Outline

1. Mid-Term Feedback

2. Risk Aversion and Lottery

3. Measures of Risk Aversion

4. Production: Introduction

5. Production Function
1 Mid-Term Feedback

• Thanks for the feedback!
2 Risk aversion

• Risk aversion:
  – individuals dislike uncertainty
  – $u$ concave, $u'' < 0$

• Implications?
  – purchase of insurance (possible accident)
  – investment in risky asset (risky investment)
  – choice over time (future income uncertain)
Theorem. (Jensen’s inequality) If a function $f(x)$ is concave, the following inequality holds:

$$f(Ex) \geq Ef(x)$$

where $E$ indicates expectation. If $f$ is strictly concave, we obtain

$$f(Ex) > Ef(x)$$

- Apply to utility function $U$.

- Individuals dislike uncertainty:

$$U(Ex) \geq EU(x)$$

- Jensen’s inequality then implies $U$ concave ($U'' \leq 0$)

- Relate to diminishing marginal utility of income
• Experiment — Are you risk-averse?
3 Measures of Risk Aversion

- Nicholson, Ch. 7, pp. 209-213 (Ch. 18, pp. 541–545, 9th)

- How risk averse is an individual?

- Two measures:
  - Absolute Risk Aversion $r_A$:
    $$ r_A = - \frac{u''(x)}{u'(x)} $$
  - Relative Risk Aversion $r_R$:
    $$ r_R = - \frac{u''(x)}{u'(x)} x $$

- Examples in the Problem Set
4 Production: Introduction

- Second half of the economy. Production

- Example. Ford and the Minivan (Petrin, 2002):
  - Ford had idea: "Mini/Max" (early '70s)
  - Did Ford produce it?
  - No!
  - Ford was worried of cannibalizing station wagon sector
  - Chrysler introduces Dodge Caravan (1984)
  - Chrysler: $1.5bn profits (by 1987)!
• Why need separate treatment?

• Perhaps firms maximize utility...

• ...we can be more precise:
  – Competition
  – Institutional structure
5 Production Function

• Nicholson, Ch. 9, pp. 295-301; 306-311 (Ch. 7, pp. 183–190; 195–200, 9th)

• Production function: \( y = f(z) \). Function \( f : R_+^n \rightarrow R_+ \)

• Inputs \( z = (z_1, z_2, \ldots, z_n) \): labor, capital, land, human capital

• Output \( y \): Minivan, Intel Pentium III, mangoes (Philippines)

• Properties of \( f \):
  
  – no free lunches: \( f(0) = 0 \)
  
  – positive marginal productivity: \( f'_{i}(z) > 0 \)
  
  – decreasing marginal productivity: \( f''_{i,i}(z) < 0 \)
- Isoquants $Q(y) = \{x | f(x) = y\}$

- Set of inputs $z$ required to produce quantity $y$

- Special case. Two inputs:
  - $z_1 = L$ (labor)
  - $z_2 = K$ (capital)

- Isoquant: $f(L, K) - y = 0$

- Slope of isoquant $dK/dL = MRTS$
• Convex production function if convex isoquants

• Reasonable: combine two technologies and do better!

• Mathematically, \( \frac{d^2 K}{d^2 L} = \)
6 Next Lecture

- Two-Step Cost Minimization
- Solve an Example
- Cases in which s.o.c. are not satisfied
- Start Profit Maximization