Resource & Environmental Economics Field Examination
Spring 2012
Instructions:
- You have 4 hours to complete the exam. This time commences at the end of the 15-minute reading period during which no writing is allowed.
- Please use your assigned "alpha letter" on every page to identify your exam and number each page. Do not use your name or social security number. Write on only one side of the page leaving at least one inch margins. When you submit the exam, make sure pages are in order.
- You have four questions to answer.

Answer four of following five questions.

Question 1 : Under California's REgional CLean Air Incentives Market (RECLAIM) polluters must have, by the end of each period, sufficient allowances to cover their emissions of nitrogen oxides (NOx). Consider a single source that is small relative to the overall market (i.e., a price taker). The source has historically emitted 100 pounds of NOx, and has an allocation of 100 RECLAIM Trading Credits (RTCs). The firm's marginal abatement cost is upward sloping – thus it could save money by increasing its emissions above 100 or it could reduce its emissions below 100, but at a positive marginal cost. Answer the following relative to this case.

a)   Assume no banking or borrowing of RTCs is allowed. State in mathematical terms the firm's profit maximizing problem relative to emission and RTC purchase and sales decisions. Using your model, describe conditions under which the firm will buy RTCs and conditions where will sell RTCs. Be careful to define all the notation that you use.

b)   Now consider how the firm would respond if RECLAIM changed its rules to banking so that credits not used this year could be used in the future. Provide a mathematical model that describes the revised optimization problem. Assume that the firm can predict future RTC prices exactly. Explain in words how banking affects firm behavior and speculate on how it will affect RTC market equilibrium prices in the short term and long term.

c)   Now assume that future prices cannot be predicted exactly. Assume the price that the firm faces this year are fixed, but that the price the firm will face in future years are known only up to a probability distribution. How does this change the firm's optimization problem? Speculate on how the firm's behavior would differ relative to its choices in the known-price case under your answer to part b.

d)   Finally, retain all the conditions of part c, but in addition assume that the firm is considering two investments. It can invest in 1) pollution-reducing equipment that would reduce the marginal cost of abatement, and/or 2) output-increasing technology that would increase its profits in the product market but increase its emissions so that it would be more costly to achieve previous levels of emissions. State the optimization problem that the firm faces prior to making both investment and abatement decisions in the first year. State in words or math the conditions under which the firm would choose to invest in each form of capital.

Question 2: In the general climate change debate, William Nordhaus represents one group of economists who advise that policy be slow and gradual, which some interpret as involving a delay of action. Sir Nicholas Stern's report represents a different group that advises more immediate and drastic actions.

a) What market based incentives are possible to deal with global warming? Briefly describe at least two.

b) The two groups of economists make different assumptions about the magnitude of the social discount rate. Why would the assumed social discount rate matter in this debate? Even if you don't know the literature, you can reason out which of the two camps assumes the lower discount rate. Which is it, and why?

c) A recent media debate (in the April 26th 2012 New York Times Book Review, in "In the Climate Casino: An Exchange.") features these quotes: "The larger point here is that uncertainties in the physical science and the economic science need to be properly considered." And, " …think of the issues as if we are playing roulette… Our best guess is that CO2 doubling will increase temperatures by 3 degrees C, but if the ball lands on black it will be 2 degrees C, while a ball on red will produce 4 degrees C." (This is from Nordhaus). Outline an approach for dealing with uncertainty in economic modeling of future climate change or global warming impacts.

Question 3: Many people in the United States were frustrated with high gasoline prices in the Spring of 2012. One politician claimed that if he were elected president, he would engineer lower gasoline prices, hinting only that he would encourage domestic development of oil. Oil prices (based on the global Brent Crude price) were above $110 per barrel. However, while offshore oil exploration and development was happening off the coast of Brazil, there was no similar exploration in Alaska.

a) First, can the politician undertake policies that would reduce the price of U.S. domestic gasoline? What policy would accomplish this? Explain why or why not.

b) Second, suppose the marginal cost of extraction is lower in Brazil versus Alaska. How does a higher marginal cost of extraction relate to the decision to develop oil supplies?

c) Suppose that the U.S. federal government set a tax on the marginal cost of extracting oil in the Alaska to cover environmental damages there. What would this do to the long term strategy for extraction in this region? Is it possible that further Arctic development would never happen? Explain.

d) Finally, resource economists often couch optimal conditions for resource extraction in terms of the rate that the "scarcity rent" [also called marginal user cost, or the royalty) should rise over time. What is this rate going to equal, in theory? And, expressing frustration that the scarcity rent is difficult to observe, several resource economists have suggested that the marginal cost of exploration might be used as a proxy measure of scarcity rent. Why is this logical? Explain.

Question 4: Present conditions influencing the water consumption behavior of households are as follows:

      (i)   household demand exhibits price inelasticity;

      (ii)   local utilities design their water rates with the regulatory condition that they do not turn a profit; and

      (iii)   increasing block rates omitting opportunity costs are favored by local utilities.

Due to rising water scarcity and heightened social concerns about the year-to-year variability of water supplies, the State of Texas is reviewing its regulatory stance on rate-making. Under discussion is the appropriateness of the above characteristics (ii) and (iii) for future policy, and whether the State should impose fresh regulatory standards regarding either of these conditions.

Using economic arguments, models, theory, and/or concepts, develop recommendations for Texas relative to points ii and iii above. Clearly number and support each of your major recommendations.

Question 5: High recent energy prices have stimulated renewable energy production from agricultural sources. To date energy feedstocks have come from traditional commodities like corn. In turn this has placed pressures on the corn market and has led to an increase in corn prices. A number of analysts have claimed that this will cause both domestic and international expansions in both a) land area farmed drawing on sensitive lands and b) intensifying input use. Furthermore they argue this will cause environmental degradation.

a)   Develop an economic explanation drawing on theory as to why expanded bioenergy might cause domestic and international environmental degradation.

b)   Today there is substantial interest in moving the feedstock source from traditional production to crop residues (corn stover) that are a byproduct of traditional production. How would this alter the above situation? Answer this by modifying the framework developed in part a.

c)   There is also substantial interest in using energy crops like miscanthus which compete for land with traditional crops but have 4 times the yield in terms of biofuel. Analyze the consequences of using these crops in place of corn using the framework developed in part a.

d)   Suppose you needed to analyze the effects of the items above on nitrogen related water quality damages. How could you approach that? **(Keep or drop or make more consistent??)**