Video lecture

https://youtu.be/uSMx6p47PEA

What?

A put option gives the buyer the option (not the obligation) to sell an underlying financial security at a specific (**strike**) price before an expiration (**maturity**) date. Anybody can purchase put options. Put options trade very similar to stocks through brokerage companies during normal market trading hours. The money that is paid to purchase put options is not an investment. Put options expire on their maturity dates. Put option value may go to zero. Put option buyer's potential loss will be no more than what they paid for the put option. 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^{th} on AAPL is trading at \$1 per share. We can buy one contract for: \$1 $\times$ 100 shares = \$100 for one contract. We have the right to sell 100 shares of AAPL at \$200 per share until January 18^{th}. Note that the \$100 that we pay to buy this option is sunk cost. It is not a down payment. It is not a deposit. There is no way to get this money back. We can try to sell this option back in the market. However, the new sale price has nothing to do with the \$100 we paid. Thus, \$100 is an instant loss that we take up front, as soon as we buy the call option. If AAPL price decreases to \$185 then we will earn \$15 per share (\$200 - \$185 = \$15 per share). Since we have the right to sell 100 shares, we will earn \$1,500 (\$15 $\times$ 100 shares = \$1,500). If AAPL price increases to \$215 then we will not lose any money. Remember that the put option gives us the right but not the obligation. Thus, we will chose not to exercise our right to sell AAPL at \$200 when the market price is above our strike price (i.e. \$215).

Pricing

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

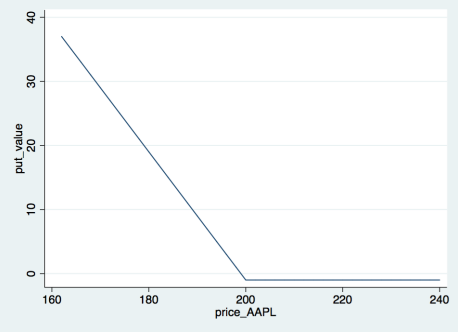
Exercise value is the value that the put option buyer will attain if s/he chose to exercise the option. So, based on our example above the \$15 per share (\$200 - \$185 = \$15 per share) is the exercise value. Exercise value is precise and easily calculated.

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 put 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 buying 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 negative \$100. This is the sunk cost of buying the put option. In fact, we need AAPL to decrease to \$199 in order to earn this \$100 sunk cost back. Note that, when we buy put options, our loss will never be more than our sunk cost. Our potential profit however is dependent on how low the AAPL share price can decrease until our put option maturity date.