Notes for Tuesday, January 20, 2004

Announcements

By today you should have read Chapter 2. Read Chapter 3, Secs 1-6 for Thurs.
- Discussion questions: Ch 3 – Q3, Q4 and Q5.

Writing Assignment #1 due.
Problem Set #1 due Thursday, January 22.
- You will get Problem Set #2 on Thursday.

General Outline

Discounting Formulas

Finish: The Single Value Formula
Catch up: Infinite Annual Series
Infinite Periodic Series
Finite Annual Series
Finite Periodic Series

Basic Process for Solving Financial Analysis Problems

Overall process
Selecting a formula
Infinite Periodic Series

This formula is used to identify the present value \( V_0 \) of an infinite series of regular payments \( R \) that are made every \( t \) years.

\[
V_0 = \frac{R}{(1+i)^t - 1}
\]

Example

Consider an aspen stand that regenerates naturally, so there is no regeneration cost. Also, for simplicity, assume that there are no taxes on the property. Every 40 years, the stand can be harvested to yield, on average, 30 cords of pulpwood at an estimated price of $6 per cord. That is, every 40 years an expected revenue of $180 per acre will be generated. Assuming there are no taxes or other costs, and that the discount rate is 3%, what is the value of the land (per acre) when used for growing aspen?
Finite Annual Series

This formula is used to calculate the present value, at an interest rate \( i \), of a regular, annual payment \( (R) \) that is made for a fixed number of years \( (n) \).

\[
V_0 = \frac{R[(1 + i)^n - 1]}{i(1 + i)^n}
\]

Example

Consider the case of an even-aged northern hardwood stand that is managed on an 80-year rotation with no intermediate revenues – i.e., the only revenue earned from the stand is from the final harvest at age 80. At an interest rate of 8%, how much revenue (per acre) must be earned from this final harvest (at age 80) to pay for an annual property tax of $2/ac that is paid each year from age 1 to age 80?
Equivalent Monthly Interest Rate

The finite annual series is often used to calculate the payment amount for a loan. However, loans are often paid in monthly, rather than yearly, amounts.

Use the following formula to calculate the equivalent monthly interest rate:

\[ i_m = (1 + i)^{1/12} - 1 \]

Now, re-arrange the finite annual series formula to solve for the payment, and use the monthly rate instead of the annual rate.

Example

Suppose you want to take out a loan for a car. You want to borrow $10,000 over a 3-yr period at an annual interest rate of 9.5%. How much will your payment be?
**Finite Periodic Series**

This formula is used to solve for the present value, at an interest rate $i$, of a regular, periodic payment $(R)$ that is received every $t$ years, which ends after a fixed number of years $(n)$.

$$V_0 = \frac{R[(1 + i)^n - 1]}{[(1 + i)^t - 1](1 + i)^n}$$
**Determining Which Formula to Use**

1. Does the problem involve a series of equal revenues or payments?
   - **Yes:** Go to question 2.
   - **No:** You will probably need to use the single-value formula. If multiple values are involved, you will probably need to apply the formula separately to each value.

2. Is the series of revenues or payments annual or periodic?
   - **Annual:** Go to question 3.
   - **Periodic:** Go to question 4.

3. Does the series of annual revenues or payments end at a specific time, or is it infinite?
   - **Specific ending point:** Use the finite annual series formula.
   - **Infinite:** Use the infinite annual series formula.

4. Does the series of periodic revenues or payments end at a specific time, or is it infinite?
   - **Specific ending point:** Use the finite periodic series formula.
   - **Infinite:** Use the infinite periodic series formula.