BEM 103 Introduction to Finance.

Homework 8: Future and Options

Due Monday November 25 5pm (in TA or instructor boxes).

1. **Financial Literacy**: Answer these questions in 3 steps. (1) give an answer to the question, (2) look over the material assigned for class and find a definition (3) modify, if need be, your first answer. The goal is not for you to memorize a given answer but to be sure you can explain the concept to someone. If you can't, then you do not control that concept.
   a. Binomial option
   b. Strike price

2. **Pondering Options**:
   Consider the case of the widget company that acquires a new technology from an inventor Ms Smith. It forms a new company to use the new technology which Widget Co owns 50% and Ms Smith owns 50%. The technology has a probability p of being successful in a year and then it will generate 1/p million dollars in profits, if it fails it returns 0. Interest rate is r.
   A. What is the expected value of the firm? What is its the net present value? And what is its price?
   B. The widget company can invest effort to adapt its product to the technology. If it invests the likelihood of success is p_h (1/p million dollars in profits). That effort can not be contracted up. What kind of contract would Ms Smith like to sign to induce the Widget co to make the effort? Can you think of a price for that contract?
   C. Once the technology has been successful the Widget company can make further effort to adapt this technology but it does not want to share those additional profits. What kind of contract would it want to sign?
   D. In the case of success the Widget company will need to expand its operations. Should it sign a forward contract to lease space or an call option? why

3. **Pondering Futures**
   You are a natural gas producer that has signed a large number of leases with foreign governments that requires you to produce a given level of output from their natural gas fields and pay them a given set of per BTU royalties**.**
   A. What set of risks does this lease arrangement make you sensitive to?
   B. What might you want to do?
   C. Suppose (unrealistically) there are not organized markets for insurance, futures, or options for natural gas but these markets exist in petroleum, what might you do to hedge? Explain why you think this might work.
   D. The Dutch have a large greenhouse industry that produces both vegetables and flowers. These greenhouses are entirely heated by natural gas. How might you use this fact to design a contract that allows you to hedge your price exposure in the gas market? Explain why you think this might work?

Computing Options

A. The current price of Ampere Co is 136. The price of an option with strike price one month ahead (i.e.) December 2013 is 136 is 9.50, assuming the interest rate is 0.25% a month. What is the expected price if the option were to be exercise next month (assume that the expected price if the option is not exercised is symmetric about the current price).
B. Currently Ampere makes about 6000 cars a quarter, recently there have been some fires in cars crashes. Suppose that if this problem persists the price of shares will fall to 100 dollars by February 13 (3months hence). If the problem is quickly solved the stock price will bounce back to 172. Assuming the interest rate is 0.25% a month, what should be the value of binomial call option with strike price 136?
C. Right now Ampere is facing problems securing enough batteries suppose each month supply can either go up by 5% or down by 5% and that will be fully reflected in the stock price because it is the only constraint on increasing output. What is a January call option worth today (assuming the interest rate is 0.25% a month).