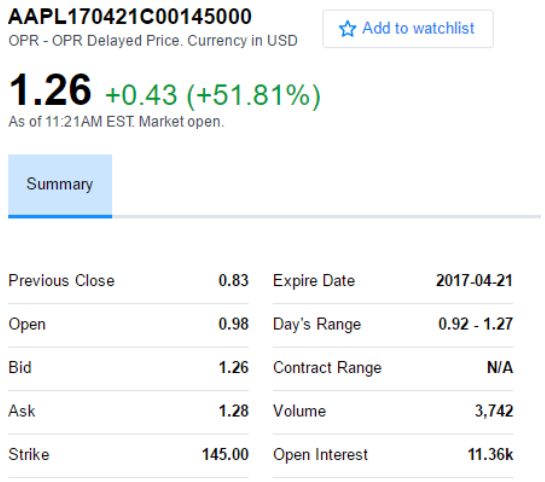
As of 11:21AM EST. Market open.

Summary

Previous Close	0.83	Expire Date	2017-04-21
Open	0.98	Day's Range	0.92 - 1.27
Bid	1.26	Contract Range	N/A
Ask	1.28	Volume	3,742
Strike	145.00	Open Interest	11.36k

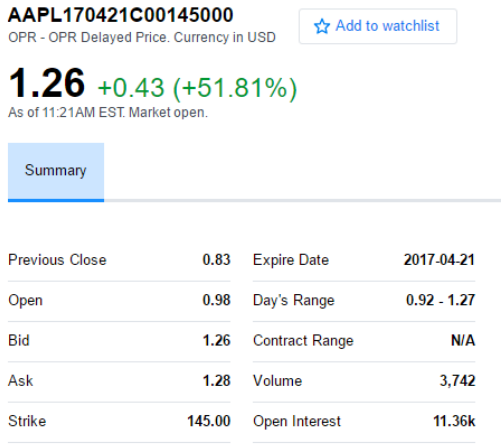
Symbol: AAPL170421C001450000

Underlying symbol: AAPL
Expiration date: 170421 (April 21, 2017in YYMMDD format)
C = Call, this would be P for a put
001450000 is the strike price of $145 the format is $XXXXX.XXX which provides for strike prices as high as $99,999.999 with three decimal place



Quotes

- Include the price of the last trade ($1.26) and the change from the previous close (+$0.43)
- Bid prices are what you can sell at ($1.26)
- Ask prices are what you can buy at ($1.28)
- Volume (3,742) shows today's trading activity
- Open interest (11,360) shows total number of contracts open in that specific option



Bid and ask prices are important

- These are the prices a market order should be executed at
- You could set a limit price using the bid and ask to ensure you get a fair price on your trade
- The spread is the difference between the bid and ask
  - You could set a limit order between the bid and ask to get a better price
- Bid $1.26/Ask $1.28: expect to sell at $1.26, buy at $1.28 or use a limit order of $1.27

Volume and open interest

- Volume shows the trading activity for that day
- Open interest (OI) shows the trading activity over the life of the contract

- Due to high frequency trading, these are no longer as important as they once were – you can trade any option in any liquid stock no matter what the volume and OI are

Option liquidity exists because of put-call parity

$$P + S = C + PV(A)$$

with

P = price of put with strike price A

S = price of stock

C= price of call with strike price A

PV(A) = net present value of the option's strike price

Simplified version: a put and the stock = a call and cash

So what?

- This means an option with low open interest (OI) will be tradable if the stock is liquid
- In this case, the model depends on:
  - Are the assumptions behind the model generally true?
  - Do market participants follow the model?

- You don’t need to know why put-call parity holds to benefit from it but this section shows the why so you’ll be able to trade with confidence

Where do the options prices come from?

- Pricing models have been developed by traders and researchers
  - Models are a way to express the real world with math and are widely used in the markets
    - For example, find a stock's estimated fair value with a model based on the P/E ratio by using the average P/E ratio for the past five years
- The most popular options pricing model is the Black-Scholes pricing model
  - Developers were awarded a Nobel Prize in Economics
- Models include a number of factors
  - Additional factors not included in the models are also at work

Factors determining options pricing

1. Stock price
   - Important because the pricing models assume the stock is actually bought. Therefore, high-priced stocks have high carrying costs and will have higher premiums than low-priced stocks
     - All things being equal, a call or put option on a $100 stock will be more expensive than a $10 stock
2. Interest rates
   - Important because models assume traders borrow money to fund their stock purchase

Factors determining options pricing

3. Dividends (if any)
   - Important because models assume the stock is bought so dividends would be received and add to the total return of the trade
4. Time to expiration
   - Important because (1) it costs more to borrow money for a longer period of time and models assume you borrow to fund the purchase and (2) there is a greater probability the option will have value when the timeframe is longer

Factors determining options pricing

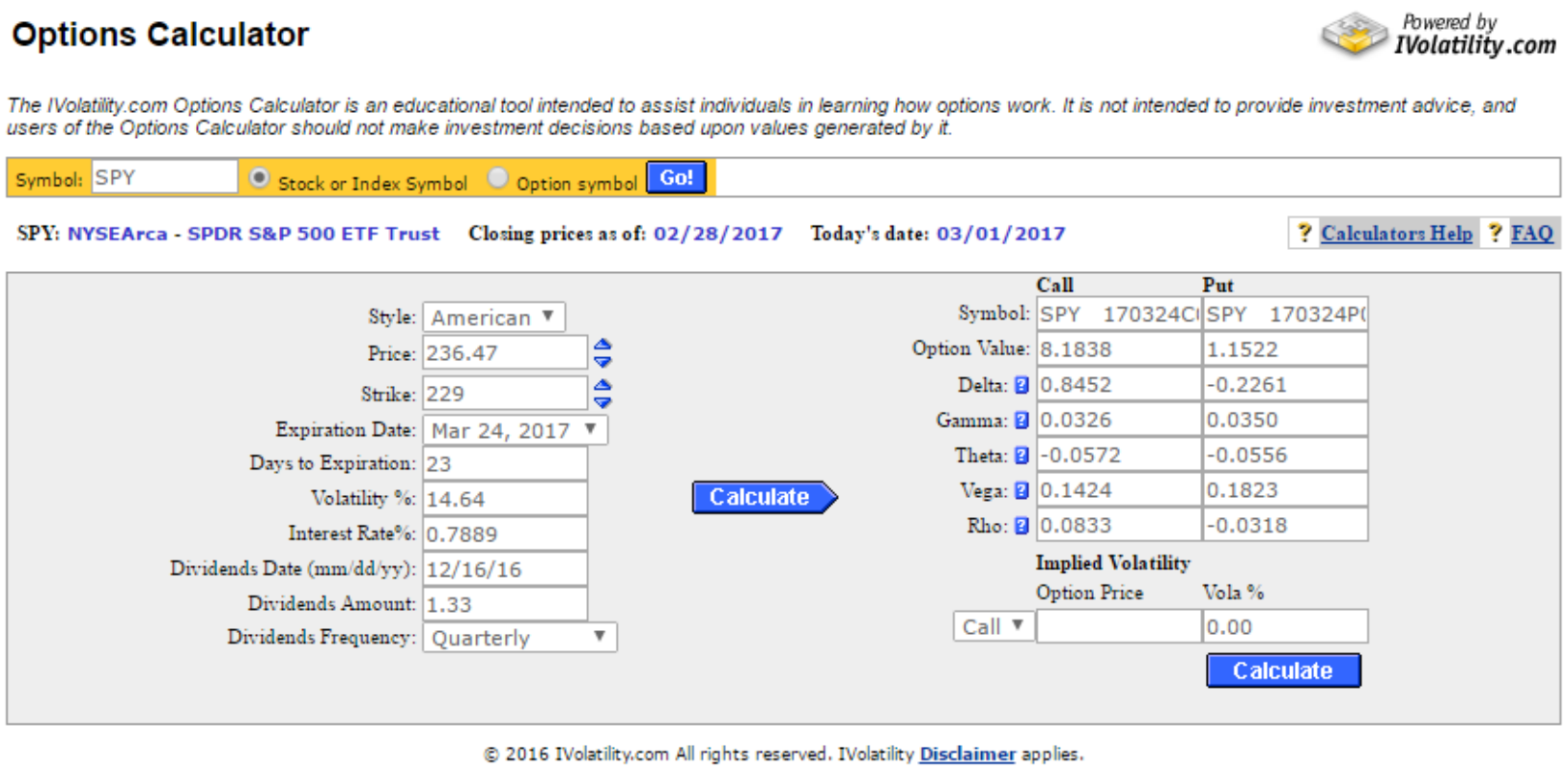
5. Volatility
   - Important because greater volatility means there is a greater likelihood of profitability on the trade
   - Volatility cannot be directly measured
   - It is found by inserting known values into the model and solving for the variable that represents volatility

Factors interact with each other

- Each factor changes frequently
  - Time changes daily
  - Interest rates usually change slightly each day
  - Prices change throughout the day
  - Volatility changes with each market tick
- To see the current value of an option, based on the Black-Scholes model use a calculator such as the one at the CBOE web site

  http://goo.gl/0WThht

CBOE Options Calculator



Options Calculator

Powered by IVolatility.com

The IVolatility.com Options Calculator is an educational tool intended to assist individuals in learning how options work. It is not intended to provide investment advice, and users of the Options Calculator should not make investment decisions based upon values generated by it.

Symbol: SPY | Stock or Index Symbol | Option symbol | Go!

SPY: NYSEArca - SPDR S&P 500 ETF Trust Closing prices as of: 02/28/2017 Today's date: 03/01/2017

? Calculators Help ? FAQ

Style:	American
Price:	236.47
Strike:	229
Expiration Date:	Mar 24, 2017
Days to Expiration:	23
Volatility %:	14.64
Interest Rate%:	0.7889
Dividends Date (mm/dd/yy):	12/16/16
Dividends Amount:	1.33
Dividends Frequency:	Quarterly

Calculate

	Call	Put
Symbol:	SPY 170324C	SPY 170324P
Option Value:	8.1838	1.1522
Delta:	0.8452	-0.2261
Gamma:	0.0326	0.0350
Theta:	-0.0572	-0.0556
Vega:	0.1424	0.1823
Rho:	0.0833	-0.0318

Implied Volatility

Option Price	Vola %
Call	0.00

Calculate

Why use a calculator?

- Can find updated data through the day
  - Allows you to trade at the best price
- Limits trading costs
  - Knowing the fair value helps you place limit orders that are likely to be filled
  - Spreads on options (the difference between the bid and ask) can reduce profits on a trade by 20% or more

Trading example

- SPY $240 call with 20 days to expiration is worth $0.70
  - Bid = $0.65
  - Ask = $0.75
- A buy order at $0.70 is likely to be filled
  - Lower trading costs are achieved by using orders inside the spread and paying $0.70 to buy with a limit order instead of $0.75 with a market order
  - Lowers trading cost by 6.7%, or almost 14% on a round turn compared to market orders

Calculator also provides the Greeks

- The Greeks are values of the risk factors that affect an options contract
  - They are calculated from models
- There are five Greeks - delta, gamma, theta, rho and vega
  - Each defines the amount an option price should move if only one factor changes and everything else remains unchanged
- Delta is the most important one for traders to follow
  - You can trade options profitably using the strategies in this course without knowing the Greeks but delta can help you increase your profits

Delta

- Delta measures how much an option's price should change if the value of the underlying security changes by $1.00
- The values of delta range from 0 to 1 for calls and 0 to -1 for puts
- As an example, if a trader holds an out-of-the-money call option on GOOGL with a delta of 0.25, they should to see the price of the option increase by $0.25 if GOOGL goes up by $1
- The call should gain about $0.125 if GOOGL increases in value by $0.50.
- If GOOGL falls by $1, the value of the option should fall by $0.25

- For puts, the delta might be -0.25 and the put option would be expected to fall by $0.25 if GOOGL rose by $1
- If GOOGL fell by $1, the put option should increase by $0.25
- If GOOGL rises $1, the put option should decrease by $0.25

Delta’s usefulness for traders

- Delta can be used to find the probability an option will be in-the-money at expiration
  - The formula for a call is

    delta * 100
  - The formula for a put is

    (1 – |delta|) * 100
- Delta can help you determine if a trade has too much risk

Other Greeks are not as useful for us

- Gamma is used to estimate how much delta will change when the underlying security moves by $1.00
- Theta describes the time decay of an option
- Vega measures how much the price of the option should change for every 1% change in the volatility of the underlying security
- Rho measures the sensitivity of an option's price to moves in interest rates. Rho is the estimated change in the value of an option when interest rates change by 1%. It is usually fairly low, often under 0.05

Options are not complex to trade

- The math behind options can be complex
- Modern markets with HFT and other changes allow anyone to obtain fair prices when trading options


BANYAN HILL