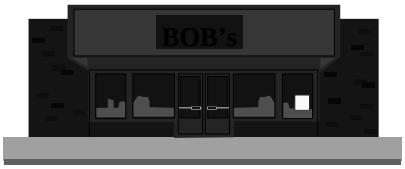
Present value, rate of return and opportunity cost of capital

Chapter 2

To Build or Not to Build: A Sports Bar



- Lot next to proposed baseball stadium is worth $50,000
- If built, a sports bar would be worth $400,000 in one year
- Will cost $300,000 to build

Plot the relevant cash flows on a timeline:

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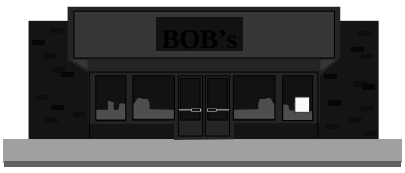
Should we build?



Build if the present value of $400,000 (delivered next year) is greater than $350,000

PRESENT VALUE

- Basic principle:
  A dollar today is worth more than a dollar tomorrow

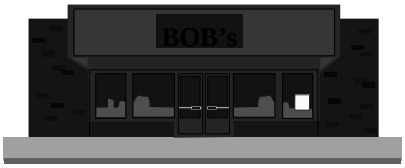
Why?

Because, a dollar today can be invested to earn interest and therefore will be worth more than one dollar tomorrow

Present value of cash in period one

- Present value = Discount factor x C_1
  - where C_1 = cash flow in period 1
- Discount factor = 1 / (1+r)
  - where r is the rate of return investors demand for accepting delayed payment
- Rate of return also referred to as the:
  discount rate,
  hurdle rate, or
  opportunity cost of capital

What discount rate should we use for the sports bar?



- Assume investment is a sure thing (no risk)
- US T-Bills are also risk-free and currently pay 7%
- Thus, the appropriate discount rate is 7%

How much would you have to invest in US government T-Bills (which pay 7%) to get $400,000 a year from now?

After committing the land and beginning construction, how much could you sell the project for?

More generally, the formula for net present value can be written as:

$$NPV = C_0 + C_1/(1+r)$$

Note that C_0, the cash flow at time 0, is typically negative and therefore a cash *outflow*.

$$NPV = -350{,}000 + 400{,}000/1.07$$
$$= \$23{,}832$$

Financing the investment: A preview

Suppose you borrow $300,000 to build the bar

What rate would the bondholder demand? How much would you have to repay next period?

300,000 x 1.07 = $321,000

Discussion Question

What's the affect on your NPV?

What is the bondholder's NPV?

1. Recalculate your net outlay in period 0 and net inflow in period 1 and refigure your NPV.
2. Determine the bondholder's cash flows in periods 0 and 1 and calculate the bondholder's NPV?
3. Explain your answers to 1 and 2. (what's going on?)

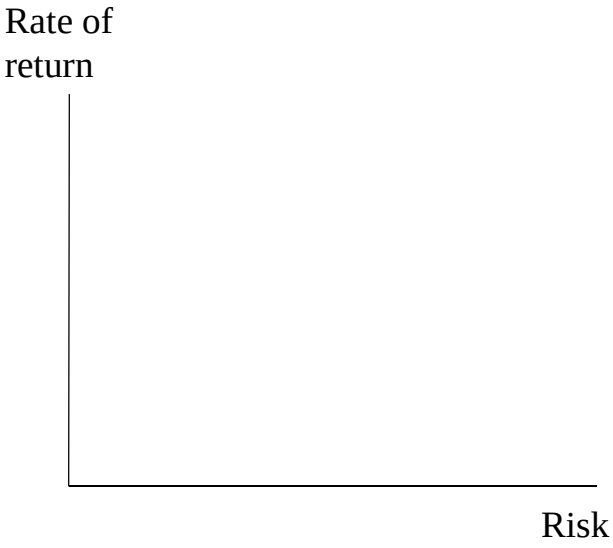
NPV = Change in Wealth

- Wealth = PV of current and future income
  - Who is wealthier?
    - Individual A: $0 today; $100,000 next period
    - Individual B: $50,000 today; $0 next period
- Giving up $350,000 today for $400,000 next period increases wealth by $23,832

A few comments on risk

- Unrealistic assumption that sports bar investment is risk-free
- Another basic principle:

  A safe dollar is worth more than a risky dollar
- Discounting is still appropriate, but investors will use a higher rate



How does risk affect our decision whether to build the sports bar?

- Assume that the risk is equivalent to an investment in the stock market which is currently expected to pay 12%
- Thus, 12% is the appropriate opportunity cost of capital
- PV = 400,000/1.12 = $357,143
- NPV = 357,143 - 350,000 = $7143
- Project still adds value, but smaller than our earlier calculations

Present value and rates of return

- Return = profit / investment
  = (400,000 -350,000) / 350,000
  = 14.3%
- In both cases, the project was worth taking because the return exceeded the opportunity cost of capital

Two equivalent decision rules for capital investments

Net present value rule:

Accept all investments that have positive net present values

Rate-of-return rule:

Accept all investments that offer rates of return in excess of their opportunity costs of capital