

value remain as initially specified in the table. What is the NPV of this project under these alternative assumptions? How does the NPV change if the revenues and operating expenses grow by 5% per year rather than by 2%?

- d. To examine the sensitivity of this project to the discount rate, management would like to compute the NPV for different discount rates. Create a graph, with the discount rate on the x -axis and the NPV on the y -axis, for discount rates ranging from 5% to 30%. For what ranges of discount rates does the project have a positive NPV?



25. Billingham Packaging is considering expanding its production capacity by purchasing a new machine, the XC-750. The cost of the XC-750 is \$2.75 million. Unfortunately, installing this machine will take several months and will partially disrupt production. The firm has just completed a \$50,000 feasibility study to analyze the decision to buy the XC-750, resulting in the following estimates:

- *Marketing:* Once the XC-750 is operating next year, the extra capacity is expected to generate \$10 million per year in additional sales, which will continue for the 10-year life of the machine.
- *Operations:* The disruption caused by the installation will decrease sales by \$5 million this year. Once the machine is operating next year, the cost of goods for the products produced by the XC-750 is expected to be 70% of their sale price. The increased production will require additional inventory on hand of \$1 million to be added in year 0 and depleted in year 10.
- *Human Resources:* The expansion will require additional sales and administrative personnel at a cost of \$2 million per year.
- *Accounting:* The XC-750 will be depreciated via the straight-line method over the 10-year life of the machine. The firm expects receivables from the new sales to be 15% of revenues and payables to be 10% of the cost of goods sold. Billingham's marginal corporate tax rate is 15%.

- a. Determine the incremental earnings from the purchase of the XC-750.
- b. Determine the free cash flow from the purchase of the XC-750.
- c. If the appropriate cost of capital for the expansion is 10%, compute the NPV of the purchase.
- d. While the expected new sales will be \$10 million per year from the expansion, estimates range from \$8 million to \$12 million. What is the NPV in the worst case? In the best case?
- e. What is the break-even level of new sales from the expansion? What is the break-even level for the cost of goods sold?
- f. Billingham could instead purchase the XC-900, which offers even greater capacity. The cost of the XC-900 is \$4 million. The extra capacity would not be useful in the first two years of operation, but would allow for additional sales in years 3–10. What level of additional sales (above the \$10 million expected for the XC-750) per year in those years would justify purchasing the larger machine?

Data Case

You have just been hired by Internal Business Machines Corporation (IBM) in their capital budgeting division. Your first assignment is to determine the free cash flows and NPV of a proposed new type of tablet computer similar in size to an iPad but with the operating power of a high-end desktop system.

Development of the new system will initially require an initial capital expenditure equal to 10% of IBM's Net Property, Plant, and Equipment (PPE) at the end of the latest fiscal year for which data is available. The project will then require an additional investment in the first year equal to one half the initial investment. The product is expected to have a life of five years. First-year revenues for the new product are expected to be 3% of IBM's total revenue for the latest fiscal year for which data is available. The new product's revenues are expected to grow at 15% for the second year then 10% for the third and 5% annually for the final two years of the expected life of the project. Your job is to determine the rest of the cash flows associated with this project. Your boss has indicated that the operating costs and net working capital requirements are similar to the rest of the

company (implying the project will have the same ratio of EBITDA to sales and working capital to sales) and that depreciation is straight-line (over 5 years) for capital budgeting purposes. Since your boss hasn't been much help (welcome to the "real world"!), here are some tips to guide your analysis:

1. Obtain IBM's financial statements. (If you *really* worked for IBM you would already have this data, but at least you won't get fired if your analysis is off target.) Download the annual income statements, balance sheets, and cash flow statements for the last four fiscal years from Yahoo! Finance (finance.yahoo.com). Enter IBM's ticker symbol and then go to "financials."
2. You are now ready to estimate the Free Cash Flow for the new product. Compute the Free Cash Flow for each year using Eq. 8.5:

$$\text{Free Cash Flow} = \overbrace{(\text{Revenues} - \text{Costs} - \text{Depreciation})}^{\text{Unlevered Net Income}} \times (1 - \tau_c) + \text{Depreciation} - \text{CapEx} - \Delta \text{NWC}$$

Set up the timeline and computation of free cash flow in separate, contiguous columns for each year of the project life. Be sure to make outflows negative and inflows positive.

- a. Assume that the project's profitability will be similar to IBM's existing projects in the latest fiscal year and estimate (revenues – costs) each year by using the latest EBITDA/Sales profit margin. Currently, Yahoo reports EBITDA at the bottom of the income statement. Verify this number by adding Income Before Tax, Interest Expense, and Depreciation & amortization (from the cash flow statement). If the two numbers are inconsistent, use the latter method to calculate EBITDA.
 - b. Determine the annual depreciation by assuming IBM depreciates these assets by the straight-line method over a five-year life.
 - c. Determine IBM's tax rate by using the current U.S. federal corporate income tax rate.
 - d. Calculate the net working capital required each year by assuming that the level of NWC will be a constant percentage of the project's sales. Use IBM's NWC/Sales for the latest fiscal year to estimate the required percentage. (Use only accounts receivable, accounts payable, and inventory to measure working capital. Other components of current assets and liabilities are harder to interpret and not necessarily reflective of the project's required NWC—for example, IBM's cash holdings.)
 - e. To determine the free cash flow, deduct the additional capital investment and the *change* in net working capital each year.
3. Use Excel to determine the NPV of the project with a 12% cost of capital. Also calculate the IRR of the project using Excel's IRR function.
 4. Perform a sensitivity analysis by varying the project forecasts as follows:
 - a. Suppose first year sales will equal 2%–4% of IBM's revenues.
 - b. Suppose the cost of capital is 10%–15%.
 - c. Suppose revenue growth is constant after the first year at a rate of 0%–10%.

Note: Updates to this data case may be found at www.berkdemarzo.com.