EXPLORATIONS

CHAPTER 13

When using the TI-83 Plus or TI-84 Plus calculators you access ***Finance*** by pressing the APPS key.

Net Present Value and Internal Rate of Return

Cash flow is money paid out or received by a firm as a result of undertaking a project.

Net cash flow is the project cash inflows minus the project cash outflows.

Present Value of a cash flow is its worth in today's dollars. Present value incorporates the time-value principle by discounting future dollars using an appropriate discount rate.

Net Present Value

One method of comparing alternative investments is to compare their net present value (NPV). This method discounts cash flow to their present value, making possible a comparison of alternatives. The guidelines for the NPV Method are:

1. In an accept-reject decision, if the NPV is positive, the investment should be made.
2. In comparing mutually exclusive investment alternatives, determine which investment has the highest NPV and reject the others. If the highest NPV is positive, accept it. Be indifferent if the NPV is zero, and reject the investment if the NPV is negative.

Example 1:
Find the net present value of buying an industrial mixer which costs $3,500, with an expected life of five years. It will increase net cash flow by an estimated $1,000 in each of the next five years. The interest rate is 10%.

The syntax for net present value is **npv**(interest rate, initial cash flow at time 0, list of cash flow amounts after the initial cash flow, list of the frequency of each of the cash flow amounts).

1. Press 2nd [FINANCE] *(5A)*†. From the CALC menu, choose **7:npv(**. (Figure 1)

   This will paste the **npv(** command on the Home Screen.

(Figure 1)

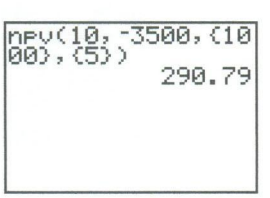
2. For this problem, enter **npv(10, -3500, {1000}, {5})**.

   Note that the first list denoting the cash flow, {1000}, contains a single entry. The second list, representing frequencies, indicates that the cash flow has a frequency of 5.

3. Press ENTER to calculate the NPV. (Figure 2)

   Since the NPV is positive, 290.79, the industrial mixer should be purchased.

(Figure 2)

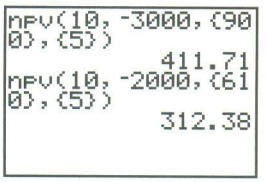


† **Refer to the section on Key Arrangement in Chapter 1 for an explanation of the key locator codes used in this manual.**

Example 2:
Model A mixer costs $3,000 and will increase cash flow by $900 a year for five years while Model B costs $2,000 and will increase cash flow by $610 a year for the five years. Which mixer has the better NPV? Assume a cost of capital of 10%.

Follow steps 1, 2, and 3 in the previous example to find the NPV for each model.

(Figure 3)



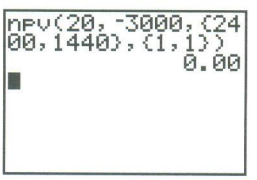
Since the NPV for Model A is higher ($412 vs. $312), the company should purchase Model A. (Figure 3)

Internal Rate of Return

The internal rate of return (IRR) is the rate we expect to earn on an investment project. The internal rate of return calculation for a project determines the rate at which a project's cash flows have a net present value of zero. The IRR is that rate which discounts a project's cash flow to an NPV of zero.

Example 3:
Suppose a company buys a mixer for $3,000. This generates $2,400 in the first year and $1,440 in the second year. What is the net present value, given that the rate is 20%?

(Figure 4)



1. Press 2nd [FINANCE] *(5A)* and choose **7:npv(** from the CALC menu.
2. Enter values as shown and press ENTER. (Figure 4)

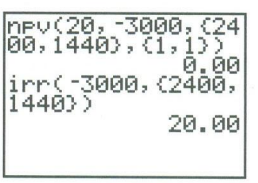
Notice that the NPV for this example is zero. Since the NPV is zero, by definition the rate used in the calculation, 20%, must be the IRR. To verify this, calculate the IRR.

3. Press 2nd [FINANCE] *(5A)* and choose **8:irr(** from the CALC menu.

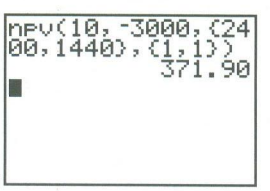
   The syntax for **irr** is
   irr(initial cashflow, cashflow list[, cashflow frequency list]).
4. For this problem, enter **irr(-3000, {2400, 1440})** and press ENTER.

   The IRR is 20% as expected. (Figure 5)
5. Using 10% as the cost of capital, the NPV of this project is $372. (Figure 6)

(Figure 5)



(Figure 6)



Lease or Borrow

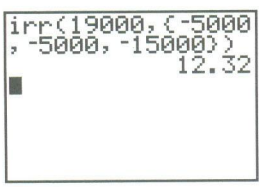
Example 4:
Carlos is trying to decide between leasing a car or borrowing the money to buy the car. To lease a $20,000 car, Carlos must pay $1,000 down and $5,000 for three years. At the end of three years, he must pay an additional $10,000 buy-out. He can borrow $20,000 at 12% for three years. Is it better to lease or to borrow?

Cash flows — Leasing a car

$20,000			
-1000	-5000	-5000	-5000
			-10000

Because there is a down payment of $1,000, a comparison of the two choices uses $19,000 for the initial cash flow. The three cash outflows are -5,000, -5,000, and -15,000. The third payment combines the $5,000 outflow with the $10,000 buy out.

(Figure 7)

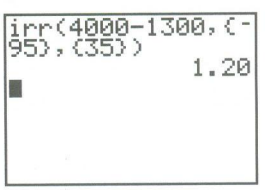


1. Select **irr(** from the CALC menu of the 2nd [FINANCE] key *(5A)*.
2. Enter the values shown and press ENTER. (Figure 7)

   Notice the internal rate of return is 12.32%. Carlos should borrow the money at 12% interest, if his only concern is interest rates.

Example 5:
Jones and Jones Company has two options regarding the acquisition of a $4,000 copier: borrow $4,000 at 1% monthly or lease the copier for $1,300 down and $95 a month for 35 months. Which is the better decision?

(Figure 8)



1. Use **irr(** as shown above. Take the $4,000 and subtract the $1,300 down payment from it for the initial cash flow. Enter -95 as the cash outflow for 35 months.
2. Press ENTER to calculate the IRR. (Figure 8)

   The internal rate of return is 1.2%, which is much higher than 1% per month.

   Note that the total payments under the lease would have been $4,625 while payments for the loan would have been $4,787.86.