Modeling the Demand Side

The demand side elements of the Hessian matrix are linear demand slopes. Further, the demand functions represent only nonfarm demands for the commodity. Commodity use by the farm sector is modeled within the constraint matrix. Demand slopes in a comprehensive (farm sectorwide) model are derived as follows.

By definition, elasticity of demand for a commodity is:

$$Ed = dQ/dP * P/Q.$$

Similarly, by definition:

$$Slope = dP/dQ.$$

Hence, for sectorwide models, how ever they may be disaggregated on the supply side:

$$H_{ii} = dP/dQ = (1/E_d)P/Q. \tag{11}$$

If the model is disaggregated to represent single region or group of farms (not marketwide), the demand slopes must be adjusted to remain consistent with a marketwide model.

The demand slope adjustment for own market share (q/Q) in partial models is:

$$dP/dq = [(q/Q)/E_d] P/Q, \tag{12}$$

where uppercase letters represent the aggregate level and lowercase letters represent the disaggregate level.

Next, the slope must be adjusted for competitors' market shares and supply responses:

$$\Delta dP/dq = - [(1-q/Q)E_{sx}] P/Q, \tag{13}$$

where E_{sx} is the elasticity of supply of the excluded subsectors or regions (competitors).

Combining equations 12 and 13 completes the required adjustment to demand slopes for partial models:

$$dP/dq = (q/Q)/E_d [1- (1- q/Q)E_{sx}] P/Q. \tag{14}$$

The elasticity of equation 14 varies from zero to E_d, as own market share expands from zero to 1.