Economics 58 **Name_Solutions____**
Fall 2006

Elasticity Calculations

Making predictions about market responses is especially easy if you use constant elasticity demand and supply curves. This exercise asks you to make a few such calculations and compare them to intuitive/back-of-the-envelope calculations. Throughout assume that demand is given by $Q_D = aP^b$ (where *b* is the price elasticity of demand) and supply by $Q_S = cP^d$ (where *d* is the elasticity of supply and could be either a short-run or long-run figure).

a. Calculate the equilibrium price (P^*) in this market.

$$P^* = \left(\frac{a}{c}\right)^{\frac{1}{d-b}}$$

b. Suppose that $d = 0$, calculate the effect of a one percent reduction in supply $c' = 0.99c$ on equilibrium price in general (your answer should be in terms of P^*).

Price will change by $P = P^*\left(\frac{1}{0.99}\right)^{\frac{1}{-b}} = P^*(1.01)^{1/-b}$

c. Use your results from b. to calculate the precise proportional increase in price for each of the following values of *b:*

$b = -1$ $\quad P = P^*(1.01)$

$b = -0.3$. $\quad P = P^*(1.01)^{3.33} = P^*(1.0337)$

$b = -1.7$ $\quad P = P^*(1.01)^{0.588} = P^*(1.0059)$

d. How do your results compare to an intuitive calculation for each of these cases?

Case 1 would predict a 1% rise in price
Case 2 would predict a 3.3% rise in price
Case 3 would predict a 0.59% rise in price

So the intuitive calculations are quite close.

e. Now calculate the effect on price of an arbitrary proportional reduction in supply of *k*. That is, now $c' = (1-k)c$ (continue to assume $d = 0$).

$$P = P^*\left(\frac{1}{1-k}\right)^{\frac{1}{-b}}$$

f. Use your results from e to fill in the following table which shows the percent increase in price for various values of *k* and *b*.

Value of k/Value of b	$b = -0.3$	$b = -1$	$b = -1.7$
$k = 0.02$	1.0696	1.0204	1.0119
$k = 0.1$	1.4202	1.1111	1.0639
$k = 0.25$	2.6062	1.3333	1.1844

g. What do your results in f. show?

Intuitive calculations are still pretty good for a 2% reduction in supply. Once the reduction gets bigger, the approximations get further from the mark.

h. Now calculate the effect of a proportional supply reduction of *k* on equilibrium price for the general case in which $d \neq 0$.

$$P = P^*\left(\frac{1}{1-k}\right)^{\frac{1}{d-b}}$$

i. Use your results from h to fill out the following two tables: One for $d = 0.2$ and one for $d = 1.0$:

$d = 0.2$

Value of k/Value of b	$b = -0.3$	$b = -1$	$b = -1.7$
$k = 0.02$	1.0412	1.0170	1.0107
$k = 0.1$	1.2352	1.0917	1.0570
$k = 0.25$	1.7777	1.2708	1.1634

$d = 1.0$

Value of k/Value of b	$b = -0.3$	$b = -1$	$b = -1.7$
$k = 0.02$	1.0157	1.0101	1.0075
$k = 0.1$	1.0844	1.0541	1.0397
$k = 0.25$	1.2476	1.1547	1.1123

j. How do these results compare to intuitive calculations you might make?

Intuitive calculations are easiest for $d = 1, b = -1$ in which case $\frac{1}{d - b} = .5$. Hence a percent shortfall in supply will raise price by one-half of one percent. This approximation works well for *k* = .02 and not badly for *k* = 0.1. It misses a lot for *k* = 0.25, however.