Note-Spreadsheets

- **Future Value (FV):** FV is the value of an investment at a specified date in the future, calculated using the formula =FV(rate, nper, pmt, pv).
- **Net Present Value (NPV):** NPV is the difference between the present value of cash inflows and outflows over a period of time, calculated using =NPV(rate, values) + initial_investment.
- **Present Value (PV):** PV is the current worth of a future sum of money or stream of cash flows, calculated using the formula =PV(rate, nper, pmt, fv).
- **Financial Calculator (HP10BII):** A financial calculator designed to perform financial calculations, requiring specific input formats such as percentages for interest rates.
- **Internal Rate of Return (IRR):** IRR is the discount rate that makes the net present value of all cash flows from a particular project equal to zero, calculated using =IRR(values).

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CORE FINANCE SPREADSHEETS

This note is some basic information that should help you get started and do most calculations if you have access to spreadsheets. You could also use a regular calculator and formulae and do the calculations, but it will take a much longer time. A compromise solution is a financial calculator, which can do most stuff. But I strongly encourage you to start using spreadsheets right away, and use a financial calculator only if you have to.

This note is primarily some brief hints on spreadsheets; you are responsible for starting here and learning as much as you need to. Since financial calculators have different models, I will just talk about some aspects of the simplest one HP10BII. Again, you are responsible for learning how to use a calculator if you do not have access to a spreadsheet.

SPREADSHEETS

Important Stuff:

1. **Make sure there are at least two decimals allowed in each cell. Otherwise rounding off may create problems in a multi-step problem.**
2. **Always enter the interest rate values in decimals because that is what a spreadsheet/excel wants. So, if the interest rate is 10%, enter 0.10.**
3. **Make sure you get comfortable with the financial functions as early as possible.**

Future Value (FV), Single Cash flow today

In a cell type in =FV(to bring up the formula.

To complete the calculation you will need to have the following information:

Rate- This is the discount rate you are using. It is also called the interest rate, cost of capital, etc. These are always reported annually. It is important to use the rate **per period** according to the periodicity of your problem. For example if your annual discount rate is 10%, and the periods are measured in years, the rate to be entered is 0.10. If compounding is monthly, however, you will enter.10/12 for the rate

Nper- This is the number of periods. This matches the periodicity of your problem. So if you have entered an annual interest rate because your periods are each one year long, then enter the number of years. But if compounding is monthly, and therefore you are using the monthly interest rate, the number of periods will be 12 times the number of years

Pmt- Enter 0 if you are doing the FV of a single cash flow

Pv- Enter the value today whose FV you are calculating

Type- NOT REQUIRED This indicates whether the payment is due at the beginning of the period (type 1) or the end of the period (type 0). Type 0 is the default assumption and no entry is required when this is the case.

Example- What is the FV of $100, 10 years from now, if the annual interest rate is 10%. You would enter =FV(.10,10,0,100) and get an answer of -$259.37. Suppose compounding is monthly (this will be obvious in real life; for example if you make monthly payments on a loan, you can assume that compounding is monthly). Then you will enter =FV(.10/12,120,0,100) to get -$270.70. (As you will learn, this is a higher number because of compounding).Note that excel returns a negative number if you enter a positive number, and vice versa. It is because even a calculator knows that you cannot get something for nothing! You know whose point of view you are taking, and can correct this by placing a negative sign either at the beginning of the equation or before the payment amount if it is an outflow for you.

Future Value (FV), Annuity

In a cell type in =FV(to bring up the formula.

To complete the calculation you will need to have the following information:

Rate- See above

Nper- See above

Pmt- This is the amount of each payment in case of an annuity.

Pv- 0

Type- NOT REQUIRED This indicates whether the payment is due at the beginning of the period (type 1) or the end of the period (type 0). Type 0 is the default assumption and no entry is required when this is the case.

Example- Suppose you have a 10-year annuity that pays $120 per year and you have an annual discount rate of 8%. To calculate in excel you would enter =FV(.08,10,120) and get an answer of $1,738.39. This means that the total value of all your annuity payments is $1738.39 in year 10 dollars. Now let's say that you have the same 10-year annuity, but you receive month payments of $10, instead of annual payments of $120. To calculate in excel, enter =FV(.08/12,120,10). Note that the FV is now $1,829.46.

Present Value (PV), Single cash flow

In a cell type in =PV(to bring up the formula

To complete the calculation you will need to have the following information:

Rate- See above

Nper- See above

Pmt- 0

Fv- Amount of money in the future whose PV you are calculating

Type- NOT REQUIRED This indicates whether the payment is due at the beginning of the period (type 1) or the end of the period (type 0). Type 0 is the default assumption and no entry is required.

Example- What is the PV of $1,000 received 10 years from now if the interest rate is 5%. To calculate in excel you would enter =PV(.05,10,0,1000) and get an answer of $613.91. This means that the value of the $1,000 is $613.91 in today's dollars. Now let's say that you have monthly compounding, you will enter =PV(.05/12,120,0,1000). Note that the PV is now $607.16.

Present Value (PV), Annuity

In a cell type in =PV(to bring up the formula

To complete the calculation you will need to have the following information:

Rate- See above

Nper- See above

Pmt- Enter the amount of the annuity (if the amount changes every year, use NPV function; see below)

Fv- Not required

Type- NOT REQUIRED This indicates whether the payment is due at the beginning of the period (type 1) or the end of the period (type 0). Type 0 is the default assumption and no entry is required.

Example- You have a 10-year annuity that pays $120 per year and you have an annual discount rate of 8%. To calculate in excel you would enter =PV(.08,10,120) and get an answer of $805.21. Now let's say that you have the same 10 year annuity, but you receive month payments of $10, instead of annual payments of $120. To calculate in excel, enter =PV(.08/12,120,10). Note that the PV is now $824.21.

Payment (Pmt) Corresponding to a Single Cash Flow, Now or in the Future

In a cell type in =PMT(to bring up the formula

To complete the calculation you will need to have the following information:

Rate- See above

Nper- See above

Pv- This is present value of the loan or project, if that is what you know (then Fv will be zero)

Fv- 0 if you have entered the Pv above, otherwise the value in the future for which you need to calculate PMT

Example 1: You are offered a loan of $10,000 at an annual interest rate of 5% over 10 years. To calculate your payment type =PMT(.05,10,10000) and you should get an answer of $1,295.05. This means that you would have 10 equal payments of $1,295.05 each year in order to repay the loan in full.

Example 2: You want to know how much to save each year for the next 5 years to have $5,000 to buy a car, if the interest rate is 6.5%. You will type in =PMT(.065,5,0,5000) and get $878.17.

Net Present Value (NPV)

In a cell type in =NPV(to bring up the formula

To complete the calculation you will need to have the following information:

Rate- See above

Values- This is a list of all of the future cash flows

Initial Investment- This is the value of the inflow or outflow at time zero (now). This amount is added back in after taking the discounted PV of all future cash flows. DO NOT include the initial investment into the values because excel will incorrectly apply the discount rate.

Example: Let's say you have an investment opportunity where you can invest $100 now with expected future annual cash flows of $10, $25, $40, and $50 in years 1-4. Your cost of capital (discount rate) is 10%. You would enter your formula as =NPV(.1,10,25,40,50)100. The initial investment is subtracted because it is a negative cash flow.The NPV for this opportunity is then -$6.04 and is a poor investment. A better way to do this because it allows you change stuff, you can enter each cash flow in a horizontal series of cells and reference those cells in your formula. Enter -100, 10, 25, 40, 50 in cells A1:A5, for example, then enter your formula as =NPV(.1,A2:A5)+A1. You should get the same answer. This method is preferred because you first need to calculate cash flows in many situations and then you can replace A2:A5 and A1 by the cells in which the cash flows reside.

Internal Rate of Return (IRR)

In a cell type in =IRR(to bring up the formula

To complete the calculation you will need to have the following information:

Values- This is a list of all of the cash flows including the initial inflow or outflow. The list of values must include at least one positive and one negative value.

Example: Let's use the same example from the NPV section. You can invest $100 now with expected future annual cash flows of $10, $25, $40, and $50 in years 1-4. Enter -100, 10, 25, 40, 50 in cells A1:A5. Enter your formula as =IRR(A1:A5). You should get an answer of 7.71%. Similarly, you can indicate the cash flows regardless of which row in which they have been entered.

FINANCIAL CALCULATORS (HP10BII AS AN EXAMPLE)

Important Stuff

1. **Make sure there are at least two decimals, ideally more. Otherwise rounding off may create problems in a multi-step problem. (See item (3) below.)**
2. **Always enter the interest rate values in percentage form, not decimals. So, if the interest rate is 10%, enter 10. This is different from spreadsheets.**
3. **Make sure you understand how to access all functions, especially the yellow ones. Press the yellow key just above the C key to access the yellow function you want. For example, it is good to CLEAR your calculator's memory after you do a calculation. So, press yellow key followed by CALL (in yellow). Similarly, press the yellow key then DISP in yellow and then 8; that will give you 8 decimals.**
4. **Make sure you get comfortable with the financial functions as early as possible. (Some are in yellow.)**

PV, FV, N: These functions are obvious, where N is the number of periods.

I/YR: The interest rate function is a bit complicated. First, as indicated above, you enter the number in % form. But the calculator unfortunately assumes that every problem has annual periods with monthly compounding. To fix this, enter 1, followed by yellow key, followed by P/YR (in yellow). Now you can enter the interest rate that matches your problem's periodicity and the corresponding N. So if you have 10 years with annual compounding and an annual interest of 12% you will enter **I/YR** as 12 and N as 10.If compounding is monthly, you will enter 1 as **I/YR** and 120 for N.

NPV and IRR: With changing cash flows you need to use the CF_j function. Suppose you want to calculate the NPV and IRR of the same problem we did earlier: -100, 10, 25, 40, 50. You will enter -100 followed by CF_j, then 10 followed by CF_j,…and finally yellow key followed by IRR (it is in yellow) to get 7.71%, and then yellow key followed by NPV to get -$6.04!