This (fictitious?) case illustrates the differences between discounted cash flow and real options valuation in the context of a start up company. As we have argued earlier in the course, the new economy contains a huge amount of optionality. Penelope’s Personal Pocket Phones (4P for short) is no exception. Having learned about modern management methods, the project’s proponents decide to explicitly price the option element and use this as an argument in their quest to raise venture capital. Imagine that you are a potential co-founder of 4P involved in the capital budgeting exercise. Write-ups consist of a memo (with analytic appendices supporting your valuation claims) addressed to potential investors in which you point out why traditional methods of valuing 4P would be grossly misleading. Obviously, you try to raise as much capital as possible so that you need to back up your arguments with hard facts: numbers speak louder than words!

1. What is the NPV of Penelope’s first generation phone project if we ignore the possibility of investing in a second generation project?
   
   (a) What valuation method(s) would you use to assess the project? What do they capture and what not?
   
   (b) Are these methods appropriate for the first stage?
   
   (c) What else might you want to do?

2. Analyze the value of the second generation project. Using the Black-Scholes-Merton or binomial option pricing model, back out the implied current value $V_0$ of the second-generation technology that would justify an investment in first-generation project.
   
   (a) What type of options does the project contain? How do they interact?
   
   (b) What is the value of having a second investment opportunity on the basis of the first? First use the given parameter values and then modify the assumptions justifying your choices.
   
   (c) How large does the current expected PV of the second stage project have to be in order to justify a USD 10m investment in the first year (stage) on the first generation phone project? Do the numbers look plausible to you? Why or why not?

3. A valuation model’s results are only as good as the underlying parameter assumptions.
   
   (a) How would an increase in the expected value’s volatility affect the value of the investment opportunity?
   
   (b) What conclusions can we draw about investments in young, high technology companies?
   
   (c) What does this say about the alleged overvaluation of the new e-conomy?
4. Ignoring the option to invest in the second generation phone, how valuable is the ability to sell the equipment in year 2? Would Penelope want to invest (and be able to find financial backers) under this scenario? Why? Once again, real options analysis can help to clarify the valuation issues.

1 Groups 1, 3, 5, 7

You are the budding 4P entrepreneurs and should analyze the case from the owner/managers/founders’ perspective. Your presentation is a pitch to raise money from financial backers, venture capitalists, say. Also, I would like you to calculate the various option values both in a binomial (very simple: 3 periods at most corresponding to the time line given in the case) and Black-Scholes-Merton setting. The issues contained in questions 2 to 4 appear to be the most relevant for your presentation.

2 Groups 2, 4, 6, 8

You are the venture capitalists considering an investment in 4P. Imagine that you are the managing partner of a VC fund specializing in telecommunications and you now present the project to your general partner(s). You need to make a recommendation regarding the investment decision. Obviously, you also need to price the option(s) to discover the hidden value in the project. Once again, I would appreciate both binomial and BSM pricing. You should focus on the issues raised in question 1-3.

Please note the following ground rules for the case write-ups:

- the maximal group size is 5; every group member gets the same grade
- at most 2 pages of analysis and 6 pages of technical appendices;
- show your work, staple the pages together and be professional;
- late write-ups will not be accepted for any reason; they are due at the beginning of class for which the discussion is scheduled;
- graded write-ups will be available a week later.