The Measurement of Elasticities

General meaning of elasticity of demand:

From the theory of demand we know that th**e amount of a commodity** purchased per unit of time is a function of or dep**ends on the price of the** commodity, money incomes, the price of other (related) commodities, tastes, and the number of buyers of the commodity in the market. A change in any of the above factors will cause a change in the amount of the commodity purchased per unit of time. The elasticity of demand measures the relative responsiveness in the

amount purchased per unit of time to a change in any one of the above factors, while keeping the others constant. Price Elasticity Of Demand

The coefficient of *price elasticity of demand (e)* measures the percentage change in the quantity of a commodity demanded per unit of time resulting from a given percentage change in the price of the commodity. Since price and quantity are inversely related, the coefficient of price elasticity of demand is a negative number. In order to avoid dealing with negative values, a minus sign is often introduced into the formula for e. Letting AQ represent the change in the quantity demanded of a commodity resulting from a given change in its price (AP), we have

AQ/Q AQ P

AP/

PAPO

Demand is said to be *elastic if* e > 1, *inelastic* if e<1 and *unitary elastic* if e = 1. EXAMPLE 1. Given the market demand schedule in Table 1.1 and market demand curve in Fig. 1-1, we can find e for a movement from point B to point D and from *D to B,* as follows:

P:($)

Table 1.1 Point PX($) Qx

A 8 0 B- 7- 1000

6___2000

3000 F 4 4000 G 3 5000

6000 L 1 7000 M 0 8000

1000

3000 5000 7000

Fig. 1-1

From B to D,

e=-Ip-QB PB --(2000Y_7-7

Po-Pe 2 -1 -2 11000 =?

From D to B.

e-- to B =-(-2000X3000)=1.67

We can avoid getting different results by using the average of the two prices [(PB+PD)/2] and the average of the two quantities [(QB+QD)/2] instead of either PB and QR or Pp and Q in the formula to find e. Thus,

AQ (Pb+Pp)/2 _ AQ PB+ PD S AP (QR+Qp)/2 AP'QB+Qp

Applying this modified formula to find e either for a movement form B to D or for a movement from D to B we get

(2000Y 12 =3 e=---24000)

This is the equivalent of finding e at the point midway between B and D (ie, at point C). Example-2. Given the market demand schedule in T**able 1.2 and the market** demand curve in Fig. 1-2, we can find e for a mov**ement from point C to point ,** from F to C and midway between C and F, as follows: Table 1.2

P.($)

Point P ($) Qx

7 500 6 750

-5— 1250 D 4 2000

33250 G 2 4750 H 1 8000

2000 4000 0000 8000

Fig. 1-2

From C to F,

AQ Pc __(2000Y_5_)=4 ETAP D.--1-2 (1250)

From F to C

e--4 2-1-2000) 3250) 20.92

At the point midway between C and F (point D on the dashed chord),

__AQ (Pc +PF) -- (-200801.78 SOAP (O+O) T2 14500)

POINT ELASTICITY

Point elasticity of demand: The coefficient of price elasticity of demand at a particular point on a demand curve.

EXAMPLE 3. We can find the elasticity of demand curve in Example 1 at point C geometrically as follows. (For easy reference, Fig. 1-1, with some modifications, is repeated here as Fig. 1-3). Since we want to measure elasticity at point C, we have only a single price and a single quantity. Expr**essing each of the** formula for e in terms of distances, we get:

P,($)

e=_AQ P

e=- AP Q

_ NM NC NC ON NM 6000

ON-2000=

= 3

2000

8000

4000 6000 Fig. 1-3

INCOME ELASTICITY OF DEMAND

The coefficient of income elasticity of demand (em) measures the percentage change in the amount of a commodity purchased per unit of time *(*AQ*/Q* resulting from a given percentage change in a consumer's income *(*AMM). Thus

_ AQ/Q_AQ M " M AM/M AM O

When em is negative, the good is inferior. If en is positive, the good is normal. A normal good is usually *a luxur*y if its em>1, otherwise it is a *necessity*. Depending on the level of the consumer's income, em for a good is likely to vary considerably. Thus a good may be a luxury at “low" levels of income, a necessity at “intermediate” levels of income and an inferior good at "high" levels of income.

EXAMPLE 4. Columns (1) and (2) of Table 1.3 show the quantity of commodity X that an individual would purchase per year at various income levels. Column (5) gives the coefficient of income elasticity of demand of this individual for commodity X *between* the various successive levels of available income. Column (6) indicates the range of income over which commodity X is a luxury, a necessity or an inferior good.

Table 13

Income (M)
(S/year)
(2)
(3) Quantity of Percent
Change (units/year)
in Qi

Percent Change

in M
(6) Type of Good

8,000
—100
Huxury
12.000
10
-1.50—
15
50%
33.33–
16,000
luxury

20,000
—20 —
254
— necessity
18
14

20—

-0.56%

necessity

24,000

20

-0.30

-inferior

28.000

19

— -5.26 —

1429 —

0.37—

inferior

32.000

18

CROSS ELASTICITY OF DEMAND

The coefficient of cross *elasticity of demand* of commodity X with respect to commodity *Y*/exy measures the percentage change in the amount of X purchased per unit of time (AQ Qz) resulting from a given percentage change in the price of Y (AP*F/Py)*. Thus

AQ Qg_4Qx Py exy AP, P, AP, Qx

If X and Y are substitutes, en, is positive. On the other hand, if X and Y are complements, exy is negative. When commodities are nonrelated (i.e., when they are independent of each other), ex = 0.

SAMPLE 5. To find the cross elasticity of **demand between tea (X) and conce** (Y) and between tea (X) and lemons (Z) for the data in the n**ext table, we proceed**

as follows.

Table 1.4 (a)

Before Price

Quantity (cents/cup) (units/month) - 40

50 - 20

40

Commodity Coffee (Y)

After Price Quantity (cents/unit) **(units/month)**

60 T 30 20 T 50

Tea (X)

Table 1.4 (b)

Before

After

Commodity Lemon (Z) Tea (X)

Price (cents/unit) - 10

20

Quantity (units/month)

20 T 40

Price (cents/unit)

20 T 20

Quantity (units/month) T 15

35

- 4Qx. Py = (+1040) = +0.5

exy = ΔP, Qx 1

one tra le mie

9 -0.125

Since exy is positive, tea and coffee are substitutes. Since ex is negative, tea and lemons are complements.