

## Video lecture

<https://youtu.be/eA6RQyDVcck>

## What?

A put option, for the writer, is an obligation to buy an underlying financial security at a specific (**strike**) price before an expiration (**maturity**) date. Anybody can write put options. Put options trade very similar to stocks through brokerage companies during normal market trading hours. The money that is collected to write put options is income for taking risk. Put options expire on their maturity dates. Put option value may go to zero. Put option writer's potential loss is significant. Put options trade in contracts and each contract is usually for 100 shares of the underlying financial security.

## Example

A put option with a strike price of \$200 and maturity date of January 18<sup>th</sup> on AAPL is trading at \$1 per share. We can write one contract for:  $\$1 \times 100 \text{ shares} = \$100$  for one contract. We have the obligation to buy 100 shares of AAPL at \$200 per share until January 18<sup>th</sup>. Note that the \$100 that we collect to write this option is our income. It is not a down payment. It is not a deposit. There are no refunds. We can try to buy this option back from the market. However, the new sale price has nothing to do with the \$100 we collected. Thus, \$100 is an instant income that we collect up front, as soon as we write the put option. If AAPL price decreases to \$185 then we will lose \$15 per share ( $\$200 - \$185 = \$15$  per share). Since we have the obligation to buy 100 shares, we will lose \$1,500 ( $\$15 \times 100 \text{ shares} = \$1,500$ ). Remember that we collected \$100 to write this put option. If AAPL price increases to \$215 then we will not lose any money. Remember that the put option gives the buyer right but not the obligation. Thus, the buyer will chose not to exercise his/her right to sell AAPL at \$200 to us when the market price is above our strike price (i.e. \$215). We will end up keeping our initially collected \$100.

## Pricing

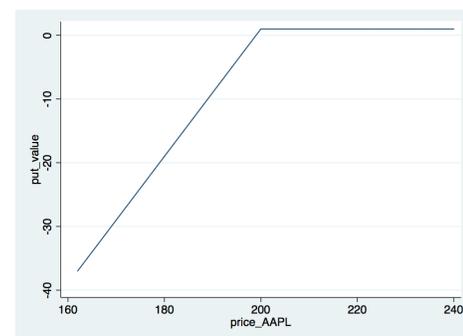
Put option price is determined by two factors: 1) **exercise value** (a.k.a. intrinsic value) and 2) **premium**.

**Exercise value** is the value that the put option buyer will attain if s/he chose to exercise the option. So, based on our example above the \$15 per share ( $\$200 - \$185 = \$15$  per share) is the exercise value. Exercise value is precise and easily calculated. **Premium** is the value that is dependent on traders' perception of the specific put option. Think of a memorabilia (ex. baseball) that is signed by a celebrity. The actual baseball may be worth a few dollars but the autograph by the celebrity adds significant value. However, how much value the autograph adds is hard to determine. The best way is to try to sell it. Then, we would know the true value of the autographed memorabilia. Option premium is similar to the autograph's value. Traders perception of the specific call option's value is hard to determine. However, the market traded prices will show true value.

## Possible outcome

We will now evaluate possible outcomes of writing the put option in our previous example. Note that, since it is hard to determine the premium, our exercise is based on exercise value.

```
set obs 40
gen price_AAPL = 160 + (_n*2)
gen put_price = -1
gen strike = 200
gen put_value = -(max(strike-price_AAPL,0) + put_price)
twoway (line put_value price)
```



The horizontal axis is the possible AAPL share price in the market. The vertical axis is the put option outcome based on possible AAPL share prices. Note that the put option outcome can be positive \$100. This is what we collected when we wrote and sold the put option. Note that when we write put options, our potential loss is significant. Our potential profit however is limited to the \$100 we collected.