Economics 101A
(Lecture 12)

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Outline

1. Nobel Prize winners
2. Risk Aversion and Lottery
3. Insurance
4. Investment in Risky Asset
5. Measures of Risk Aversion
6. Mid-Term Feedback

1 Nobel Prize winner

- Edmund Phelps (Columbia University)

- Macroeconomist – You get to hear about him in 101B

- Contribution:

  - Price setting should account for price expectations

  - You cannot keep raising money supply to lower unemployment

  - People will come to expect the price increase

- Also: Model in Phelps and Pollak (1968) – Antecedent of self-control models (next lecture)

2 Risk Aversion and Lottery

- Are you risk-averse?

- Let's see...

3 Insurance

- Nicholson, Ch. 18, pp. 545–551 [OLD: Ch. 8, pp. 211-216] Notice: different treatment than in class

- Individual has:
  - wealth w
  - utility function u, with $u' > 0$, $u'' < 0$

- Probability p of accident with loss L

- Insurance offers coverage:
  - premium \$$q$ for each \$1 paid in case of accident
  - units of coverage purchased α

- Individual maximization:

$$\max_{\alpha} (1-p)\, u(w-q\alpha) + pu(w-q\alpha-L+\alpha)$$
$$s.t. \alpha \geq 0$$

- Assume $\alpha^* \geq 0$, check later

- First order conditions:

$$\begin{aligned} 0 &= -q(1-p)\, u'(w-q\alpha) \\ &\quad + (1-q)\, pu'(w-q\alpha-L+\alpha) \end{aligned}$$

or

$$\frac{u'(w-q\alpha)}{u'(w-q\alpha-L+\alpha)} = \frac{1-q}{q}\frac{p}{1-p}.$$

- Assume first $q = p$ (insurance is fair)

- Solution for $\alpha^* =$?

- $\alpha^* > 0$, so we are ok!

- What if $q > p$ (insurance needs to cover operating costs)?

- Insurance will be only partial (if at all)

- Exercise: Check second order conditions!

4 Investment in Risk Asset

- Individual has:
  - wealth w
  - utility function u, with $u' > 0$

- Two possible investments:
  - Asset B (bond) yields return 1 for each dollar
  - Asset S (stock) yields uncertain return $(1 + r)$:
    - $r = r_+ > 0$ with probability p
    - $r = r_- < 0$ with probability $1 - p$
    - $Er = pr_+ + (1 - p)\, r_- > 0$

- Share of wealth invested in stock S $= \alpha$

- Individual maximization:

$$\max_{\alpha} (1-p)\, u\left(w\left[(1-\alpha)+\alpha\left(1+r_{-}\right)\right]\right)+$$
$$+pu\left(w\left[(1-\alpha)+\alpha\left(1+r_{+}\right)\right]\right)$$
$$s.t. 0 \leq \alpha \leq 1$$

- Case of risk neutrality: $u(x) = a + bx$, $b > 0$

- Assume $a = 0$ (no loss of generality)

- Maximization becomes

$$\max_{\alpha} b\,(1-p)\left(w\left[1+\alpha r_{-}\right]\right)+bp\left(w\left[1+\alpha r_{+}\right]\right)$$

or

$$\max_{\alpha} bw+\alpha bw\left[(1-p)\, r_{-}+pr_{+}\right]$$

- Sign of term in square brackets? Positive!

- Set $\alpha^{*} = 1$

- Case of risk aversion: $u'' < 0$

- Assume $0 \leq \alpha^* \leq 1$, check later

- First order conditions:

$$\begin{aligned} 0 &= (1-p)\,(wr_-)\,u'\,(w\,[1+\alpha r_-]) + \\ &\quad +p\,(wr_+)\,u'\,(w\,[1+\alpha r_+]) \end{aligned}$$

- Can $\alpha^* = 0$ be solution?

- Solution is $\alpha^* > 0$ (positive investment in stock)

- Exercise: Check s.o.c.

5 Measures of Risk Aversion

- Nicholson, Ch. 18, pp. 541–545 [OLD: Ch. 8, pp. 207–210].

- 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

6 Mid-Term Feedback

- Thanks for the feedback!

7 Next lecture and beyond

- Tu:
  - Time consistency
  - Time Inconsistency
  - Application to health clubs

- Then:
  - Begin Production
  - Returns to scale
  - Cost minimization