Question: If I buy 100 shares of common stock, then write an out-of-the-money covered call against it, what are some good proxies for calculating expected yield (1) if the stock price rises above the strike price and (2) if the option expires unexercised?

This question is answered by the Aruba Options Model.

Note: This is the first half of the Aruba Options Model. The other half, which involves probability calculations, is taught in Economics 136.
Using The Aruba Options Model to Calculate Two Yields:

Two outcomes are possible when you write a covered call using an out-of-the-money call:

(a) the stock will go into the money before expiration, the call will be exercised and you will sell your stock at the strike price. The yield from this outcome we will call the **Projected Exercise Yield (PEY)**.

(b) the stock will stay below the strike price and the option will expire worthless (but you wrote it, so that is fine). The yield from this outcome we will call the **Unexercised Option Yield (UOY)**.

Screen shot (first screen) of the Aruba Options Model (yours may appear a little different).
Calculating the Projected Exercise Yield  
(the yield if the option is exercised)

\[
PEY = \ln \left[ \frac{(SPO \times N) - SFee}{((PPS - PO) \times N) + BFee} \right] \times \left( \frac{365}{\text{Days}} \right)
\]

PEY = Projected Exercise Yield  
SPO = Strike Price (of Option)  
PPS = Purchase Price of Stock  
PO = Price of Option  
N = Number of Shares  
SFee = Selling fees, typically of stock only  
BFee = Buying fees, typically of stock purchase and fee for writing covered call.  
Days = Number of days between the present and the day the option expires.
# Model logic (1)

1. \[ X_f = X_p e^{rt} \]

2. \[ \ln X_f = \ln X_p + rt \]

3. \[ (\ln X_f - \ln X_p)(1/t) = r \]

4. \[ \ln \left( \frac{X_f}{X_p} \right) \times \left( \frac{1}{t} \right) = r \]

Equation 1. shows the standard formula for a continuous growth rate, where \( f \) is the future, \( p \) is the present, and \( r \) is the continuous rate of growth over time \( t \).

Equation 4, derived from equation 1, tells us that if we take the natural log of the ratio of a future value over a present value (of, say, an investment) and adjust for time, the solution is the continuous growth rate of the investment.
## Model logic (2)

\[
X_f = (SPO \times N) - S\text{Fee}
\]

The numerator \(X_f\) is the value of the investment if the option is called. It is equal to the strike price of the option (because the stock will be sold at that price) minus any fees.

\[
X_p = ((PPS - PO) \times N) + B\text{fee}
\]

The denominator, \(X_p\), is the cost of the initial investment when buying a stock and writing a covered call against it. It is equal to the price per share minus the option price per share times the number of shares plus fees.
The model shown again

\[
PEY = \ln \left[ \frac{(SPO \times N) - SFee}{((PPS - PO) \times N) + BFee} \right] \times \left( \frac{365}{Days} \right)
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PEY = Projected Exercise Yield
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Calculating the Unexercised Option Yield

\[
UOY = \ln \left( \frac{PPS \times N}{((PPS - PO) \times N) + Bfee} \right) \times \left( \frac{365}{Days} \right)
\]

This yield is realized in the event that the option is not exercised and is only the yield on the uncalled option. Because the stock does not close above the strike price, the cash return to the option writer is the price of the option for which it was sold. The UOY does not take into account the possible capital gain or capital loss of the stock itself, which is assumed to be zero (it is easy to modify the model to build in an expected \textit{alpha} (yield).
An example

Buy 100 shares of SPY at 119.64, then sell a Nov 123.00 call for $2.94. Suppose there are 40 days between now and the expiration date in Nov, and assume selling fees and buying fees to be $7 and $14 (the same values used in the model example):

\[
PEY = ln \left[ \frac{(123.00 \times 100) - 7.00}{((119.64 - 2.94) \times 100) + 14.00} \right] \times \left( \frac{365}{40} \right) = 46.36\%
\]

\[
UOY = ln \left[ \frac{(119.64 \times 100)}{((119.64 - 2.94) \times 100) + 14.00} \right] \times \left( \frac{365}{40} \right) = 21.61\%
\]

PEY absolute = 5.08%  UOY absolute = 2.37%