Problem Overview: This assignment involves a comparison of two different investment alternatives. In addition to the basic analysis, you will investigate the sensitivity of the results to changes in parameter values using several methods.

Problem Statement: The Bad Day Company wants to install new equipment in one of its factories. This equipment will result in both a higher production rate and higher quality so that the defect rate will be lower. They have evaluated many different manufactures of this type of equipment and have narrowed the field down to two alternatives. They now want to compare these two alternatives to see which one makes the most sense financially.

There are several factors that are the same regardless of which alternative is selected. These include an estimate for the future tax rate at 25% and a useful life of 10 years. In addition, the company estimates that expenses will grow at a compound rate of 6.5% each year. This increase in expenses is expected to start immediately so that at the end of the first year, the expenses will already have increased by 6.5%. The company also estimates that revenues will grow at a compound rate of 9.2% each year. Like expenses, this increase in revenues is expected to start immediately so that at the end of the first year, the revenues will already have increased by 9.2%. The other common factor that is the same for both alternatives is the discount rate that will be used to compute the net present value of the annual cash flows. Bad Day uses a discount rate of 14%.

In addition to the common parameters above, the equipment in alternative 1 will have a purchase cost of $445,000 and an after-tax resale value of $83,000 at the end of the useful life. It is estimated that alternative 1 will generate $124,000 in annual revenues and have annual expense estimated at $48,500 (subject to the growth rates described earlier). Depreciation will be computed using the straight-line method.

Alternative 2 will have a purchase cost $375,000 and an after-tax resale value of $40,000 at the end of the useful life. It will generate annual revenues of $98,000 and annual expenses of estimated at $27,500 (also subject to the growth rates described earlier). Depreciation will also be computed on a straight-line basis.

Details: You need to compute the net present value of each alternative. The NPV that is the largest (and positive) will be the best choice.

To compute the cash flow at time period “t”, use the following formula:

$$\text{cashFlow}_t = \text{revenues}_t - \text{expenses}_t - \text{taxRate}_t * (\text{revenues}_t - \text{expenses}_t - \text{depreciation}_t)$$

Add the after-tax proceeds (resale value) from selling the equipment to the cash flow for the final period.

In computing depreciation for tax purposes as you are doing above, salvage value is assumed to be zero (even if you expect to sell the equipment for its resale value).

Once you have computed the cash flows for the two alternatives, you need to compute their net present value. Use Excel’s NPV function to do this.

Further Analyses: After you have completed the cash flow and NPV portion of the spreadsheet, you need to do further analysis of the parameters upon which the model is based.

Begin by creating a table that computes the NPV of each alternative for a number of different discount rates. Use discount rates ranging from 10% to 21% in steps of 1%. Using this table, create a chart that plots the two NPVs on the y-axis versus the discount rate on the x-axis. This chart will show three things. First, it will show how sensitive the NPV is to different discount rates. A flat line is not very sensitive while a steep line is. Second, it will show at which discount rate the two alternatives have negative (not profitable) NPVs. Finally, it will show if the two NPV lines cross. If they do, this means that one is better than the other for one set of discount factors and worse otherwise.

As a second analysis, use the Scenario Manager and perform a sensitivity analysis on the four parameters that are common to the two options. A “Current Values” scenario is created automatically by Excel using the estimated tax rate (25%), estimated operating expenses growth rate (6.5%) estimated revenues growth rate (9.2%), and NPV discount rate (14%) parameters. You should create four more scenarios with each of these parameters changed by 10% (each scenario will only have one parameter value changed—the other parameters should be set at their base values). Make the 10% change in such a way as to cause the NPV to increase in all cases.

Produce a scenario summary that displays the NPV of each alternative for the four scenarios. The “Result Cells” box in the Summary dialog box can include more than one cell reference. You will need two result cells—the net present value from each alternate.

After having Excel generate the summary spreadsheet, modify it by adding formulas that compute the percentage change in each scenario’s NPV from the base scenario NPV. The general formula for percentage change is:

$$\text{percentageChange} = \frac{\text{newValue} - \text{oldValue}}{\text{oldValue}}$$

With this modification, you will be able to see which of the four parameters under study impacts NPV the most. You will also be able to see the strength of this relationship (an x% change in A causes a y% change in B).

To Turn In: Print a copy of your spreadsheet and the Scenario Summary. Be sure your name is included as part of each printout. Also print a copy of your spreadsheet formulas for the NPV model (not the scenario summary). On this formula printout, you must include row/column headings.