Reviewing the Reference Handbook

Goal: Compare funding alternatives over time

Components:
- Nomenclature & Definitions
- Fundamental Equations
- Cost Concepts
- Interest Tables

Vocabulary:
- P: Present Value
- F: Future Value
- i: Interest compounded each period
- n: Number of compounding periods
- m: Number of compounding periods per year
- Standard notation: (F|P,i,n)

Interest Structures and Rates

Simple
- Interest paid out as earned

Compound
- Interest increased incrementally over time
- 3 ways to represent, not always straightforward
  - Actual (i): rate associated with compounding period (use for calcs)
  - Nominal (r): annual rate w/o effects of compounding
  - Effective (i_e): effect of actual interest rate over a different period

\[ i = \frac{r}{m} \quad i_e = (1+i)^{m} - 1 \]
Cash Flow Diagrams

- Horizontal timeline
- Vertical cash-flow lines, direction depends on POV

Types of Payments

- Single Payments
  - Convert lump sums between present (P) and future (F) worth
- Uniform Series
  - Convert equal payments (A) to present (P) or future (F) worth
- Arithmetic Gradient
  - Convert periodic payments of increasing/decreasing amount (G) to present (P) worth
- Composite Flows
  - Convert combinations of these payments (P/F/A/G) to present (P) or future (F) worth

Using The Interest Factor Tables

- Tables save us from repeating the same calculations

Steps:
- Draw cash flow diagram
- Identify what you are given and what you want to find
- Select the correct relationship/equation
- Fill out the symbolic notation
- Match notation values to the interest factor tables
- Pick correct value!
Rules for Using Fundamental Equations/Tables

- The cash flow diagram you draw for the problem MUST match the fundamental cash flow diagram perfectly in order to use its equation.
- If it doesn’t, you need to make it fit!
  - Brute force
    - Treat all payments at P/F and convert to what you are looking for
  - Breakup
    - Separate payments into types and convert
    - Look for patterns - much faster!!

Net Worth Calculations

- Convert everything to a set timeframe
  - Net present worth
    - Convert all cash flows to an equivalent value at a time designated as the present \( t = 0 \)
  - Net annual worth
    - Convert all cash flows to an equivalent uniform series spanning the time period: \( t = 1 \) through \( t = n \)
    - Inverse sign of equivalent annual cost

Benefit-Cost Ratio

- Ratio of NPW of benefits to NPW of costs
- Benefits may also include “disbenefits” (negative impacts)
- Compare two alternatives, or one alternative to the do-nothing alternative
- When \( BCR > 1 \) (or \( \sum B - \sum C > 0 \)), accept the alternative
FE Examples

If a company wanted to make a single investment now instead of spending $20,000 five years from now, how much would the investment be at an interest rate of 10% per year?

a) $3,276  b) $5,276  c) $12,418  d) $32,300

A short-haul trucking company purchased a used dump truck for $12,000. The company paid $5,000 down and financed the balance at an interest rate of 10% per year for five years. The amount of its annual payment is nearest to:

a) $1,447  b) $1,846  c) $3,166  d) $4,346

A machine that has a five year life has a first cost of $50,000, an operating cost of $4,000 per month and a $10,000 salvage value. At an interest rate of 12% per year compounded monthly, the present worth of the machine is nearest to:

a) $83,285  b) $83,307  c) $60,000  d) $73,264

General Tips

- Don’t be intimidated by the equations
  - You can solve most problems by finding the right equation
  - Pay attention to units

- Do as many practice problems as you can!

- Get to know the FE reference handbook.

- When in doubt, work backwards!
  - Plug answers into the equations and see what works