Spreadsheet Case 9

Easton Tool & Die Company

Problem:	Develop a sensitivity analysis for capital budgeting
Management skills:	Planning Deciding
PC skills:	Data base creation Data table building Financial functions

File: Easton_q.xls

Easton Tool and Die Company, a tool and die manufacturer in Easton, Pennsylvania, manufactures tools and dies for the plastics industry. It is starting to rely heavily on computerized design and manufacturing for its products. One way it hopes to increase productivity and profits is by investing in more sophisticated equipment that will allow it to design tools and dies with fewer defects.

Don Flaherty, Easton's production manager, would like to spend $220,000 for four new CAD (Computer-Aided Design) workstations which will enable the firm to translate designs for new tools and dies more rapidly into finished products with fewer defects. Don estimates that the new CAD workstations should increase the firm's after-tax income by $45,000 each year over a five-year period by reducing production costs. At the end of five years, the firm hopes to sell the workstations for a total of $56,000. The sale price of the equipment at the end of its useful life to the firm is called the salvage value.

Purchasing a new piece of expensive equipment or upgrading plant facilities often requires a substantial investment in order to produce future benefits. Such investments are called capital expenditures. The process of analyzing and selecting various proposals for capital expenditures is called capital budgeting. A capital expenditure is not considered worthwhile unless it produces at least the same rate of return on the investment as if the amount of the investment were invested at a certain rate of interest specified by the firm.

Businesses use a number of different methods for evaluating the desirability of capital expenditures. One widely-used method is the net present value method.

The initial cost of the investment must be compared to the total cash flow from the investment. The total cash flow is the sum of the additional income produced by the investment plus the salvage value of the equipment. The cash flow from the investment must be discounted to account for the declining time value of money. A dollar earned ten years from now will not be worth one of today's dollars because today's dollar could be invested at a certain rate of interest. Ten years from now we would have not only the dollar but the interest income from the period.

For instance, $1000 invested in a savings account at a 7% interest rate with the interest compounded monthly would be worth $2010 at the end of 10 years.

To arrive at the return from the investment in today's dollars, one must first calculate the present value of the total cash flow from this new piece of equipment discounted at the prevailing interest rate for borrowing money. (This discount rate is the minimum return on the investment desired by the company.) Easton wants a minimum return of 7% on its investment. The initial purchase price of the equipment in today's dollars is then subtracted from the present value of the total cash flow from the investment to arrive at the net present value of the investment. If the net present value for the investment is positive, it is a worthwhile investment. If it is negative, the investment should be rejected.

Since investments are highly sensitive to changes in interest rates and economic conditions, Don wants to see whether the machine tool makes a good investment under a wide range of situations. What if the interest rate and annual income from the new tool are lower or higher than his original assumptions? He can perform a *sensitivity analysis* in the form of a data table which shows what impact changes in the interest rate and annual income from the investment have on the net present value.

Tasks

There are 5 tasks in this case:

1. Print out the data file Easton_q.xls to see the assumptions for the problem and the basic outline of the template.

2. Calculate the total additional income from the investment for the years 2001-2005.

3. Calculate the total cash flow from the investment for 2001-2005. Calculate the present value of this amount using the =NPV function of your spreadsheet software. The interest rate required by the firm is the discount rate used in the =NPV formula. Then calculate the net present value of the investment by subtracting the purchase price from the present value.

4. Develop a data table that shows the impact of different interest rates and annual incomes on the net present value of the investment. The interest rate should be on the X axis and the annual income from the investment should be on the Y axis. The interest rate should begin with a value of 5% and end with 11% in half percent increments. The annual income should begin with $30,000 and end with $60,000 in $5000 increments. It is helpful to use the Edit/ Fill/Series command of your spreadsheet software to set up these values on the data table.

5. Write a one-paragraph evaluation of the proposed investment. Should it be made? Should it be rejected at all costs? Or are there are conditions under which it would be worthwhile?

Additional Problems:

1. Another capital budgeting method is the profitability index, which helps firms compare the profitability of different potential investments. The profitability index is calculated by dividing the present value of the cash flows by the cost of the investment. For instance, if the present value of the total cash flow from an investment was 24,000 and the initial cost of the investment was 22,500, the profitability index would be 1.066. Using this method, firms can compare various capital investment projects and select those with the highest profitability indices. Any investment with a profitability index of less than 1 should be rejected. What is the impact of different interest rates and annual cash savings on the the profitability index? You can use the same range of interest rates and annual cash savings as you used before.

2. What if the annual income from the investment remained constant but the salvage value of the equipment varied from $35,000 to $70,000? What would the impact be on the net present value of the investment? (You can use the same range of interest rates as you used before.)

Time Estimates

Expert: 45 minutes
Intermediate: 1.5 hours
Novice: 2 hours

Excel Tutorial For Spreadsheet Case 9

This case requires knowledge of the table-building features of spreadsheet software and the =NPV function of Excel.

Sensitivity analysis is the process of exploring various "what-if" situations in order to determine the impact of one or several variables on a model. Table-building automates the "what-if" process so that sensitivity analysis does not have to be performed manually. Instead of performing repeated "what-if" analyses, the Excel table-building function allows various values to be substituted for existing values in your worksheet. A table will then be generated to detail the results.

To demonstrate, let's create a new worksheet that calculates sales commissions. You want to see the impact on commissions on sales of $5000 when they are based on different percentage rates. In order to fully display the data table on your worksheet screen, we will not enter documentation into the first four rows.

Set up your worksheet so that the labels PERCENT, SALES, and COMMISSION are right-justified in cells A1, B1 and C1, respectively, and the values for percent (5%) and sales ($5000) that we want to use in our calculation are in cells A2 and B2, respectively. In cell C2, place the formula, =A2*B2, for calculating the commission.

You could enter different percentages in the A column and then copy the formula for commission calculation to appropriate cells in the C column. However, you can also use the **Data/Table...** commands to perform this analysis automatically.

The Edit/Fill/Series Command

Before using these commands, you must enter the different percentage values in a column. Instead of entering each value individually, you can use the **Edit/Fill/Series** command. This command fills a range of cells with a series of numbers or dates that increase or decrease by a specified increment or decrement, or increase or decrease with a multiplicative growth factor.

Firstly enter .05 in cell A9. After accessing the **Edit** menu, select the **Fill** item, and select **Series** in the submenu. In the dialog box, check the Series in Columns setting and the Type is Linear. In the Step window type .01 and in the Stop window type .1. Press the OK Button when finished.

Alternatively, if you did not have a required Stop value but have a desired range for the series, you could select the range with the first cell containing the starting value and select **Edit/Fill/Series**. In the dialog box do not specify a Stop value; Excel will finish Filling when it reaches the end of the selection.

Data/Table Commands

After generating the column of interest rates in range A9:A14, we must enter either the formula for calculating commissions or the cell address from which to draw the formula. *This entry goes next to the column of percentages and one row above the first entry.*

Enter =C2 in cell B8. You could also have entered the formula for computing commission in B8.

Select the range A8:B14, the range containing the percentage values, the formula and the blank cell where the results will go. Next, select the **Table** item from the **Data** menu. The Table dialog box has two available settings: the Row Input Cell and the Column Input Cell. Since you are only examining the impact of changes in one variable -- percentage -- you will enter a cell reference in only one of these. The variable numbers you are examining are in a column so the cell reference for the percentage variable should be entered. Enter the reference A2 in Column Input Cell and select the OK Button.

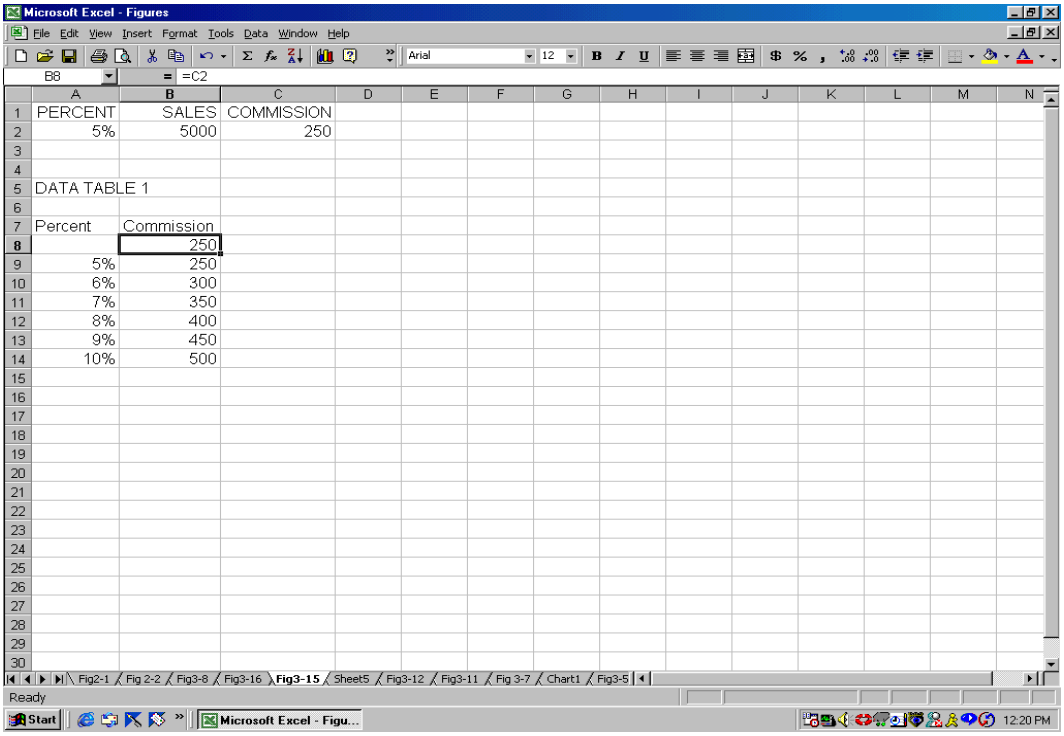
By entering only a single input cell reference in the dialog box, you are examining the impact of changes to one value in a formula. If you entered both the Row Input Cell and Column Input Cell, you would show the impact of changes to two values in a formula.

The results should look like Figure 3-15.

Now examine the impact on commissions if the sales amount, as well as the percentage, is variable. What happens when sales are $5000, $10,000 and $15,000? You would enter the values for our second variable (Sales) in the row just above the first entry of

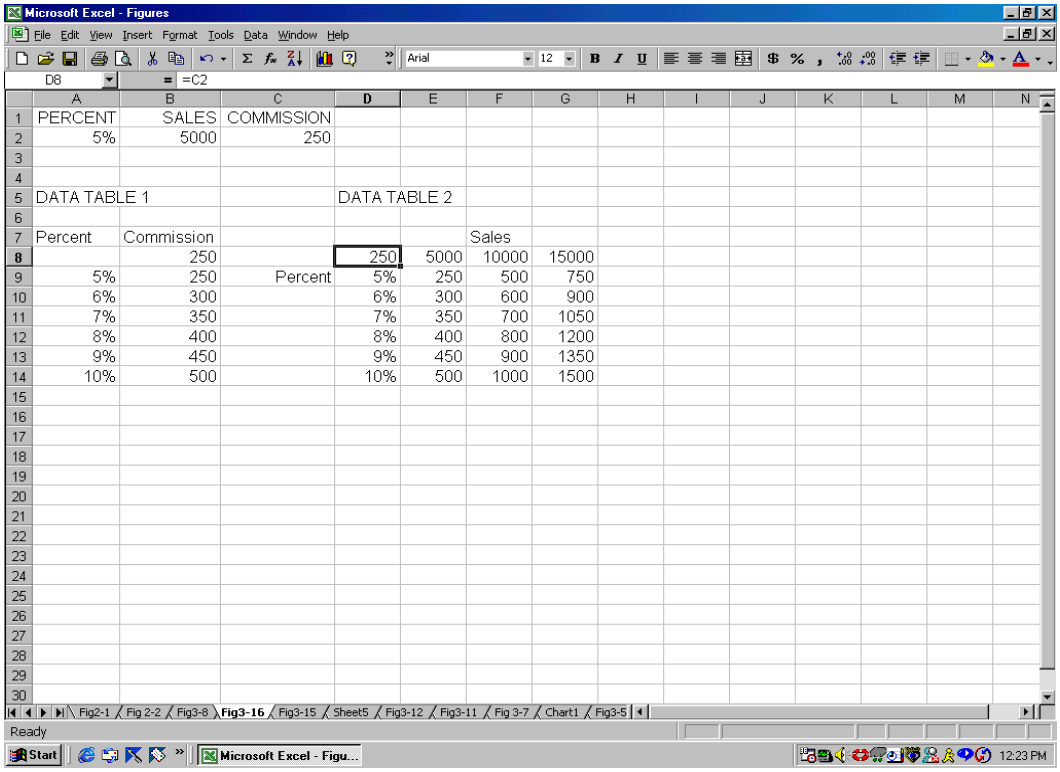
our first variable (Percentage). Enter the Sales values in range E8:G8 and the Percentage values in range D9:D14. *The address of the formula (=C2), must be entered in the cell directly above the first entry of the first variable.* (In your example, this would be in cell D8.)

Figure 3-15



Select the range of the table (D8:G14) and then choose **Data/Table**. In the Table dialog box choose cell reference B2 as the Row Input Cell and cell reference A2 as the Column Input Cell. Then select the OK Button. The two-dimensional data table should look like Figure 3-16:

Figure 3-16



	A	B	C	D	E	F	G
1	PERCENT	SALES	COMMISSION				
2	5%	5000	250				
3							
4							
5	DATA TABLE 1			DATA TABLE 2			
6							
7	Percent	Commission				Sales	
8		250		250	5000	10000	15000
9	5%	250	Percent	5%	250	500	750
10	6%	300		6%	300	600	900
11	7%	350		7%	350	700	1050
12	8%	400		8%	400	800	1200
13	9%	450		9%	450	900	1350
14	10%	500		10%	500	1000	1500

=NPV Function

Spreadsheet Case 9 requires that you compute the projected value of an investment in today's dollars. The **=NPV** function computes the present value of a stream of cash flows discounted at a fixed periodic interest rate. The form of this function is:

=NPV(*Discount Rate*, *Value1, Value2, ...*)

The discount rate is the interest rate, and the Values are the series of cash flows to be discounted. The interval between cash flows must be constant and must agree with the period of the discount rate. The Value parameters can be both values in the formula, references to cells, and references to ranges of cells. Up to 29 Value parameters are allowed, although each can of course be several values in a range on the worksheet. It is important to realize that Excel takes the order of Value1, Value2 and so on, as the sequence of the cash flows.