$$CV = E(p^1, U^0) - E(p^1, U^1)$$

$$E(p^1, U^1) = I^1$$

If $I_1 = I_0 = E(p^0, U^0)$

then $CV = E(p^1, U^0) - E(p^0, U^0)$

In our example,

$$CV = \int_{2}^{4} \frac{\partial E}{\partial p_1} \cdot dp_1$$

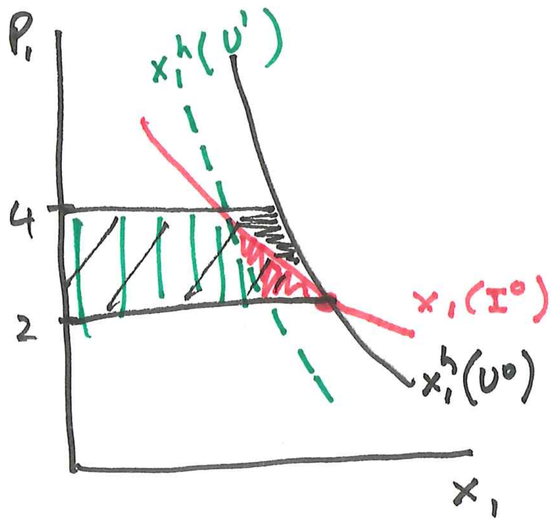
$$= \int_{p_1^0}^{p_1^1} x_1^h \, dp$$

$$= \int_2^4 \left(\frac{1250\, p_2}{p_1}\right)^{1/2} dp_1$$

$$= (1250)^{1/2}(2)\, p_1^{+1/2} \Big|_2^4$$

$$= 41.42$$

$$\Delta W_{CV} = -41.42$$



$$\Delta W_{CS} = -34.66$$

$$EV = E(P^0, U^1) - E(P^0, U^0)$$

If $I_0 = I_1$, then

$$EV = E(P^0, U^1) - E(P^1, U^1)$$

$$= \int_{P_1^1}^{P_1^0} \frac{\partial E}{\partial P_1} \cdot dP_1$$

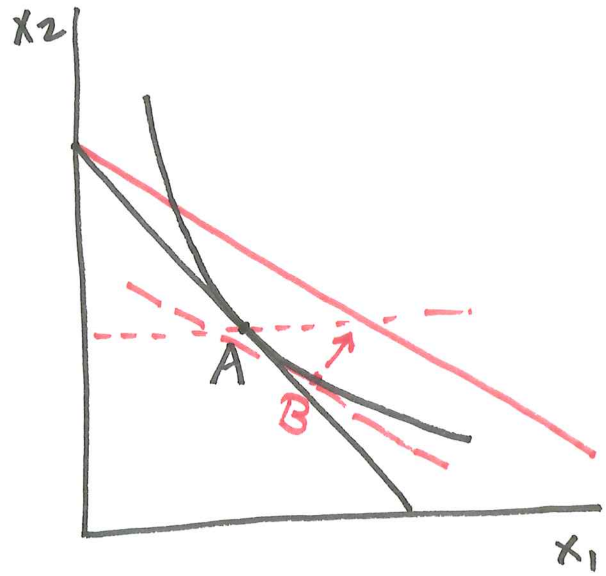
$$= \int_{P_1^1}^{P_1^0} x_1^h(U^1) \cdot dP_1$$

$$= (625)^{1/2} \cdot 2P_1^{1/2} \Big|_4^2$$

$$= -29.29$$

$$x_1 = x_1(p_1, p_2, I)$$

Cross-price Effects.



$\frac{\partial x_2}{\partial p_1} > 0$: gross substitutes

$\frac{\partial x_2}{\partial p_1} < 0$: gross complements

$$\frac{\partial x_1}{\partial p_1} = \frac{\partial x_1^h}{\partial p_1} - x_1^h \frac{\partial x_1}{\partial I}$$

$$\frac{\partial x_2}{\partial p_1} = \frac{\partial x_2^h}{\partial p_1} - \underbrace{\underset{+}{x_1^h}\,\underset{+}{\frac{\partial x_2}{\partial I}}}_{-}$$

$$\frac{\partial E}{\partial p_1} = x_1^h \implies \frac{\partial x_1^h}{\partial p_1} = \frac{\partial^2 E}{\partial p_1^2}$$

$$\frac{\partial E}{\partial p_2} = x_2^h \implies \frac{\partial x_2^h}{\partial p_1} = \frac{\partial^2 E}{\partial p_1 \partial p_2}$$

$$\frac{\partial x_1}{\partial p_2} = \frac{\partial x_1^h}{\partial p_2} - x_2^h \frac{\partial x_1}{\partial I}$$

$$\frac{\partial^2 E}{\partial p_1 \partial p_2}$$

$$\frac{\partial x_2}{\partial P_1} = \frac{\partial x_2^h}{\partial P_1} - \overbrace{x_1^h \frac{\partial x_2}{\partial I}}^{+} < 0 \text{ possibly if } x_1^h \text{ large } \cancel{\text{small}}$$

$$\frac{\partial x_1}{\partial P_2} = \frac{\partial x_1^h}{\partial P_2} - \underbrace{x_2^h \frac{\partial x_1}{\partial I}}_{+} > 0 \text{ possibly if } x_2^h \text{ small}$$

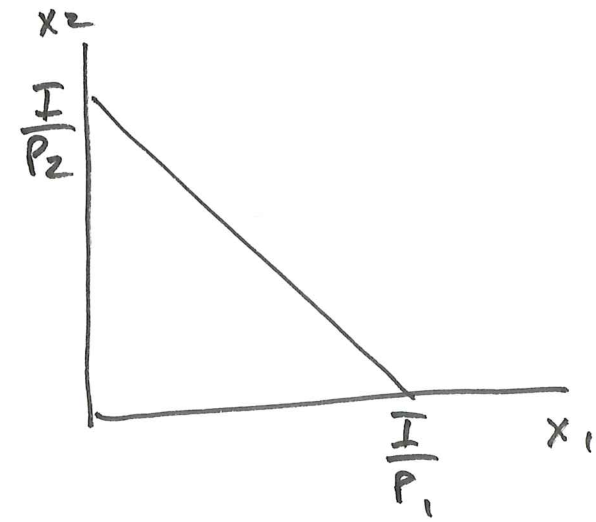
Net Substitutes : $\frac{\partial x_2^h}{\partial P_1} > 0$

" Complements : $\frac{\partial x_2^h}{\partial P_1} < 0$

Homogeneity of Demand Function.

homogeneous of degree zero.

$$x_1(P_1, P_2, I) = x_1(tP_1, tP_2, tI)$$



$$x_1 = x_1(P_1, P_2, P_3, \dots P_n, I)$$

$$\frac{P_1}{x_1}\frac{\partial x_1}{\partial P_1} + \frac{P_2}{x_1}\frac{\partial x_1}{\partial P_2} + \dots + \frac{P_n}{x_1}\frac{\partial x_1}{\partial P_n} + \frac{I}{x_1}\frac{\partial x_1}{\partial I} = 0$$

$$\varepsilon_1 + \varepsilon_{12} + \varepsilon_{13} + \dots + \varepsilon_{1n} + \eta = 0$$

Cobb-Douglas: $U(x_1, x_2) = x_1^2 x_2^3$

$$x_1^* = \frac{2}{5}\cdot\frac{I}{P_1} = \frac{2}{5} I^{1} P_1^{-1} P_2^{0}$$

$$\varepsilon_1 = \frac{\partial x_1}{\partial P_1}\cdot\frac{P_1}{x_1} = -1$$

$$\eta = 1$$

$$\varepsilon_{12} = 0$$

$$\varepsilon_1 + \varepsilon_{12} + \eta = -1 + 0 + 1 = 0$$

<u>Interpretation of λ</u>

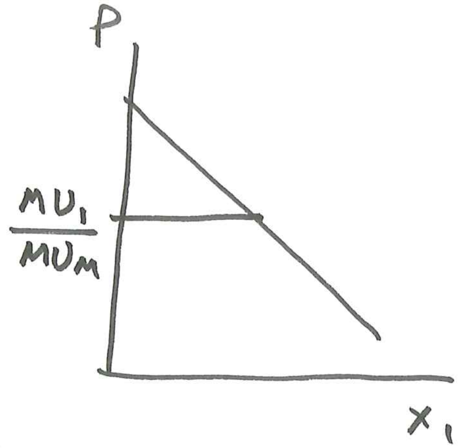
$$\mathcal{L} = U(x_1, x_2) + \lambda\left[I - P_1 x_1 - P_2 x_2\right]$$

$$U^*(x_1^*, x_2^*)$$

What is $\dfrac{\partial U^*}{\partial I} = \dfrac{\partial \mathcal{L}}{\partial I} = \lambda$

λ: marginal utility of income

$$P_1 = \frac{MU_1}{MU_m}$$



$$\frac{\partial \mathcal{L}}{\partial x_1} = u_1 - \lambda P_1 = 0$$

$$P_1 = \frac{u_1}{\lambda}$$

Revealed Preference Approach to Law of Demand.

Weak Axiom of R.P. If a consumer chooses A when B is available, she has revealed a preference for A over B.