Econ 100A: Intermediate Microeconomic Analysis Lecture 21

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Plan of Today's Lecture

- We will watch the documentary
- LTCM bailout: an analysis with microeconomic tools
- Risk & return trade–off (Ch. 5, pp.171 -178)
  - Risky asset:
    - Expected return = the return earned on average (the expected value of return on the asset)
    - Actual return = the return that an asset earns
    - Real return (nominal return net of the rate of inflation)
    - Riskless (or risk free) asset = the return is known with certainty
    - Diversification: allocating resources to a variety of not closely related activities
- Capital Asset Pricing Model (Ch. 15, pp. 557 -560)
    - Diversifiable risk = can be eliminated via diversification
    - Nondiversifiable risk = cannot be eliminated via diversification
  - It is only nondiversifiable risk that matters for investors' returns
- Plan for future lectures

Information, Incentives and Risk:

- **We studied** how information helps to reduce risk, and how to value information (how much someone would be willing to pay for information depends on:
  - expected income from a project
  - risk preferences
- We discussed how to determine the value of *complete* information
  - The difference between the expected value (income / profit) of a choice with complete information and the expected value when information is incomplete
- **Now** we are interested in how firms behavior depends on information structure (incentives for information acquisition & processing) when player actions are strategic

Trade-off between Risk and Return:

- How do we determine the allocation of funds between the two choices?
  - b = fraction of funds in stocks (risky), R_m market return
  - $(1-b)$ = fraction of funds in T-bills (riskless), R_f risk free return
- Expected return on portfolio is weighted average of expected return on the two assets
- How risky is the portfolio? Intuitively, if b↑ ➔ risk↑. We will use standard deviation as measure of risk. Let:
  - σ_m standard deviation of the risky asset
  - σ_p standard deviation of risky portfolio
- Then, equations 5.1 & 5.2: (derived in footnote 15, p. 174)

$$R_P = bR_m + (1-b)R_f$$

$$\sigma_p = b\sigma_m$$

- The leverage & risk-return trade off (more leverage is more risky). How to proxy the riskiness of LTCM portfolio?

Price of Risk

- *From* 5.2 ($\sigma_p = b\sigma_m$) ➔ b= σ_p/σ_m
- *From* 5.1 ($R_p = bR_m + (1-b)R_f$) ➔

$$R_p = R_f + b(R_m - R_f) = R_f + \sigma_p/\sigma_m\,(R_m - R_f)$$

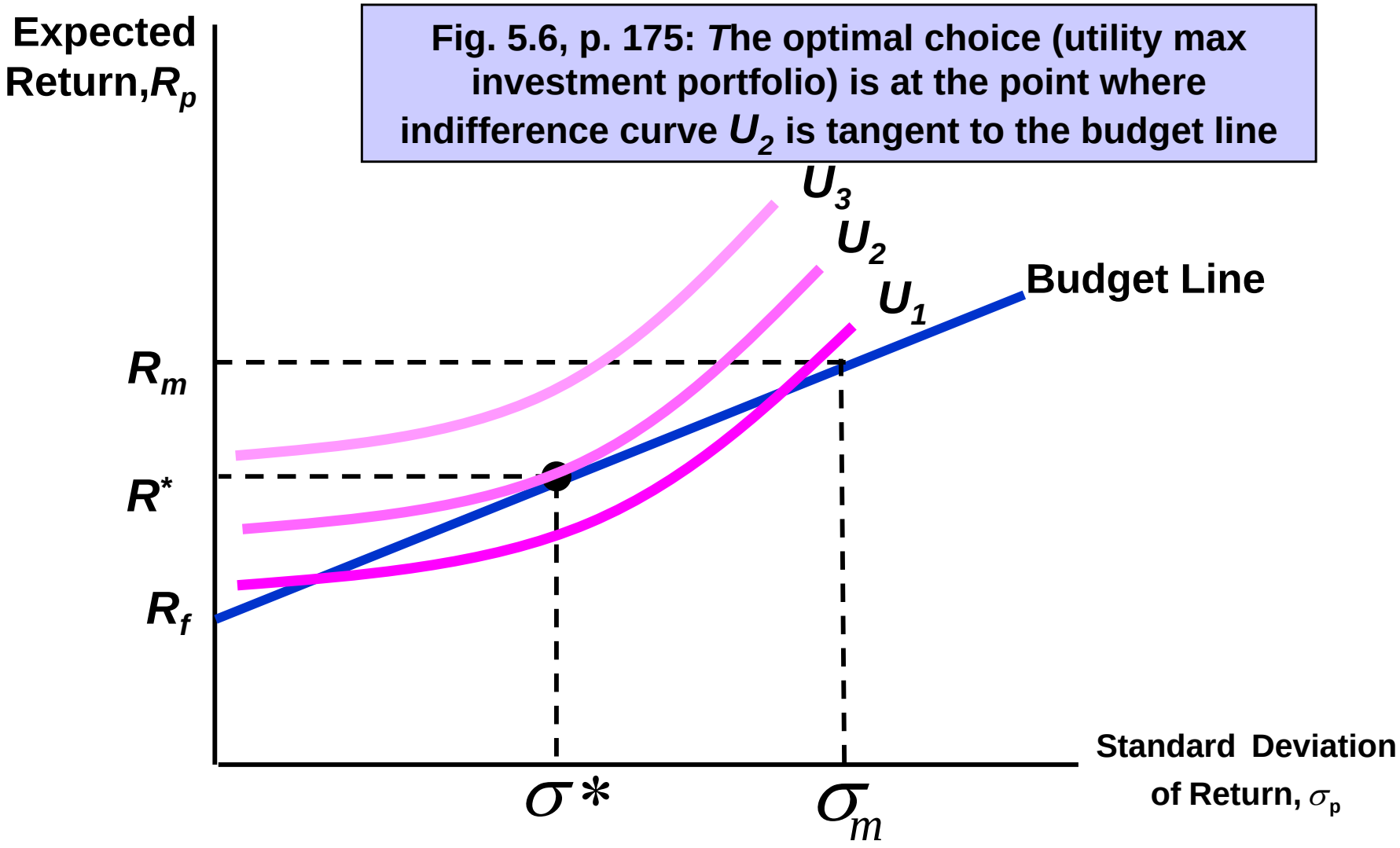
- *We derived that* R_p increases with σ_p

$$R_p = R_f + \frac{(R_m - R_f)}{\sigma_m}\sigma_p$$

- price of risk: $Slope = (R_m - R_f)/\sigma_m$

- Price of risk tells how much extra risk an investor must incur to enjoy a higher expected return, i.e., MRS of risk and return

Risk - Return tradeoff, M., p. 175



The choices of investors differing in their risk attitude, p. 176

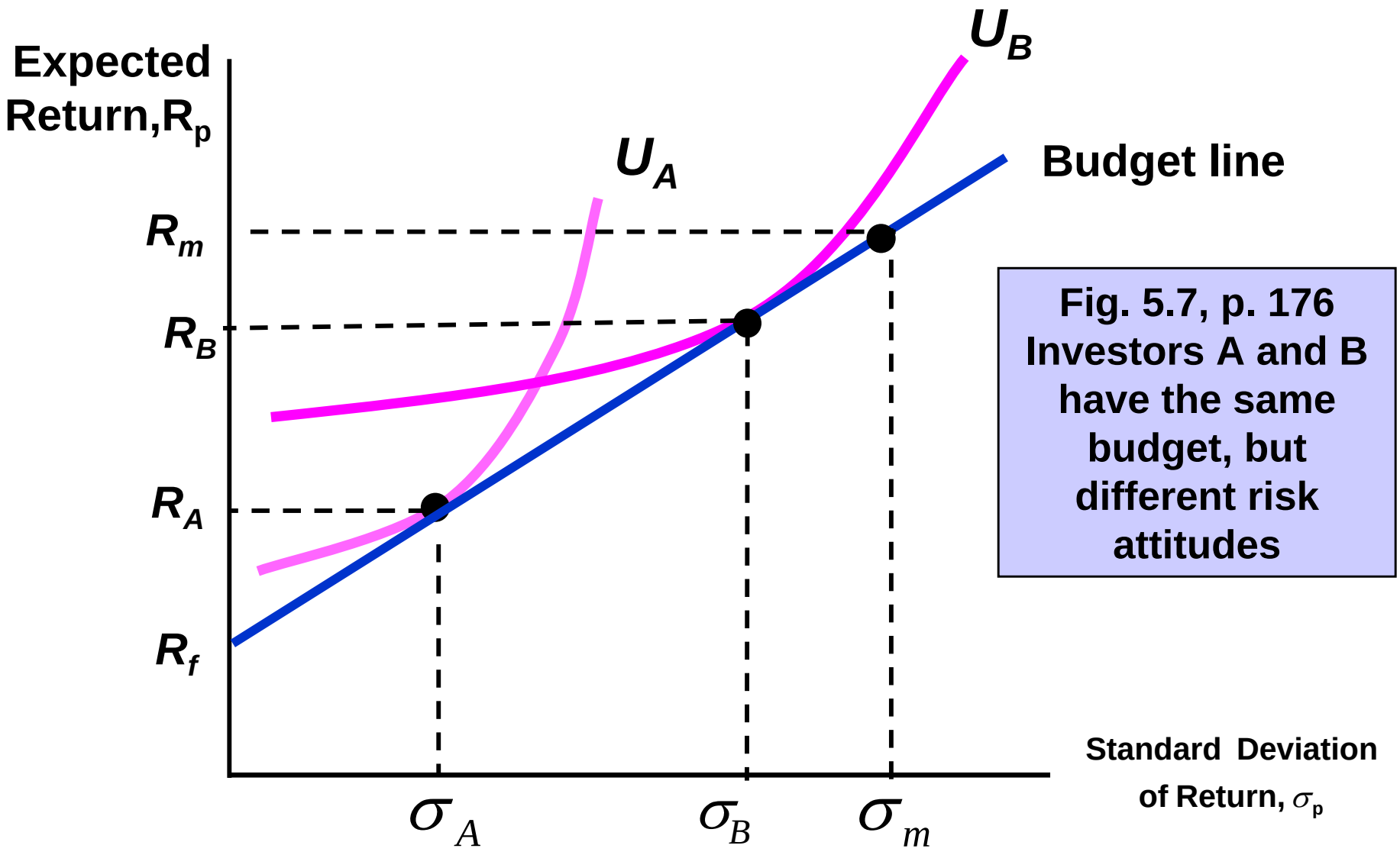


Fig. 5.7, p. 176 Investors A and B have the same budget, but different risk attitudes

How much Risk to hold?

- *The answer depends on (i) price of risk & (ii) preference about risk*
- *(i) If $R_m\uparrow$ or $R_f\downarrow$ or $\sigma_m\downarrow$* ➔ higher fraction of risky asset becomes optimal (due to a steeper budget line)

$$Slope = (R_m - R_f)/\sigma_m$$

- *(ii) It could be optimal (for an investor with a low risk-aversion to invest more than 100% wealth in risky asset. (By buying stocks on the margin, i.e., borrowing invest) [leveraging], (p. 177: expected return R_p is higher than market one R_m, and (σ_p higher than σ_m).*
- LTCM:
  - Their "technology" (dynamic hedging) permitted to maintain lower σ_m than of a typical old-fashioned portfolio ➔ High leverage is optimal for LTCM partners. But their estimates were based on historical σ.
  - Events of 1998: a decrease of R_f and an increase of σ (due to exogenous reasons (Asian crisis and Russian default).

Opportunity Cost of Capital

- Q: How to determine the proper discount rate (or interest rate or opportunity cost of capital)?
  - The firm must determine the opportunity cost of its money
  - The correct value of the discount rate should equal the rate that the firm could earn on a *similar* investment
    - 'similar' investment: investment with the same risk
    - If no risk, opportunity cost is what the firm could earn on a government bond
- Adjustment for risk: How to determine the discount rate for an uncertain environment?
  - This can be done by increasing the discount rate by adding a **risk-premium** to the risk-free rate
    - **risk-premium** = amount of money that a risk-averse individual will pay to avoid taking a risk

Diversifiable vs. Nondiversifiable Risk

- **Diversifiable risk** can be eliminated by investing in many projects (or by holding many stocks)
  - spreading the risk over many options
    - Invest in many types of investments – diversify portfolio; Firms invest in many different projects
  - No reward for assets that have only diversifiable risk – tend to earn return close to risk free return [on average]
- **Nondiversifiable risk** cannot be eliminated by diversification (should be accounted in the risk premium)
  - Some risk cannot be eliminated or avoided
    - Company profits depend on the economy – boom or recession
    - Future economic growth is uncertain so cannot eliminate all risk
  - Investors should be rewarded for bearing these risks (when opportunity cost of investing is higher, rate of return must include risk premium)

Capital Asset Pricing Model (CAPM)

- The Capital Asset Pricing Model (CAPM)
  - Model in which the risk premium for a capital investment depends on the correlation of the investment's return with the return on the entire stock market
  - If you invest in a mutual fund, there is no diversifiable risk, because you already have diversified, but there is nondiversifiable risk, because stocks tend to move with economy
    - Expected return on stocks is higher than on risk free investment

Capital Asset Pricing Model (CAPM)

- CAPM summarizes the relationship between expected return and risk premium
  - r_m = expected return of the stock market
  - r_f = risk free return
  - r_m - r_f = risk premium for nondiversifiable risk

$$R_p = R_f + \frac{(R_m - R_f)}{\sigma_m}\sigma_p$$

$$r_i - r_f = \beta(r_m - r_f)$$

r_i = expected return on an asset

β = asset beta

CAPM: Adjustments for Risk

- Return on some assets is correlated with stock market as a whole
- The asset beta, β, measures the sensitivity of an asset's return to market movements and, therefore, the asset's nondiversifiable risk
  - 1% rise in market resulting in a 2% rise in asset price means the beta is 2
  - 1% rise in market resulting in a 1% rise in asset price means beta is 1
  - The larger the beta, the greater the expected return on the asset

Summary of Today & Plan of Next Lecture

- Ch. 5: material on Risky Assets; Ch. 15: CAPM
- Next: in the LTCM analysis we will touch:
  - Lecture 22: Ch 12: LTCM as cartel
  - Lecture 23: Ch. 13: LTCM: strategic games [Fed & cartel, LTCM partners & Buffet]
    - The games Fed plays: “Too big to fail” an example of the game without pure strategy equilibrium
    - Prisoners dilemma in bailout cartel
  - Lecture 24:
    - LTCM unwinding: the ability to move the markets: a blessing or a curse? (+ agency + information)
    - Cartel: Expected returns & real returns. So, why cartel members were reluctant?
    - JWM change of mind as profit maximization. The feedback of investor risk preferences on financial intermediaries
  - Lecture 25: LTCM as an agency problem
    - Agency problem managers/owners and workers (in LTCM: banks and their traders)
    - Asymmetric information
      - In LTCM: (market beliefs (subjective) and fundamentals)
      - In LTCM: Why cartel members were reluctant? (due to market beliefs)
  - Lecture 26: Ch. 18 Public goods & externalities: FED in the LTCM bailout
    - enforcing the antitrust
    - providing financial system stability
    - information signaling
    - free riding in financial markets