Honors Assignment

As advanced students, it is reasonable to assume that at some point in your career you will need to communicate reasoning in writing to someone, whether it be for a paper in a published journal or a “white paper” for one’s employer. Though each homework assignment in and of itself is a written assignment where you (should) explain your mathematical reasoning in writing, it is much less structured than a standard paper. In addition, your audience is one which is very familiar with the material at hand. Therefore, you can be justified in skipping some steps in your analysis. However, in the real world you will need to present analyses to people who are not as mathematically sophisticated.

In order to give you some practice in developing these skills, I am assigning a writing assignment. In order to receive honors credit, you must complete the writing assignment. Depending on your performance, it may raise your final grade, but it will never bring it down.

I would like you to write up thoroughly your solution (including modeling) of an economic problem of your own choosing. When working on the problem, you should try to keep in mind the techniques we have learned in this course. It is also critically important that you explain your solutions carefully for an audience not familiar with the problem. Pretend you are an economic consultant or analyst hired by a company or government agency.

The assignment consists of three parts:

1. On September 28 you should submit a brief description of the topic you wish to explore in your paper. The description should be similar to an abstract: short, but indicative of the problem at hand and the mathematical techniques you think might be required. That way, I may be able to assist you in finding references and avoiding mathematical pitfalls which would needlessly complicate the project.

2. On October 26 you should submit an outline of your project. It should consist of
   (a) a short introduction to the problem,
   (b) a description or derivation of the equations, and
   (c) a brief description of how your solution process will proceed.
   At this time I will perform another check just to make sure you aren’t trying to do too much.
3. On November 30 you should submit the written paper, which should consist of
   (a) an introduction to the economic problem.
   (b) your model and any simplifications you employed.
   (c) a careful exposition of how you solved the problem. This should be written for an audience which has some knowledge of the mathematical and economic material, but not an extensive one. Pretend you are teaching the class. There are simple commands in Excel and Mathematica that can solve these types of problems, and you should avail yourself of them if appropriate.
   (d) an analysis of your mathematical results, and what they reveal about the real-world problem. Does your solution have any useful predictive capabilities?
   (e) any data you used/estimated.
   Though it would be nice if the paper were typed, it is not required.

Sample Topics

1. COST-BENEFIT ANALYSIS. In any endeavor, there is a tradeoff between costs and benefits. Write a cost-benefit analysis, playing the role of an economic analyst in a large corporation or government office. For instance, you could examine
   • the benefit of a new government regulation versus the associated costs
   • the costs of fixing a product versus settling related litigation
   • up-front costs of technology versus long-term cost savings

2. SPORTS. What positions should a sports team draft and/or fill with a limited budget?

3. ADVERTISING. How should a company allocate its advertising budget to fulfill its goals of how many people are exposed to it?

4. THE PRODUCTION PROBLEM. Find the optimal way for a company to produce its widgets, given costs of the various inputs. You could include transportation, weather, seasonal, or other factors in the production process, as well as varying demand. Again, play the role of an economic analyst.

5. THE TRANSPORTATION PROBLEM. Find the optimal way for a company to transport its goods from its various factories to wholesale distribution centers, given costs to transport. You could include weather, seasonal, or other factors. Again, play the role of an economic analyst.

6. INSURANCE. How does the cost of an insurance product vary with changes in the utility function? What utility functions are most realistic, or how should the product be priced if the utility function is unknown? Again, play the role of a consultant.
7. **STRATEGIC PLANNING.** Suppose that a company is looking to implement a new initiative, release a new product, etc. If the company has one main competitor, produce a strategy that will maximize the utility of the company associated with the initiative.