*Analysis for Financial Management*

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Spreadsheet Tutorial

to accompany Chapter 7

*Discounted Cash Flow Analysis*

**Introduction:** This spreadsheet tutorial will give you practice with the functions and tools in Excel that allow you to value projects using discounted cash flow analysis. Follow the instructions on this handout using the accompanying Excel spreadsheet. Use your spreadsheet to answer the questions in each of the problems below. The instructions are based on Excel 2013 for a PC, so you may need to make some adjustments if you are using a different spreadsheet, such as Calc or Excel for a Mac.

**Instructions:**

Project #1

Complete the cash flow projections and find the NPV for this project. Initial CAPX are $20,000 and depreciated on a 10-year MACRS schedule (the percentages of initial cost allowed for depreciation under the current U.S. tax system). Net working capital required is $5,000 (just a one-time increase) over the life of the project. Incremental sales are $22,000 per year and incremental operating expenses are $18,000 per year. Assume that plant and equipment is disposed of at the end of year 7 (it has no resale value). The tax rate is 30%. Assume a WACC of 9.3%.

Note that the spreadsheet is set up so that assumptions (things you can change later) go in the green cells, and that the other cells contain formulas based on the assumptions.

1. **Assumptions.** Fill in the assumptions section first. Put in the tax rate across the whole row. Put in the MACRS percentages. (The quickest way to do this is to copy them from the MACRS schedule, then go to where you want to paste the values, select Paste Special, click on Values and Transpose, and hit OK.) Enter the WACC and the resale value.

2. **Balance sheet items.** I find the cash flow projections are easier if we track two balance sheet items, Net Working Capital and Net PPE. In the NWC line, enter the amount that will be required for the project in each year. Note that the NWC must be in place by (the end of) Year 0, and would be gone by (the end of) year 7. Keep in mind that this line is the level of NWC in each year, *not* the change in NWC.

In the Net PPE line, we are going to track the book value of the assets we acquire for this project. So in the green cell (Year 0) put the amount of the initial CAPX. In subsequent years the Net PPE will be Net PPE from the previous year minus depreciation from that year. (Go ahead and enter this formula even though depreciation isn’t entered yet.)

3. **Getting EBIT(1**–**t).** Enter sales and expense for Years 1-7. Enter depreciation expense for each year, which is the initial value of PPE times the MACRS percentage for that year. Enter the formula for EBIT, which is sales less operating expenses and depreciation. Enter taxes, which is the tax rate times EBIT, and then enter the formula for EBIT(1–t).

4. **CAPX.** In year 0, CAPX is just equal to the initial value of our PPE, so just enter a formula that references that cell.

The other thing we want to account for here is selling PPE at the end of the project. Put this in the next line below CAPX. In Year 7 we get a cash inflow from selling the equipment for resale value (RV), and the we also pay taxes on the gain over book value (BV). Here the RV is given in the assumptions, and the BV is the value of Net PPE in Year 7. So enter a formula in Year 7 under CAPX that reflects: RV– (RV–BV)\*t where t is the tax rate.

5. **Change in** **NWC.** For the change in NWC (ΔNWC), for Year 0, we just make it equal to the initial amount of NWC in Year 0 from above. For Years 1-7, the change in NWC is just that year’s NWC minus the previous year’s NWC.

6. **Cash Flows.** Now we’re ready to calculate cash flow each year, and all we do is apply the formula: EBIT(1–t)+Dep. –CAPX–ΔNWC. Enter this formula and copy it across for all years 0-7. Then the only change necessary is to also add in the sale of PPE in year 7 to the year 7 cash flows.

7. **NPV.** Now enter the formula for NPV on the last line. Remember that the NPV function in Excel discounts the first value by one year, so don’t put the initial cash flow inside the NPV function. Add this in separately.

Q1: What is the NPV of the project under the given assumptions? \_\_\_\_\_\_\_\_\_\_\_\_

Q2: How low would the initial investment have to be in order to make this project acceptable? \_\_\_\_\_\_\_\_\_\_\_\_

Project #2

This time we won’t go through the spreadsheet step by step. You are given the assumptions and you must complete the projections on your own.

1. **Projecting cash flows.** Complete the cash flow projections for project #2. Assume the following:

* The project has a 10-year life.
* Revenues are $70,000 in year 1 and increase $5,000 per year thereafter.
* Operating expenses are 70% of revenues in each year.
* Initial equipment purchases are $100,000, depreciated on a 7-year MACRS schedule.
* Equipment purchased will have a resale value of $30,000 at the end of the project.
* The tax rate is expected to be 35% over the life of the project.
* The discount rate for the project is 11.5%
* Net working capital of $25,000 will need to be maintained over the life of the project.

2. **Finding the NPV.** Use the NPV function to find the NPV of the project.

Q3: Under the above assumptions, what is the NPV of this project? \_\_\_\_\_\_\_\_\_\_\_\_

3. **Finding the IRR (in two ways).** Use the Goal Seek tool to find the internal rate of return on this project. Recall that the IRR is the discount rate that makes the NPV=0. So in Goal Seek set the NPV to 0 by changing the discount rate. After finding the IRR using Goal Seek, verify the IRR using the IRR function (enter on line 31, below the NPV).

Q4: What is the IRR under the above assumptions? \_\_\_\_\_\_\_\_\_\_\_\_

4. **Sensitivity analysis**. Note on the spreadsheet that all green cells are assumptions that you can modify. Return the discount rate back to 11.5%. Now find the NPV of this project under the following alternative assumptions (change only one at a time, then change back before going to the next one):

Q5: Initial equipment purchases are $115,000 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Q6: Sales in Year 1 are only $60,000, but still rise by $5,000 thereafter \_\_\_\_\_\_\_\_\_\_\_

Q7: The equipment has no resale value \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Q8: The discount rate is 13% \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

5. **Creating a two-dimensional data table.** Do some additional sensitivity analysis by creating a two-dimensional data table. Create a Data Table showing what the NPV would be with discount rates of 8%, 10%, 12%, 14%, and 16% and with initial CAPX of $80,000, $90,000, $100,000, $110,000, and $120,000. Enter the discount rates in a row (e.g. in C33:G33) and the initial CAPX values in a column just to the left (e.g. in B34:B38). In the cell in between these two (e.g. B33) enter the reference for the cell containing the NPV (e.g. B30). Then to create the Data Table, highlight a block that includes all the cells you just entered and go to Data | What-if Analysis | Data Table[[1]](#footnote-1). The row input cell is the cell where you would input the discount rate, and the column input cell is the cell where you would in put the initial CAPX. Click on OK and you will have a table showing the NPV under different combinations of assumptions.

Q9: According to your table, what would the NPV be if the discount rate were 14% and initial CAPX were $110,000? \_\_\_\_\_\_\_\_\_\_\_\_

6. **Accounting for straight-line depreciation.** Change the depreciation method to straight line. Assume a 10-year life. Recall that straight line would be the same each year: (initial book value-salvage value)/life. Estimate salvage value as being equal to the resale value.

Q10: What is the NPV of the project with straight-line depreciation (under all other initial assumptions in #1)? \_\_\_\_\_\_\_\_\_\_\_\_\_

7. **Creating a switch with data validation.** You can make it easy to switch back and forth between straight-line and MACRS with a switch. Put the switch in a new row in the assumptions area (e.g. line 9). In the first cell (e.g. A9), put the label “Depreciation method”. Then in the next cell (e.g. B9) you’d enter “MACRS” or “Straight-line” depending on the desired method. But to make entering theses choice easier, we’ll use data validation. Click on B9, then go to DATA | DATA VALIDATION. Under “Settings”, choose to allow “List” and check the box for “In-cell dropdown”. Then under “Source” highlight two cells somewhere inconspicuous (I put them at the bottom of the MACRS table) where you can enter the two possible inputs: MACRS and Straight-line. Once you have done this, cell B9 will offer a drop-down box in which you can choose between the two depreciation methods.

In addition to making data entry easier, data validation ensures that the next part of the switch works properly. On row 17, where you have Depreciation, you must enter an IF function in each cell. IF functions look like this =IF(condition to check, formula if condition is true, formula if condition is false). So you enter three arguments in each IF function. In this case it would be something like =IF($B9=“MACRS”, enter MACRS formula here, enter straight-line formula here). If you enter this correctly and lock in the right cells, you only have to enter one formula, which you can then copy all the way across the row.

1. In other versions of Excel it is under Data | Table. [↑](#footnote-ref-1)