Cost minimization

Cost minimization problem

Long run vs Short run

Short run: $q = f(L)$

Long run: $q = f(K,L)$

Choice of production process

Short run: $q = f(L)$

Long run: $q = f(K,L)$

Deciding the cheapest production

Cost minimization rule

$$cost\ minimized\ where\ \frac{MP_L}{w} = \frac{MP_K}{r}$$

Cost minimization

$$\frac{MP_L}{w} > \frac{MP_K}{r}$$

$$L \uparrow \text{ and } K \downarrow \text{ to reduce cost}$$

$$\frac{MP_L}{w} \downarrow \text{ and } \frac{MP_K}{r} \uparrow$$

$$\text{Repeat until balance achieved!}$$

Lagrange multipliers

$$\mathcal{L}(\lambda, \mathbf{x}) = \mathbf{w}\mathbf{x} - \lambda(f(\mathbf{x}) - y)$$

$$w_i - \lambda \frac{\partial f(\mathbf{x}^*)}{\partial x_i} = 0 \quad \text{for i} = 1, \ldots, \boldsymbol{n}$$

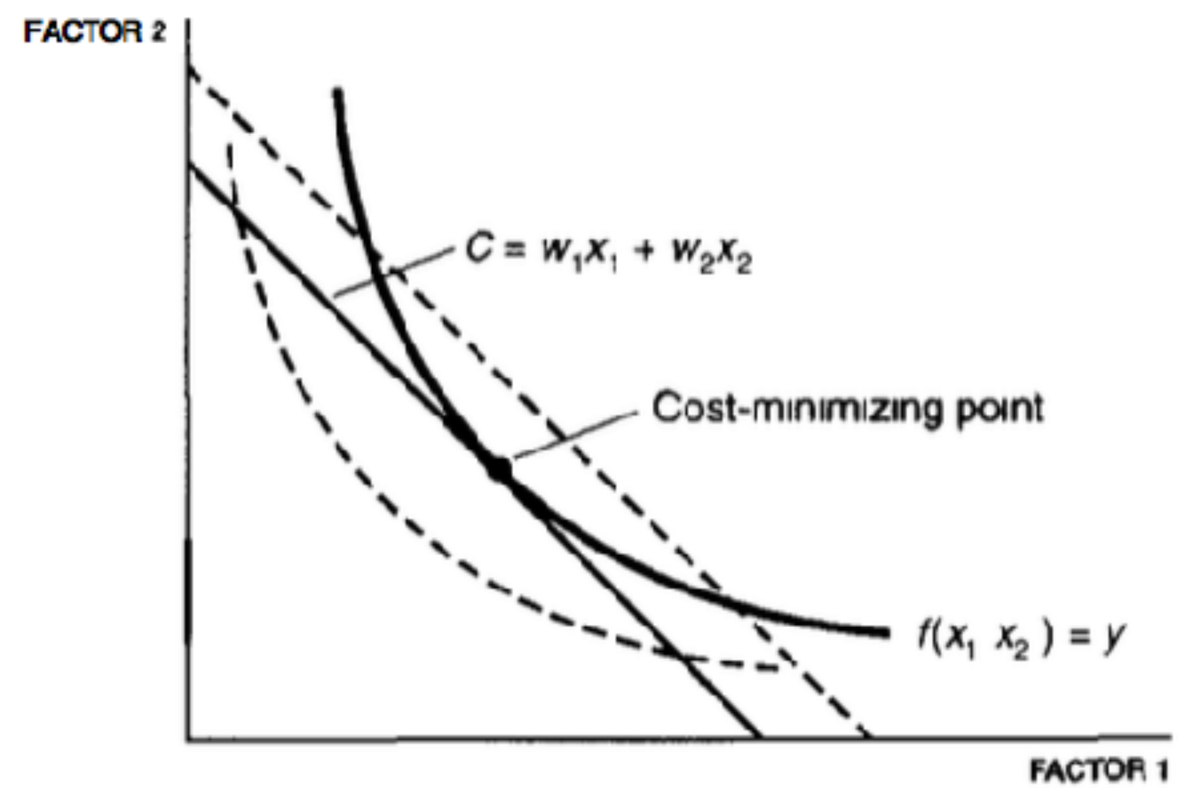
$$f(\mathbf{x}^*) = y$$

$$\mathrm{w} = A D f(\mathbf{x}^*)$$

$$\frac{w_i}{w_j} = \frac{\dfrac{\partial f(\mathbf{x}^*)}{\partial x_i}}{\dfrac{\partial f(\mathbf{x}^*)}{\partial x_j}} \qquad i, j = 1, \cdots, n$$

Cost minimization

$$\frac{w_i}{w_j} = \frac{\frac{\partial f(\mathbf{x}^*)}{\partial x_i}}{\frac{\partial f(\mathbf{x}^*)}{\partial x_j}} \qquad i, j = 1, \cdots, n$$



$$f(x_1 + h_1, x_2 + h_2) \approx f(x_1, x_2) + \begin{pmatrix} f_1 & f_2 \end{pmatrix} \begin{pmatrix} h_1 \\ h_2 \end{pmatrix} + \frac{1}{2} \begin{pmatrix} h_1 & h_2 \end{pmatrix} \begin{pmatrix} f_{11} & f_{12} \\ f_{21} & f_{22} \end{pmatrix} \begin{pmatrix} h_1 \\ h_2 \end{pmatrix}$$