Elasticity:

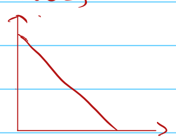
price elasticity of demand: the percentage change in demand when price increase by 1%.

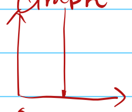
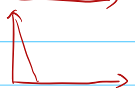
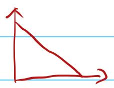
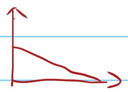
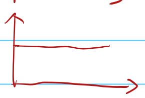
$$\varepsilon_{Q,P} = \frac{\frac{\Delta Q}{Q}}{\frac{\Delta P}{P}} = \frac{\text{percentage change in demand}}{\text{percentage change in price.}}$$

$$= \frac{\Delta Q \cdot P}{\Delta P \cdot Q} \leq 0 \leftarrow \text{by the law of demand,}$$

if $\Delta Q > 0 \Rightarrow \Delta P < 0$

$\Delta Q < 0 \Rightarrow \Delta P > 0$



	ε	Graph	Meaning:
perfectly inelastic	0		Q^D shows no response to change in price.
inelastic	$(-1, 0)$		relatively small response
unitary elastic	-1		percentages change in price and demand are the same.
elastic	$(-\infty, -1)$		sensitive to change in price.
perfectly elastic	$-\infty$		decrease in price leads to infinity increase in demand; increase in price make demand decrease to zero.

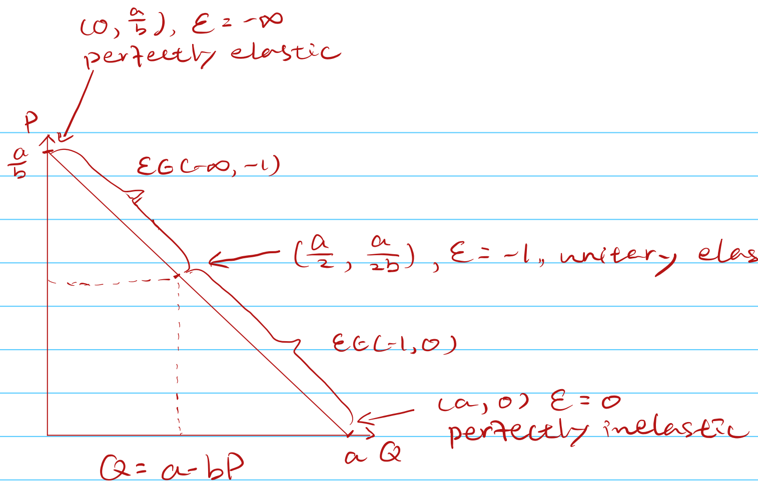
the elasticity compare the sensitiveness to price in each indunsteries.

Ex: if we know the function $Q^D(p) = a - bp$, then:

$$\frac{\Delta Q}{\Delta P} = \frac{dQ}{dp} = \frac{d(Q^D(p))}{dp} = -b$$

$$\varepsilon_{Q,P} = \frac{\Delta Q}{\Delta P} \cdot \frac{P}{Q}$$

$$= -b \cdot \frac{P}{a - bp}$$



to find the unitary elastic point:

$\varepsilon = -1 = -b \cdot \frac{P}{a-bP}$

$P = \frac{a}{2b}$ ⇐ the midpoint of a linear curve is the

$Q = a - bP = \frac{a}{2}$ unitary elastic point.

constant elasticity of demand:

$Q^D(p) = a\,p^{-b}$

$\frac{dQ^D(p)}{dp} = a\cdot(-b)\,p^{-b-1}$

$= -bP^{-1}\cdot aP^{-b}$

$= -bP^{-1}\cdot Q^D(p)$

$\varepsilon_{Q,P} = -bP^{-1}\cdot aP^{-b}\cdot\frac{P}{aP^{-b}}$

$= -b$

Other elasticities: $\frac{\Delta x\%}{\Delta y\%}$

1. income elasticities of demand $\varepsilon_{QI} = \frac{\Delta Q}{\Delta I}\cdot\frac{I}{Q}$.
2. cross-price ------ : $\varepsilon_{Q_I,P} = \frac{\Delta Q_i}{\Delta P_j}\cdot\frac{P_j}{Q_i}$.
3. price ------- of supply : $\varepsilon_{Q^S,P} = \frac{\Delta Q^S}{\Delta P}\cdot\frac{P}{Q^S}$.

Suppose P, Q, estimate of elastic at $(\hat{P},\hat{Q})$

assume demand is linear, $Q(p) = a - bP$

$\varepsilon_{Q,P} = -b\cdot\frac{\hat{P}}{\hat{Q}}$, $a = \hat{Q} + b\hat{P}$

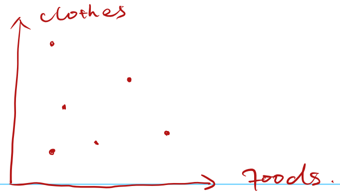
$b = -\frac{\hat{Q}}{\hat{P}}\varepsilon_{Q,P}$

$Q^D(p) = a - bP = \cdots\cdots$

Consumer preferences: consumers have preference on bundles of goods: i.e. a list of quantites of all goods consumer would by.

Preference: discribe how the consumer rank any two bundles.

e.g.



each point in the graph is a bundle
each bundle the consumber pick and buy is a preference.

Three assumptions about preferences:

1. Competitiveness: consumer could rank any two bundles.
2. Transitivity: if bundle A > bundle B, bundle B > bundle C, then bundle A > bundle C
3. "More is better": if a bundle A has more of at least one good than bundle B and no less in any other goods, then bundle A > bundle B.

Preferences are ordinal in a sense that they give us ranking over bundles but not the intensity of those ranking. still we will switch to a cardinal measure of preference called utility.

Utility function: the assumption that allows us to assume cardinal reperesentation of preferences exists, called an utility function

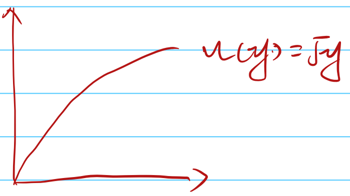
thus, assign a number to any bundle of goodes in a way that reperesent the origin preferences

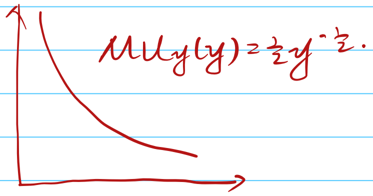
e.g. for a good y, $u(y) = \sqrt{y}$ if $u(x) \geq u(y)$, $u(y) \geq u(z)$ then $u(x) \geq u(z)$

transitivity.

Marginal utility:

$$MU_y(y) = \frac{d}{dy} u(y) = \frac{d}{dy} y^{\frac{1}{2}} = \frac{1}{2} y^{-\frac{1}{2}}$$

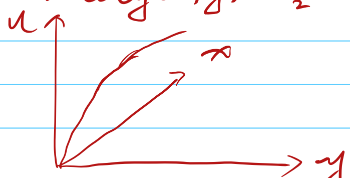




The decrease in MU_y is called diminishing of marginal utility

if there are two goods x, y, $u(x,y) = \sqrt{xy}$.

$$MU_y(x,y) = \frac{\sqrt{x}}{2} \cdot y^{-\frac{1}{2}}$$



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