Seminar 5. Production Theory

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1 Jehle & Reny 3.35

Calculate the **cost function** and the **conditional input demands** for the linear production function, $y = \Sigma_{i=1}^{n} \alpha_1 x_i$.

ASSUMPTION 3.1 Properties of the Production Function (Jehle & Reny pp.127)
The production function, $f : \mathbb{R}_+^n \to \mathbb{R}_+$, is continuous, strictly increasing, and strictly quasiconcave on $\mathbb{R}_+^n$, and $f(0) = 0$.
DEFINITION 3.5 The Cost Function (Jehle & Reny pp.136)
The cost function, defined for all input prices $w \gg 0$ and all output levels $y \in f(\mathbb{R}_+^n)$ is the minimum-value function,

$$c(w, y) \equiv \min_{x \in \mathbb{R}_+^n} w \cdot x, \;\; s.t. \;\; f(x) \geq y.$$

The solution $x(w, y)$ is referred to as the firms **conditional input demand**, because it is conditional on the level of output y.

- **Conditional input demand** is similar to Hicksian demands for consumers
- The difference is that cost minimization may not lead to profit maximization.

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- Verify Theorem 3.7 for the profit function obtained in Example 3.5.
- Verify Theorem 3.8 for the associated output supply and input demand functions.

DEFINITION 3.7 The Profit Function (Jehle & Reny pp.148)
The firms profit function depends only on input and output prices and is defined as the maximum-value function,

THEOREM 3.7 Properties of the Profit Function (Jehle & Reny pp.148)

THEOREM 3.8 Properties of Output Supply and Input Demand Functions (Jehle & Reny pp.149)

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1. Derive the **cost function** for the production function in Example 3.5.
2. Solve $\max_y py - c(w, y)$
3. Compare its solution, $y(p, w)$, to the solution in (E.5). Check that $\pi(p, w) = py(p, w) - c(w, y(p, w))$.
4. Supposing that $\beta > 1$, confirm our conclusion that profits are minimised when the first-order conditions are satisfied by showing that marginal cost is decreasing at the solution.
5. Sketch your results.