

Take-home Graded Opportunity 5

Due date: October 27, 2011, 5:00 p.m.

1. In your own words, explain how *derived demand* is found. That is, knowing the demand for products in the retail market and the supply of marketing & processing services, how do you determine the derived demand for the farm-level commodity?

Do not use the definitions out of your lecture notes. I want to see that you understand the intuition behind derived demand.

2. For each of the following, carefully illustrate the changes that occur in both the retail and farm markets. Make sure to do the following:
 - **Label** all original and new quantities and prices in both markets.
 - Indicate the point at which derived demand is equal to zero.

In the production of ethanol, corn is converted into fuel and byproducts (dried distillers grains, DDGs) are used for feed.

- (a) Illustrate the demands for ethanol and DDGs in the retail market, showing each individual demand and also the final demand for all corn-based ethanol products. Explain your intuition for arranging the demands from top to bottom. That is, why is a particular demand curve above or below another demand curve. Carefully label each curve.
 - (b) Using the information in (a), illustrate the farm market. Assume that the supply of processing & marketing services and the supply of corn is known. Carefully label each curve.
 - (c) Find the equilibrium quantity and price of corn in the farm market, as well as the equilibrium quantity and price of corn-based ethanol products. Using the latter quantity, illustrate the prices of ethanol, DDGs, and total corn-based ethanol products. Is the price of total corn-based ethanol products in the retail market the same or different than the price of total corn-based ethanol products in the farm market? Why?
3. Suppose that there is a substantial drought in the Corn Belt (the primary corn production region in the United States).

- (a) Without illustrating anything, go through the steps of what changes occur. Where does the change occur first? What is the next event that happens? Etc.
 - (b) Using a new two-diagram figure, illustrate what occurs in both the farm and retail markets.
 - (c) Using economic intuition, explain why the changes that you've outlined occur in each of the markets. Who is likely better off and who is likely worse off?
4. Using a new two-diagram figure, illustrate what occurs in both the farm and retail markets if there is an increase in the price of soybean meal, a product that is used in feeding livestock. Explain the economic intuition of the changes.
 5. Your next goal is to determine quantitatively the equilibrium values in the corn farm market and the ethanol product retail market. Suppose that the individual demands for ethanol and DDGs are as follows:

$$D_{ethanol} : P_{eth}^D = 400 - 0.35Q$$

$$D_{DDGs} : P_{ddg}^D = 200 - 0.15Q$$

You also know that the processing and marketing of corn-based ethanol products is characterized by the function:

$$S_{tot.eth}^{PM} : P^{PM} = -600 + 0.5Q$$

Lastly, you know that the production of corn involves fixed input costs and variable labor costs. Fixed costs are \$500 and the labor supply function is: $Q_L^S = -200 + 50P$. (*Hint: use this last piece of information to solve for your farm-level corn supply function.*)

Calculate the following:

- (a) The demand function for total corn-based ethanol products.
 - (b) The derived demand function for corn.
 - (c) The supply function for corn.
 - (d) The equilibrium quantity of corn (in thousand bushels).
 - (e) The equilibrium price of corn (in cents per bushel).
 - (f) The equilibrium price of the rack price of ethanol (cents per gallon), and the price of DDGs (dollars per ton).
6. Suppose that the demand for DDGs is now $D_{DDGs} : P_{ddg}^D = 100 - 0.15Q$. Answer questions (a)-(f) in question 5 using the new DDG demand function.