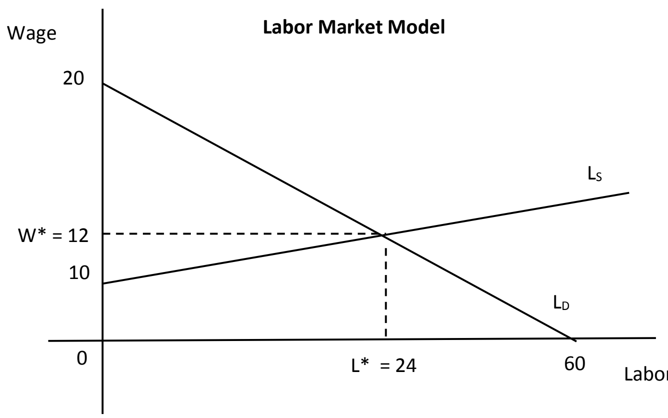
Elasticity of Demand[1]
In-Class Problem[2]

In the In-Class Problem on Evaluating Economic Models we considered a system of two equations for a particular labor market and asserted that we could identify several outcomes from those equations; one of which was ***own wage elasticity of demand***. So let's continue on with that same system of equations and look more closely at elasticity. Assume we have a labor market for engineers parameterized by two equations, W is monthly wages in $1,000's and L is number of engineers:

$$L_S = 12W - 120 \quad (1)$$
$$L_D = 60 - 3W \quad (2)$$

These yield a labor market model with the values shown:



And also yields the following table:

W	$L_S = 12W - 120$	$L_D = 60 - 3W$
8	-24	36
9	-12	33
10	0	30
11	12	27
12	24	24
13	36	21
14	48	18
15	60	15
16	72	12
17	84	9

[1] This In-Class Problem is intended to present an abbreviated discussion of the included economic concepts and is not intended to be a full or complete representation of them or the underlying economic foundations from which they are built.

[2] This problem was developed by Rick Haskell (rick.haskell@utah.edu), Ph.D. Student, Department of Economics, College of Social and Behavioral Sciences, The University of Utah, Salt Lake City, Utah (2014).

a) What is the own wage elasticity of demand when wages change from $12 to $15?

$$\eta = \frac{\%\,\Delta\,L}{\%\,\Delta\,W} = \frac{\frac{L_2 - L_1}{L_1}}{\frac{W_2 - W_1}{W_1}} \qquad \text{Simple elasticity formula} \qquad (8)$$

We already know that $W_1 = 12, L_1 = 24$ and we're given $W_2 = 15$, so we need to find L_2 via the L_D equation, which we already calculated in part d):

$L_D = 60 - 3(15) = 15 = L_2$

$$\eta = \frac{\%\,\Delta\,L}{\%\,\Delta\,W} = \frac{\frac{15-24}{24}}{\frac{15-12}{12}} = \frac{-\frac{9}{24}}{\frac{3}{12}} = \left(-\frac{9}{24}\right)\left(\frac{12}{3}\right) = -\frac{108}{72} = -1.5 > |-1|$$

So, we see that this own wage elasticity of demand is ***elastic***, but not hugely so (it is relatively inelastic compared to elasticities of -2, -3, -4, etc), which doesn't really surprise us given that engineers are highly skilled and not easily substituted by other forms of labor.

b) Does the above value differ when using the Mid-Point formula?

$$\eta = \frac{\%\,\Delta\,L}{\%\,\Delta\,W} = \frac{\frac{L_2 - L_1}{(L_2+L_1)/2}}{\frac{W_2 - W_1}{(W_2+W_1)/2}} \qquad \text{Mid-Point elasticity formula} \qquad (9)$$

$$\frac{\frac{15-24}{(15+24)/2}}{\frac{15-12}{(15+12)/2}} = \frac{-\frac{9}{19.5}}{\frac{3}{13.5}} = \left(-\frac{9}{19.5}\right)\left(\frac{13.5}{3}\right) = -\frac{121.5}{58.5} = -2.07 > |-1|$$

Which is still ***elastic***, but with a much higher coefficient.

c) What if there was a dramatic change in wage from $11 to $19, might that change either of the two formula's outcomes?

W_1 = \$11, W_2 = \$19, $L_1 = L_D$ = 60-3(11) = 27, $L_2 = L_D$ = 60-3(19) = 3

Simple Formula: $\frac{\frac{3-27}{27}}{\frac{19-11}{11}} = \frac{-\frac{24}{27}}{\frac{8}{11}} = \left(-\frac{24}{27}\right)\left(\frac{11}{8}\right) = -\frac{264}{216} = -1.22 > |-1|$

Mid-point Formula: $\frac{\frac{3-27}{(3+27)/2}}{\frac{19-11}{(19+11)/2}} = \frac{-\frac{24}{15}}{\frac{8}{15}} = \left(-\frac{24}{15}\right)\left(\frac{15}{8}\right) = -\frac{24}{8} = -3.00 > |-1|$

Yes, the values change, but they are still representing an ***elastic*** own wage elasticity of demand.