Solutions to capital budgeting practice problems

Capital budgeting and cash flows

1. No. The $5 million is a sunk cost: whether or not the firm goes ahead with the new product, the $5 million has been spent.

2. An increase in the rate of depreciation will cause the cash flows from depreciation (the depreciation tax-shield) to become larger in the earlier years of a project's life and smaller in the latter years of its depreciable life.

3. If the asset is sold for less than its original cost, the difference between its sale price and its book value is taxed as ordinary income. If the asset is sold for more than its original cost, the difference between its sales price and the original cost is taxed as a capital gain (usually at rates lower than for ordinary income) and the difference between its original cost and its book value is taxed as ordinary income. The cash flow from the sale include the cash inflow from the sale itself and the cash outflow for taxes.

4. Year 0:
   - Purchase new equipment: Cash flow (acquire new equipment) - $200,000
   - Sell old equipment:
     - Cash flow from sale + $100,000
     - Tax of sale (40% of $100,000) - 40,000
     - Net cash flow from sale of old + 60,000

   Cash flow, Year 0 - $140,000

Year 5:
   - Sale of new equipment:
     - Cash flow from sale + $50,000
     - Tax on sale 40% of $10,000 - 4,000
     - Net cash flow from sale of new + 46,000

5. Cash flow in Year 0: - $130,000
   - Cost of the new equipment = - $200,000
   - Sale of the old equipment = + $50,000
   - Tax benefit from $50,000 loss on sale = 0.4 ($50,000) = + $20,000

   Note: loss on sale of old equipment = $50,000 - $100,000 = -$50,000
   - Cash flow in Year 5: + $54,000
     - Cash flow from sale of new equipment = + $50,000
     - Tax benefit from $10,000 loss on sale = 0.4 ($10,000) = + $4,000

6. | Year | Change in revenues | Change in expenses | Change in depreciation | Change in working capital | Incremental cash flow |
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<tbody>
<tr>
<td>1</td>
<td>+ $100,000</td>
<td>+ $75,000</td>
<td>+ $20,000</td>
<td>+ $20,000</td>
<td>+ $3,500</td>
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<tr>
<td>2</td>
<td>+ 200,000</td>
<td>+ 90,000</td>
<td>+ 40,000</td>
<td>+ 10,000</td>
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<tr>
<td>3</td>
<td>+ 300,000</td>
<td>+ 100,000</td>
<td>+ 30,000</td>
<td>- 10,000</td>
<td>+ 159,000</td>
</tr>
<tr>
<td>4</td>
<td>+ 200,000</td>
<td>+ 50,000</td>
<td>+ 10,000</td>
<td>- 10,000</td>
<td>+ 118,000</td>
</tr>
<tr>
<td>5</td>
<td>+ 100,000</td>
<td>+ 25,000</td>
<td>0</td>
<td>- 10,000</td>
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Capital budgeting techniques

1. The internal rate of return on an investment is the return considering the cash inflows and the reinvestment of the cash inflows (at this IRR). The yield to maturity of a bond is the return on the bond from interest, the reinvestment of the interest (at this yield), and the principal repayment.

2. The source of this conflict is the reinvestment rate assumption. The NPV method assumes reinvestment at the required rate of return, whereas the IRR assumes reinvestment at the IRR. For certain required rates of return, the project with the higher IRR may not have the greatest present value.

3. The source of this conflict is the manner in which the method assesses the investment. The NPV produces a dollar value of wealth enhancement, whereas the IRR is in terms of a yield.

4. The MIRR is designed to overcome the reinvestment rate assumption inherent in the IRR method. Since the IRR method's reinvestment assumption may be unrealistic, the MIRR provides an alternative method that permits a more realistic reinvestment assumption to be built-in.

5. a. IRR = 15%
   
   b. MIRR = 8.8%
      Note: FV = Terminal value = $35,027 x 4 = $140,108
   
   c. MIRR = 12.92%
      Because the cash flows are the same, we can use the future value of an annuity to solve for the terminal value:
      FV = Terminal value = $35,027 (FV annuity factor for n=4 i = 10%)
      FV = $162,560

6. a. IRR = 15%
   Use the annuity relation to determine the i (the IRR).
   
   b. MIRR = 13.178%
   Terminal value = $144,971.38
   
   c. MIRR = 14.6359%
   Terminal value = $150,647.60

7. a. IRR = 18.7189%
   
   b. MIRR = 14.6873%
   Terminal value = $396,831.50
   
   c. MIRR = 16.9875%
   Terminal value = $438,254.78

8. a. IRR = 15%
   
   b. MIRR = 15%
   Note: Because there is only one cash inflow, you can use the following to solve for the MIRR: FV = $174,901; PV = $100,000; n = 4; Solve for i (the MIRR)
Capital budgeting and risk

1. The standard deviation of the expected value is a measure of dispersion about the expected value; that is, how the possible outcomes deviate from the central tendency of the probability distribution. The standard deviation is in the same unit of measure as the expected value (e.g. dollars, return, units sold). The coefficient of variation is a measure of dispersion that is standardized to reflect dispersion relative to the expected value (e.g. a coefficient of variation of 2.0 indicates that the standard deviation is two times the expected value). The coefficient of variation is useful in comparing the dispersion of distributions that are centered on different expected values.

2. A standard deviation of $500 and an expected value of $1,200 indicates that it is 64% likely that the possible outcome will be within 1.64 ($500) or $820 either side of the expected value of $1,200, or in the range $380 to $2,020. [Note: The 64% and the 1.64 are based on the properties of the normal distribution.]

3. Procedure:
   Step 1: Classify the project in terms of its line of business
   Step 2: Identify firms with single lines of business that are the same as the project’s, and whose stock is traded in the financial markets
   Step 3: Calculate the beta of the firm’s or firms’ stock
   Step 4: Unlever the betas
   Step 5: If there is more than one firm in the same line of business, average their betas
   This will produce an estimate of the project’s beta.

4. Sensitivity analysis involves modifying one parameter at a time in the examination possible future outcomes to a decision, whereas simulation analysis allows modifying more than one parameter and explicitly incorporates the probability distributions of the parameters of the decision.

5. The approach to determine the cost of capital for a small, single owner business would be different than that of a large publicly-held corporation since stand-alone, or project specific risk is more important for the small, single owner firm than for the large corporation. In the case of large corporation, the focus should be on the project's market risk, not on a project's total risk.

6. Using a single rate to evaluate all projects is not a problem as long as all projects have the same risk and this risk is the same as that of the rest of the firm's projects. If the projects differ in terms of riskiness, a single rate will result in the rejection of profitable, yet less risky projects and the acceptance of unprofitable projects with risk greater than the average project's risk.

7. Using risk classes is a step towards using risk-adjusted discount rates. However, there are two potential problems:
   (1) Determining the discount rates for the risk classes
   (2) The possibility that projects within a given class will have different risks.

8. Neither. The total risk of the two products is the same (that is, they have identical coefficient of variations):
   Coefficient of variation, Product A = $2/$10 = 0.20
   Coefficient of variation, Product B = $3/$15 = 0.20

9. a. Expected cash flow = $0.2 + $1.2 + 2.0 = $3.40
   b. Standard deviation = $1.4967
   c. Coefficient of variation = $1.4976/$3.4000 = 0.4405

10. Calculate the asset beta for each firm, III, JJJ and KKK:
    Firm III: 1.5 (0.5714) = 0.8571
    Firm JJJ: 1.5 (0.6557) = 0.9836
    Firm KKK: 1.0 (0.6250) = 0.6250