Uncertainty and Consumer Behavior

EE311

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Reducing Risk

- Consumers are generally risk averse and therefore want to reduce risk
- Three ways consumers attempt to reduce risk are:
  - Obtaining more information
  - Diversification
  - Insurance

Reducing Risk

- Diversification
  - Reducing risk by allocating resources to a variety of activities whose outcomes are not closely related.
  - "Don't put all eggs in one basket."
- Example:
  - Suppose a firm has a choice of selling air conditioners, heaters, or both.
  - The probability of it being hot or cold is 0.5.
  - How does a firm decide what to sell?

Income from Sales of Appliances

	Hot Weather	Cold Weather
Air conditioner sales	$30,000	$12,000
Heater sales	12,000	30,000

Diversification – Example

- If the firms sells only heaters or air conditioners their income will be either \$12,000 or \$30,000.
- Their expected income would be:
  - 1/2(\$12,000) + 1/2(\$30,000) = \$21,000

Diversification – Example

- If the firm divides their time evenly between appliances their air conditioning and heating sales would be half their original values.
- If it were hot, their expected income would be $15,000 from air conditioners and $6,000 from heaters, or $21,000.
- If it were cold, their expected income would be $6,000 from air conditioners and $15,000 from heaters, or $21,000.

Diversification – Example

- With diversification, expected income is $21,000 with no risk.
- Better off diversifying to minimize risk
- Firms can reduce risk by diversifying among a variety of activities that are not closely related

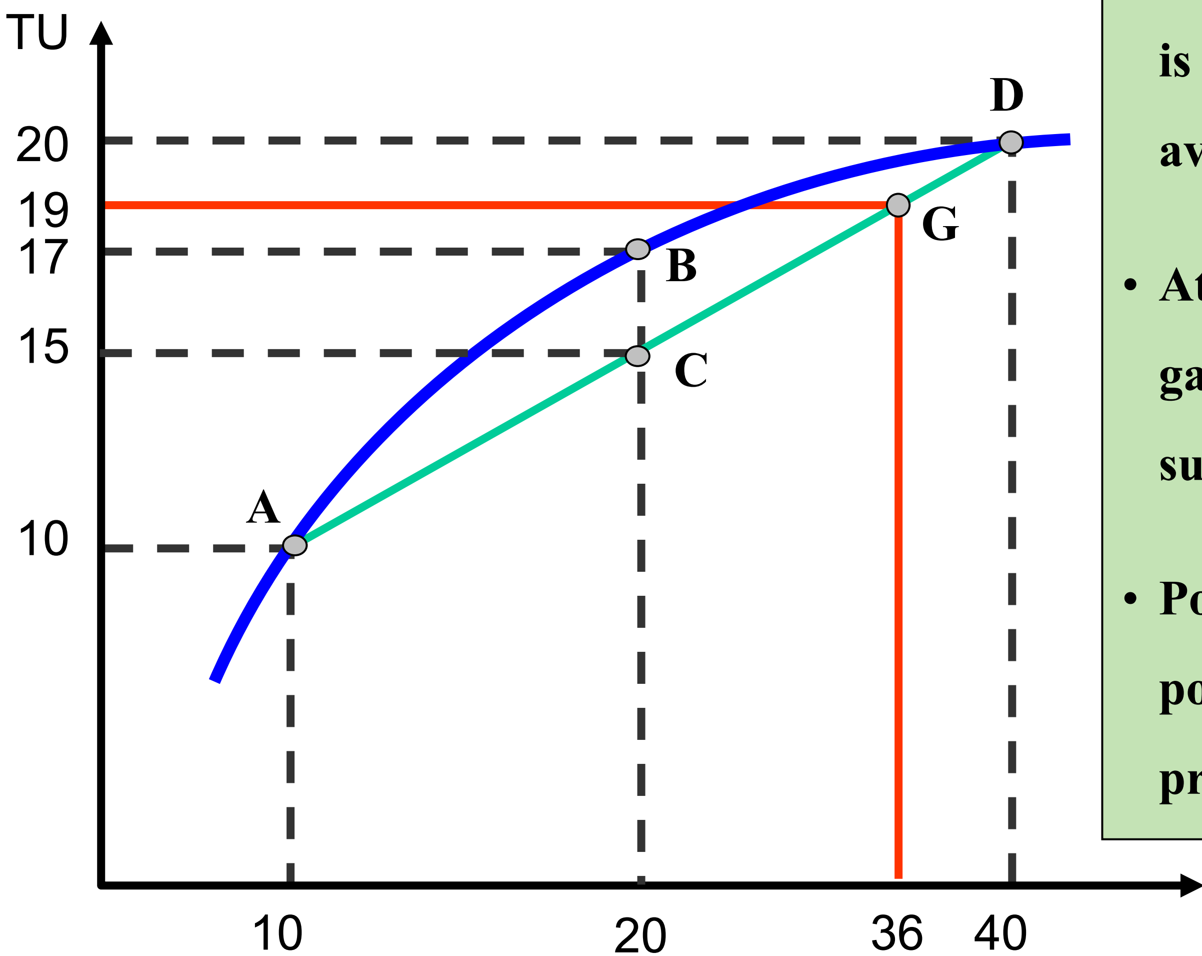
Reducing Risk – The Stock Market

- If invest all money in one stock, then take on a lot of risk
  - If that stock loses value, you lose all your investment value
- Can spread risk out by investing in may different stocks or investments
  - Ex: Mutual funds

Gambling

- Why do people take unfair bets?
  - Risk lovers.
  - Compulsion to gambling.
- How do we explain non-compulsive gambling by people who exhibit risk-averse behavior?
  - For entertainment
    - They insure their houses because there is no enjoyable about bearing risk of theft or fire.
    - They bet on horse races because they get enough pleasure from the game.

Non-compulsive Gambling



- If the probability of wining is high enough even a risk averse person may gamble.
- At G the expected utility of gambling is higher than a sure income at B.
- Point G may be the result of poor judgment on the probability of winning.

The Demand for Risky Assets

- The higher the return, the greater the risk.
- Investors will choose lower return investments in order to reduce risk
- A risk-averse investor must balance risk relative to return
  - Must study the trade-off between return and risk

Trade-offs: Risk and Returns: Example

- An investor is choosing between Treasury-bills – riskless and Stocks – risky
- Investor can choose only T-bills, only stocks, or some combination of both
- R_f = risk free return on T-bill
  - Expected return equals actual return on a riskless asset
- R_m = the expected return on stocks
- Assume $R_m > R_f$ or no risk averse investor would buy the stocks

Trade-offs: Risk and Returns: Example

- How do we determine the allocation of funds between the two choices
  - b = fraction of funds placed in stocks
  - $(1-b)$ = fraction of funds placed in T-bills
- Expected return on portfolio is weighted average of expected return on the two assets

$$\boxed{R_P = bR_m + (1-b)R_f}$$

Trade-offs: Risk and Returns: Example

- Assume, R_m = 12%, R_f = 4%, and b = 1/2

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

$$R_P = (1/2)(12\%) + (1-1/2)(4\%)$$

$$R_P = 8\%$$

Trade-offs: Risk and Returns: Example

- How risky is the portfolio?
  - As stated before, one measure of risk is standard deviation
  - Standard deviation of the risky asset, σ_m
  - Standard deviation of risky portfolio, σ_p
  - Can show that:

$$\boxed{\sigma_p = b\sigma_m}$$

Trade-offs: Risk and Returns: Example

- We still need to figure out how the allocation between the investment choices
- A type of budget line can be constructed describing the trade-off between risk and expected return

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

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

- Expected return on the portfolio, R_p increases as the standard deviation, σ_p of that return increases

Trade-offs: Risk and Returns: Example

- The slope of the line is called the price of risk
  - Tells how much extra risk an investor must incur to enjoy a higher expected return

$$\boxed{Slope = (R_m - R_f)/\sigma_m}$$

Choosing Between Risk & Return

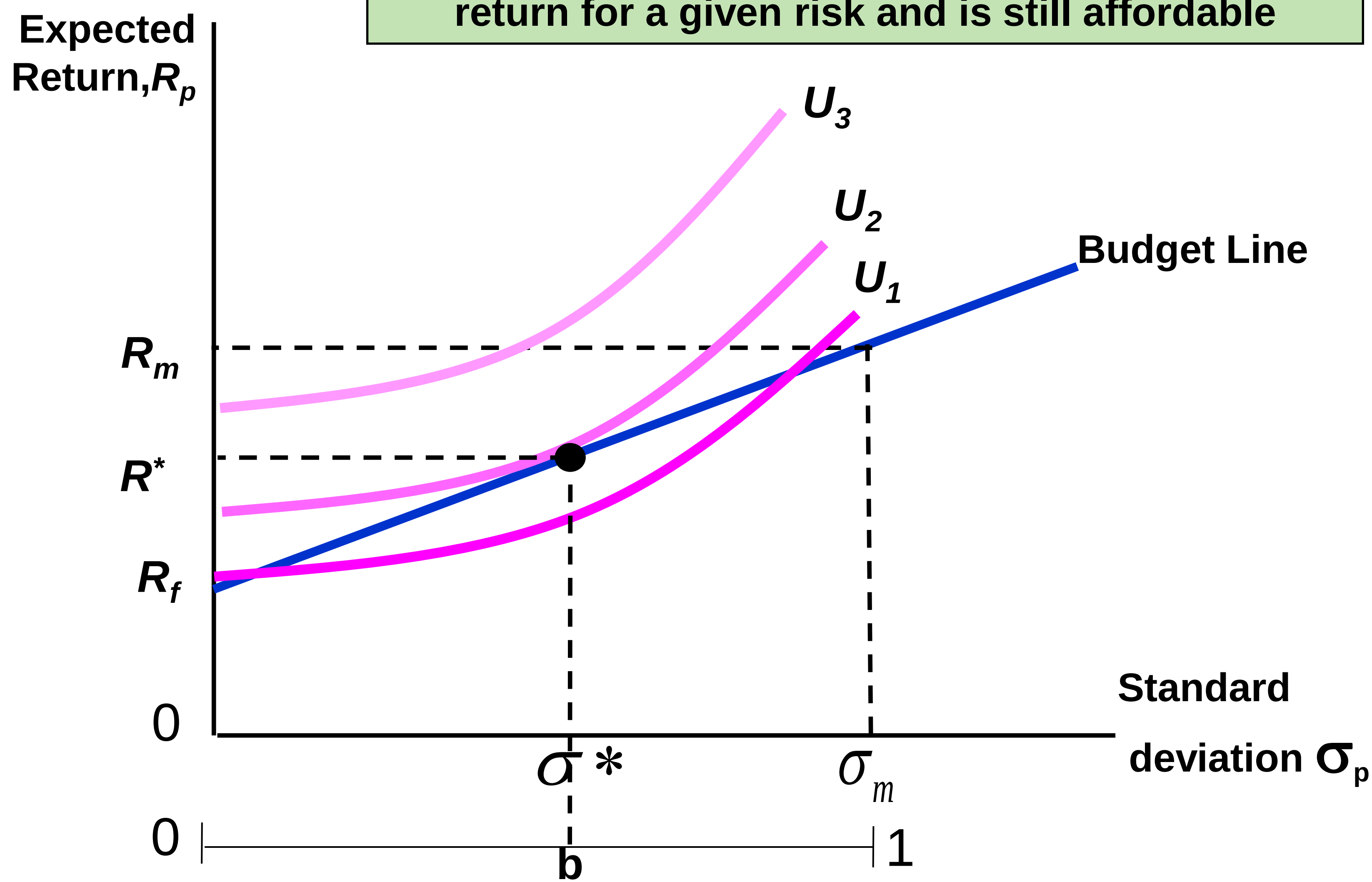
- If all funds are invested in T-bills (b=0), expected return is R_f
- If all funds are invested in stocks (b=1), expected return is R_m but with standard deviation of σ_m
- Funds may be invested between the assets with expected return between R_f and R_m, with standard deviation between σ_m and 0

Choosing Between Risk & Return

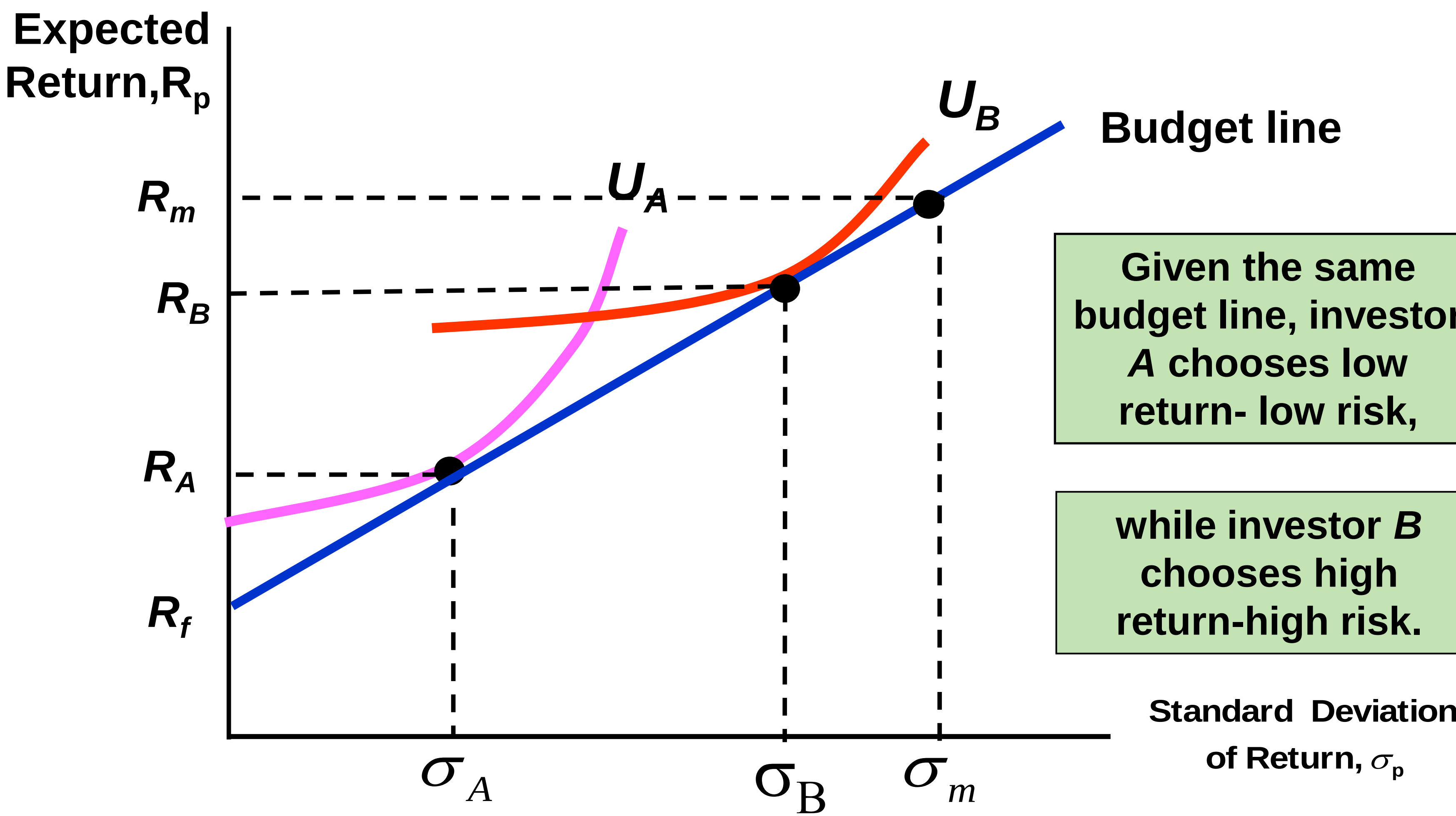
- We can draw indifference curves showing combinations of risk and return that leave an investor equally satisfied
- Comparing the pay-offs and risk between the two investment choices and the preferences of the investor, the optimal portfolio choice can be determined
- Investor wants to maximize utility within the "affordable" options

Choosing Between Risk & Return

***U_2* is the optimal choice since it gives the highest return for a given risk and is still affordable**



The Choices of Two Different Investors



Given the same budget line, investor *A* chooses low return- low risk,

while investor *B* chooses high return-high risk.

Choosing Between Risk & Return

- Different investors have different attitudes toward risk
- If we consider a very risk averse investor (A)
  - Portfolio will contain mostly T-bills and less in stock with return slightly larger than R_f
- If we consider a riskier investor (B)
  - Portfolio will contain mostly stock and less T-bills with a higher return R_b but with higher standard deviation