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 *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:**
  - ▪ **(Face value) x (Interest rate)/(# 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 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 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!)**