Lecture 19

Bonds
Types of Financing

◆ Cash (owners’ capital):
  ▪ Private funds
  ▪ Partnerships
  ▪ Stocks

◆ Debt (loans, bonds):
  ▪ *Bonds are just one type of financing!*

◆ Leasing
When to Borrow

Better than other options in long run:
- E.g., higher present value

Suitable payment plan in short run:
- Less flexible than selling stock

Loans difficult in volatile industries:
- But can increase rate of return to owners
  - *Can increase return without larger investment!*
Types of Loans

- **Interest each year, principal at end:**
  - Bonds

- **Annual payments of principal:**
  - Equal principal, declining interest
  - Equal total, increasing principal (car/house)

- **No interest each year, interest/principal at end (some federal bonds)**
Types of loans

- All are equivalent \textit{if:}
  - Life of debt = Life of asset
  - Interest rate of debt = minimum acceptable rate of return

- Minimum acceptable rate of return typically > interest rate:
  - Loan period may also be < asset life
  - E.g., cars
Definitions

- **Face value:**
  - Lump-sum amount that will be paid at end
  - *Not necessarily equal to purchase price!*

- **Interest payment:**
  - \((\text{Face value}) \times (\text{Interest rate}) / (\# \text{ periods})\)

- **Coupon rate** = interest rate
Bond Repayment

- If collecting capital to repay bonds:
  - Must be in a safe investment *(sinking fund)*
  - (Interest rate may be less than the rate on the loan!)
- Can buy back bonds early:
  - Depends on price
Bond Repayment

Alternative approach:

- **Serial maturity**
  - (e.g., issue bonds due in years 1-20)
- Can buy back at face value *(guaranteed!)*
  - But no flexibility on timing
- Often used by local governments:
  - Tax income is fairly stable
  - *Prevents diversion of accumulated funds!*
Example

**Typical bond:**
- 7% interest rate
- $10,000 face value
- Due in 20 years
- Compounded every 6 months
  - Need to use effective interest rate!

**Buying this bond is like loaning the company $10,000 for 20 years!**
Example (continued)

Bond owner gets:

- Interest of $350 every 6 months
- $10,000 in 20 years

How much is this bond worth?

- Minimum acceptable rate of return is 9%, compounded semi-annually
Example (continued)

**Present worth of bond:**

- $350 (P/A, 4.5%, 40) = $6,441
- $10,000 (P/F, 4.5%, 40) = $1,719
- Total = $8,160

**Would not pay more than $8,160**

**Company borrows $8,160:**

- *Pays back $10,000!*
Example (continued)

- At a minimum attractive rate of return of 7%:
  - Bond would be worth exactly $10,000

- At a minimum attractive rate of return of 4%:
  - Bond would be worth $14,103
    - Loan company $14,000
    - Get back only $10,000
  - This is a good idea if no other investment pays more than 4%!
Observations

- **Price is essentially a present value:**
  - So present value is better than equivalent annual cost for determining prices

- **If the current interest rate is higher than the coupon rate on the bond:**
  - The sale price will be **less** than face value

- **If the current interest rate is lower:**
  - The sale price will be **more** than face value!
**Internal Rate of Return**

- Find internal rate of return of bond:
  - 7% interest rate
  - $10,000 face value
  - Due in 20 years
  - Compounded every 6 months
  - *Bought for $8,000*
    - Can’t do without knowing purchase price!

- Expect higher or lower than 7%?
Internal Rate of Return

- At a minimum acceptable rate of return of 4.5% every 6 months:
  - Present worth = $8,160
- At a minimum acceptable rate of return of 5% every 6 months:
  - Present worth = $7,426
- To get present worth = $8,000:
  - Interpolation gives 4.6% per 6 months
  - Nominal interest rate of 9.2% per year
Internal Rate of Return

◆ For the investor:
  ■ A large internal rate of return is *good*!
  ■ (Large return on initial investment)

◆ For the company selling the bonds:
  ■ A large internal rate of return is *bad*!
  ■ Large future payments due
  ■ Small initial influx of funds
Buyer versus Seller

Company sells $50 million of bonds
- 9.2% interest rate
- Due in 20 years
- Compounded every 6 months

A total of 5,000 bonds are sold:
- Each with $10,000 face value
- Bought for $9,750!
Buyer versus Seller (continued)

_value to investors = 9.5% (yield):
- $48.75 million initial investment
- $4.6 million in annual interest payments
  - (9.2% times $50 million)
- $50 million in year 20

Cost to company ≥ 9.8%:
- Larger than value to investors
- Large rate of return is _bad_ for seller!
Buyer versus Seller (continued)

- Minimum cost to company = 9.8%:
  - Present benefit $P = $47.45 million
  - *Sold to middlemen (investment bankers)!*
- Annual cost $A = $4.6 million
- Future cost $F = $50 million in year 20
Buyer versus Seller (continued)

More realistic cost to company 10.2%:

- Present benefit \( P = \$47.45 \text{ million} \)
  - Minus \$0.85\ million in setup costs
  - = \$46.6\ million

- Annual cost \( A = \$4.6\ million \)
  - Plus \$0.09\ million in processing costs
  - = \$4.69\ million

- Future cost \( F = \$50\ million \text{ in year 20} \)
Observation

- Income tax may make a difference:
  - *Interest payments are tax deductible!*
- *This analysis has been before tax*
Review

We learned how to analyze bonds:
- How to find maximum purchase price
  - Given a minimum acceptable rate of return
- How to find internal rate of return (*yield*)
  - Given purchase price

We learned how to interpret internal rate of return:
- For investor, large rate of return is *good*
- For seller, large rate of return is *bad*
  - (Cost of money!)