

# Lecture 14

Money and Banking, Econ 345

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## Summary so far

- For assets viewed as perfect substitutes to be valued, *rate-of-return equality* must hold
  - assets' real rates of return must be equal
- Today: assets are not perfect substitutes
  - one asset is risky and the other is safe
  - rate-of-return equality does not hold
- Important for understanding money:
  - since money does not pay the same rate of return as other assets, we must understand in what sense money is not a perfect substitute with other assets (next lecture)

## Risky vs safe assets

- So far considered *safe assets* - those that provide fixed (certain) return
  - e.g., capital acquired in  $t$ , pays return  $x$  in  $t + 1$
- Risky assets - those that yield random return
- Example:  $d$  real dollars of a risky loan pays 15% net real return 90% of the time and  $0.5d$  real dollars 10% of time (default)

- What is the expected (average) gross real rate of return?

$$\begin{aligned} E(r) &= \Pr(r_1) \cdot r_1 + \Pr(r_2) \cdot r_2 \\ &= 0.9 \cdot 1.15 + 0.1 \cdot 0.5 = 1.085 \end{aligned}$$

- If individuals do not care about risk (are *risk neutral*), they will hold capital and risky loans if their rates of return equal on average:

$$x = E(r) = 1.085$$

# Are people risk neutral?

- Suppose you have \$1000 and I offer you a deal:
  - you can win \$2002 with probability 50%, or
  - you lose your \$1000 with probability 50%
  - expected gross return on this deal is \$1001 so on average you will gain *premium* of 1\$
  - will you take the deal?
- Risk neutral people would accept the deal because expected return on the risky deal is higher than \$1000

## Are people risk neutral?

- Most people would not take the deal because they dislike losing more than they like gaining
  - they are *risk averse* (dislike risk)
- If the premium is large enough, risk averse people will accept the deal
  - suppose you are willing to accept the deal if the winning reaches \$2100
  - risk premium is the premium that makes you indifferent between accepting risky asset over safe asset

$$\begin{aligned}\text{risk premium} &= E(r_{\text{risky}}) - r_{\text{safe}} \\ &= 0.5 \cdot \$2100 + 0.5 \cdot \$0 - \$1000 = \$50\end{aligned}$$

## Exercise 6.2 from CF

- Suppose capital is risky and pays gross real rates of return of 1.2, 1.1 and 0.9 with probabilities 0.1, 0.7 and 0.2, respectively. A risk-free asset pays a safe gross real rate of return of 1.04. What is the expected rate of return on capital? What is the risk premium on capital?
- Expected gross return:

$$E(x) = 0.1 \cdot 1.2 + 0.7 \cdot 1.1 + 0.2 \cdot 0.9 = 1.07$$

- Risk premium:

$$\text{risk premium} = E(x) - r_{\text{safe}} = 1.07 - 1.04 = 0.03 \quad (\text{or } 3\%)$$