

MSCI 261 Midterm Review 2 (Chpt. 6-9)

Depreciation

- **Market value:** value at which an asset can be sold in a market (usually estimated)
- **Book value:** value calculated for accounting purposes, using a depreciation model
- **Scrap value:** value at the end of an asset's physical life (when it's broken up for its parts)
- **Salvage value:** value at the end of an asset's useful life (when it's sold)
- **Straight-line depreciation:** linear diminishment of book value

$$D_{sl}(n) = \frac{P - S}{N} = \text{amount of depreciation in period } n$$

$$BV_{sl}(n) = P - nD_{sl} = \text{book value at the end of period } n$$

- P = current market value/purchase price
- S = salvage value after N periods
- N = # of periods in useful life

- **Declining-balance depreciation:** proportional diminishment of book value

$$D_{db}(n) = d \cdot BV_{db}(n - 1) = \text{amount of depreciation in period } n$$

$$BV_{db}(n) = P(1 - d)^n = \text{book value at the end of period } n$$

$$d = \sqrt[n]{\frac{S}{P}} = \text{depreciation rate, given } P, S, \text{ and } N$$

Financial Accounting

- **Balance sheet:** snapshot of a firm's financial position at a point in time
 - $(\text{Current assets} + \text{long-term assets}) = (\text{Current liabilities} + \text{long-term liabilities}) + (\text{Owner's equity})$
- **Income statement:** summary of a firm's revenues and expenses over an accounting period
 - $\text{Income before taxes} = \text{Revenues} - \text{expenses}$
 - $\text{Net income} = \text{Income before taxes} - \text{taxes}$
- Liquidity ratios: ability of a firm to meet its current liability obligations
 - **Working capital** = Current assets - Current liabilities
 - **Current ratio/Working capital ratio** = $\frac{\text{Current assets}}{\text{Current liabilities}}$
 - **Acid-test ratio/quick ratio** = $\frac{\text{Quick assets}}{\text{Current liabilities}}$
 - Quick assets = Current assets - Inventories - Prepaid items
- Leverage/debt-management ratios: how much a firm relies on debt for its operations

- **Equity ratio** = $\frac{\text{Owner's equity}}{\text{Total assets}}$
- Efficiency/asset-management ratios: how efficiently a firm uses its assets
 - **Inventory-turnover ratio** = $\frac{\text{Sales}}{\text{Inventories}}$
- Profitability ratios: how productively a firm employs its assets to produce profit
 - **Return-on-assets ratio** = $\frac{\text{Net income (before extraordinary items)}}{\text{Total assets}}$
 - **Return-on-equity ratio** = $\frac{\text{Net income (before extraordinary items)}}{\text{Total equity}}$

Replacement Decisions

- **Equivalent Annual Cost (EAC)**

Taxes

- As an approximation:
 - $\text{Profit}_{\text{after-tax}} \approx \text{Profit}_{\text{before-tax}} \times (1 - t)$
 - $\text{MARR}_{\text{after-tax}} \approx \text{MARR}_{\text{before-tax}} \times (1 - t)$
 - $\text{IRR}_{\text{after-tax}} \approx \text{IRR}_{\text{before-tax}} \times (1 - t)$
 - Where t = corporate tax rate
- Effects of taxes on cash flows (straight-line):
 - $-\text{First cost}_{at} = -\text{First cost}_{bt} + \text{First cost}_{bt} \times t/N \times (P/A, i, N)$
 - $\text{First cost} \times t/N$ = annual tax savings due to the depreciation expense
 - $\text{Savings}_{at} = \text{Savings}_{bt} \times (1 - t)$
 - $\text{Salvage value}_{at} = \text{Salvage value}_{bt} \times (1 - t)$
- Businesses want to depreciate assets as quickly as possible = receive tax savings earlier = savings are worth more
- **Capital Cost Allowance (CCA)**: maximum amount of depreciation that a business can claim in a year
 - Usually calculated as a percentage of assets: the **CCA rate**
- **Undepreciated Capital Cost (UCC)**: value of assets from which the CCA for a year is calculated

$$UCC_{i+1} = UCC_i + \text{purchases}_i - \text{salvages}_i - CCA_i$$
- **Half-year rule**: for net purchases, half is added to the base UCC used to calculate CCA for the current year, and half is added to that of the next year
 - Intended to reduce tax savings
 - Without half-year rule: $UCC_n = P(1 - d)^n$

- With half-year rule: $UCC_n = P(1 - \frac{d}{2})(1 - d)^{n-1}$
- **Capital tax factor:** present worth of an asset, taking into account all future tax benefits due to depreciation

$$CTF = 1 - \frac{td(1 + i/2)}{(i + d)(1 + i)}$$

- **Capital salvage factor:** present worth of an asset's salvage value, taking into account the ongoing effect of tax benefits

$$CSF = 1 - \frac{td}{i + d}$$

- Effects of taxes on cash flows (declining-balance, with half-year rule):
 - First cost_{at} = First cost_{bt} × CTF
 - Savings_{at} = Savings_{bt} × (1 - t)
 - Salvage value_{at} = Salvage value_{bt} × CSF
 - e.g. finding the annual worth of a purchase with taxes, given first cost, annual revenue, and salvage value (all before taxes):

$$AW = -P_{bt}(A/P, i, N)CTF + A_{bt}(1 - t) + S_{bt}(A/F, i, N)CSF$$

Inflation

- **Inflation:** increase in average price of goods & services, decrease in purchasing power of currency
 - **Deflation** describes the opposite
- **Consumer Price Index (CPI):** a measure of purchasing power of currency
 - Relates the avg. price of a fixed amount of some good in a given year (*in the future*) with that of the base year (*now*)

$$CPI = \frac{\text{avg price of G\&S in year } i}{\text{avg price of G\&S in year 0}} \times 100$$

- **Inflation rate** = f = change in CPI every year
- **Real dollars** = equivalent value of money in a specified base year (a *present worth* of money)
- **Current/actual/nominal dollars** = value of money at the time of cash flow (a *future worth* of money)

$$R_{0,N} = \frac{C_N}{I_{0,N}/100} = \frac{C_N}{(1 + f)^N} = C_N(P/F, f, N)$$

- $R_{0,N}$ = real value of C_N relative to year 0, the base year

- C_N = current dollars in year N
- $I_{0,N}$ = value of CPI at year N , relative to year 0
- f = inflation rate per year

- **Real interest rate**

$$i' = \frac{1+i}{1+f} - 1$$

$$i = i' + f + i'f$$

- **Real MARR**

$$MARR_R = \frac{1 + MARR_C}{1 + f} - 1$$

$$MARR_C = MARR_R + f + MARR_R \cdot f$$

- **Real IRR**

$$IRR_R = \frac{1 + IRR_C}{1 + f} - 1$$

$$IRR_C = IRR_R + f + IRR_R \cdot f$$

- Only evaluate investments using **current dollars** and **current MARR/IRR**, OR **real dollars** and **real MARR/IRR**
- With taxes, calculate tax benefits first, then convert from current to real dollars