The UNIVERSITY of VERMONT

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Notes – Chapters 16 & 17

Capital Expenditure Decisions

I. Time Value of Money
   a. Based on the fact that using money has a value.
   b. Interest
      i. Interest is compensation to the lender.
      ii. Calculated based on the principal, time involved, and a rate.
      iii. Simple
         1. Principal * Rate = Interest
         2. Principal does not change
      iv. Compound
         1. Interest is added to principal over time
         2. Exponential Growth
   c. Future Value = $S(1 + i)^t$
   d. Present Value
      i. $S / (1 + i)^t$
      ii. Also called "discount rate"
   e. Annuity
      i. Series of payments for the same amount
      ii. Easier to calculate than for unequal discrete payments
   f. See BSAD-060 for review

II. Discounted Cash Flow Methods
   a. Methods of evaluating investment decisions that include the time value of money.
   b. Net Present Value
      i. Five Steps
      ii. Make a Timeline
         1. Purchase date, T_1, T_2, T_3, …
         2. Define new costs at each time
         3. Consider the benefits at each time
      iii. Define an appropriate discount rate
         1. Hurdle rate
         2. Considered in EVA too.
      iv. Calculate present values for everything on the timeline.
      v. Calculate net present value as the sum of all present values calculated.
      vi. Any positive Net Present Value is worth accepting
      vii. Always talking about cash flows, not accounting income
   c. Internal Rate of Return
      i. Discount rate that will cause the net present value of a project to be zero.
      ii. Investment Required / Annual Cash Flow = PV Factor
      iii. (Works for Annuities only)
      iv. Solving for Present Value of an annuity such that it exactly cancels the current investment.
      v. Use the calculated factor to find the associated rate of return
      vi. If you don't have an annuity, you have to use trial and error.
      vii. Assumptions
         1. All cash flows occur at period-end (not true, but not worth the cost of dealing with cash flows in the middle of a period)
         2. Projects are made with certainty
            a. Can increase the hurdle rate to lower PV for later periods.
            b. Still a source of error
         3. Perfect capital markets are assumed
            a. Borrowers and lenders will be able to access money at the rate implicit in the analysis (the hurdle rate)

4. All cash flows are immediately reinvested
    a. NPV means at the hurdle rate
    b. IRR means at the rate implicit in the analysis
5. The model is robust enough that with these sources of error that the benefits of adding their complexity do not outweigh the costs.

viii. Risk / Sensitivity Analysis
1. Example
    a. Investment Cost = $50,470
    b. Cost Savings, Annual, 5 years = $14,000
    c. Hurdle Rate = 10%
    d. How much would the $14,000 need to drop before it's not worth the investment?
2. Don't want to make an investment that yields negative NPV
3. Annuity Amount = PV / Factor gives value needed to zero out the NPV.
4. Example: $13,313 is the lowest acceptable return.

III. Income Taxes
a. Cash flows are heavily impacted by income taxes
b. Example
    i. Purchasing a new truck
    ii. Cost = $40,000
    iii. Depreciation, 4 years, straight-line
    iv. Anticipated cash revenue = $110,000
    v. COGS, Cash = $60,000
    vi. Tax Rate = 28%
c. After-Tax Cash Flow = $36,000
d. Depreciation Etax Shield
    i. Use half-year convention
        1. Should be $10,000 / year
        2. Make year 1 = 5,000, year 5 = 5,000, other years = 10,000
    ii. Depreciation Tax Shield = $11,200 ($40,000 * 28%)
    iii. Deductible from taxable income
    iv. Include depreciation in NPV analysis so taxes will be lower.
e. MACRS
    i. Modified Accelerated Cost Recovery System
    ii. Government came up with ACRS to explain how to use accelerated depreciation for tax purposes
    iii. Eight asset categories (see page 747)
    iv. Half-year convention in year of acquisition
    v. Take the second half in the second year in addition to whatever accelerated depreciation amount is calculated for that year.
f. Example
    i. Cost of Machine = $100,000
    ii. After Tax cash Flows = $20,000 / year [5 years]
    iii. Tax Rate = 28%
    iv. Discount Rate = 10%
    v. Find the NPV of the proposal.
    vi. Considerations
        1. Incremental cash flow, after tax.
        2. Depreciation Tax Shield
    vii. Solution
        1. Present Value of Incremental = $75,800
        2. MACRS depreciation using schedule of rates (times 28%) = $21,644

IV. Non TVM Methods
a. Neither endorsed nor preferred, but have some limited utility
b. Payback

i. Initial Investment / Net Annual After Tax Cash Inflow
ii. Does provide a tool to screen investments
iii. Might decide your investments need quick payback since you can't wait for long-run benefits (not enough cash)
iv. Also do a DCF analysis of some kind.
v. Might have a situation where payback doesn't show significant positive or negative effects until after the payback period, and just calculating the payback period misses that.

c. Accounting Rate of Return
i. Incremental Accounting Income used
ii. Accrual instead of cash flows.
iii. No TVM involved.
iv. ARR = (Incremental Accounting Revenue – Incremental Accounting Expenses) / (Initial Investment)
v. Could use average investment as denominator: Take average of beginning and ending book value.
vi. $ARR_{initial} < IRR < ARR_{average}$