HP 12c Platinum Financial Calculator - Net Present Value

Cash flow and NPV calculations

Cash flow analysis is an extension of the basic TVM concepts applied to compound interest problems when payments occur in regular periods and do not have the same value. Any financial investment can be represented as an initial investment of money and a series of cash flows that occur in regular periods of time. Each flow of money can be positive (received) or negative (paid out) and considered as a cash flow. Common cash flow problems usually involve the calculation of the Internal Rate of Return (IRR) or the Net Present Value (NPV).

The NPV expresses the amount of money resulting from the summation of the initial investment (CF_0) and the present value of each anticipated cash flow (CF_j) calculated to the time of the initial investment. The IRR is the discounted rate applied to all future cash flows that cause NPV = 0.

The expression that calculates the Net Present Value is:

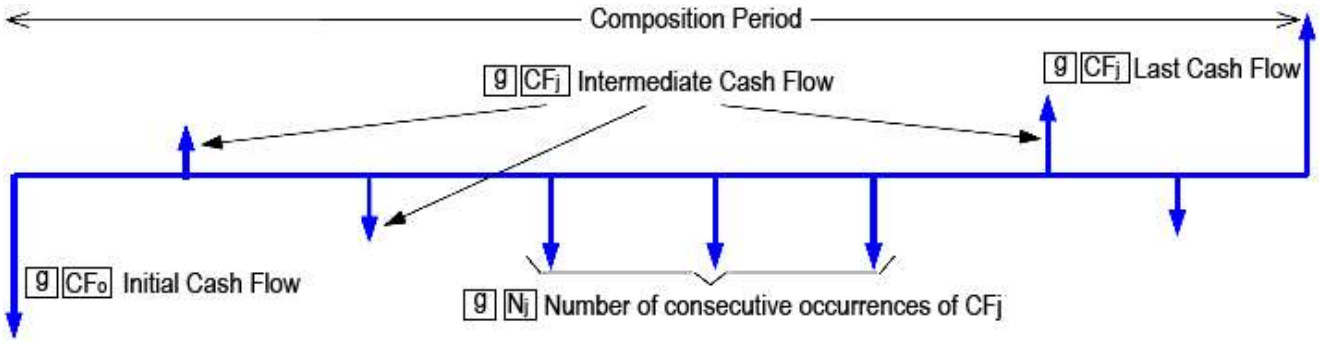
Figure : Expression for calculating the Net Present Value

$$NPV = CF_0 + \frac{CF_1}{(1+i)^1} + \frac{CF_2}{(1+i)^2} + \Lambda + \frac{CF_j}{(1+i)^j}$$

Cash flow diagrams

The cash flow diagram in Figure 2 illustrates one of the many possible situations that can be handled by the HP 12c Platinum.

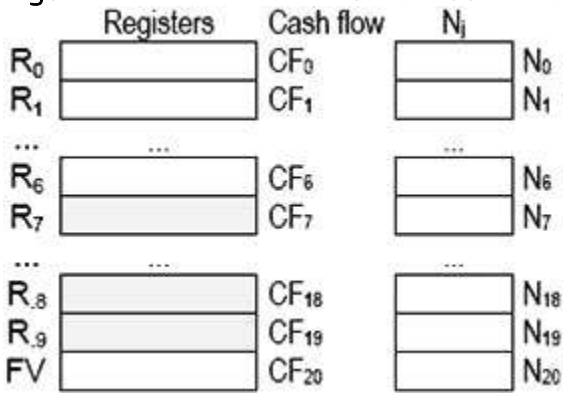
Figure : Cash flow diagram



The HP 12c Platinum cash flow approach

In the HP 12c Platinum each cash flow amount is stored in its corresponding register in memory. For each cash flow amount there is a related register to store the number of consecutive occurrences of this amount. This approach is shown below:

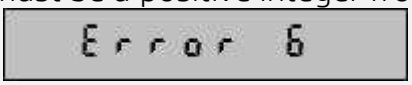
Figure : Different cash flow amounts can be stored in its corresponding register



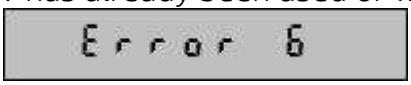
The HP 12c Platinum memory organization allows up to 20 different cash flow amounts plus the initial investment to be stored and handled according to the diagram in Figure 2. If any cash flow amount repeats consecutively, then it can be stored as a grouped cash flow CF_j and its corresponding N_j holds the number of occurrences, up to 99. TVM register n is used as an index to control CF operations.

The keys to enter cash flow data are:

Keystroke	Description
g CFo	Stores the number in the display in R_0 and sets 'n' to zero.
g CFj	Adds 1 unit to current 'n' contents (j) and then stores the number in the display in R_j.
g Nj	Stores the number in the display in N_j; 'n' contents (j) are not changed.

NOTE:
The number in the display must be a positive integer from 1 to 99, otherwise g Nj returns 

to the display and no operation is performed.

If the last available register has already been used, g CFj adds 1 unit to current 'n' contents and stores the number in the display in TVM register FV. Any attempt to add a cash flow amount with g CFj after FV has already been used or when 'n' contents refer to a register that is not available causes 

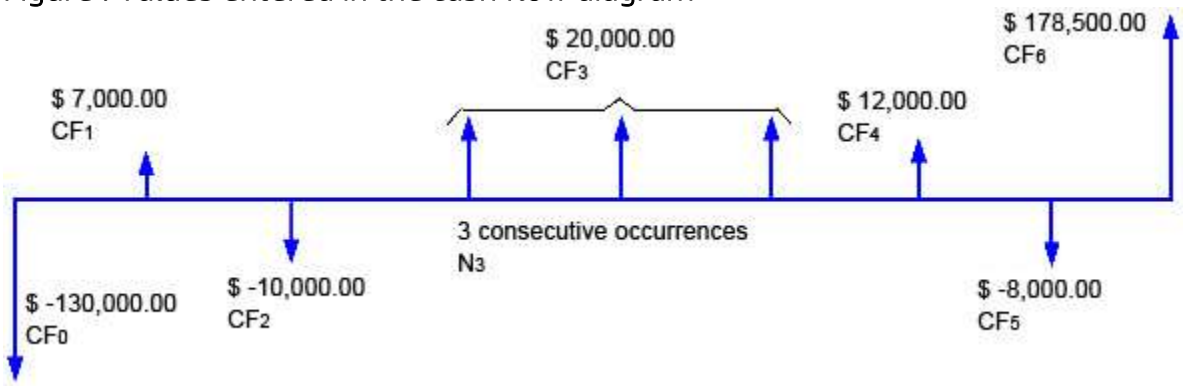
to be shown in the display and no operation is performed.

Practice solving NPV problems

Example 1

The cash flow diagram below represents a possible investment and you were chosen to determine if it is feasible. The success of this investment dictates your future in the company, so the analysis must be precise and error free. What is the correct keystroke sequence to fill the HP 12c Platinum registers with this data?

Figure : Values entered in the cash flow diagram



Solution

It is not necessary to clear all registers to start cash flow analysis because only the registers updated with cash flow data are used.

Keystroke	Display
1 3 0 0 0 0 CHS g CFo 7 0 0 0 g CFj 1 0 0 0 0 CHS g CFj	Figure : Entering the first set of values - 10,000.00

The next cash flow amount occurs three times in a sequence, so it can be entered as a grouped cash flow.

Keystroke	Display
2 0 0 0 0 g CFj 3 g Nj	Figure : Entering the next set of values 3.00

The remaining data is entered with the following keystroke sequence:

Keystroke	Display
12000 g CFj 8000 CHS g CFj 178500 g CFj	Figure : Entering the remaining set of values 

Answer

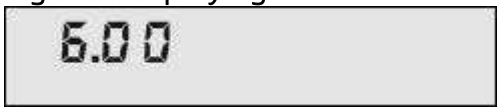
The keystrokes presented above indicate the correct entries.

Example 2

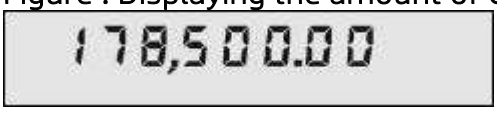
The cash flow diagram has all of its information used to compose the cash flow data in the HP 12c Platinum memory. How can the entries be checked to ensure they are correct?

Solution

Now that all data is entered, checking for its correctness is possible in two ways. The alternative way is the random check through the use of the RCL key. The procedure for this checking is as follows:

Keystroke	Display
RCL n	Figure : Displaying the number of the last register 

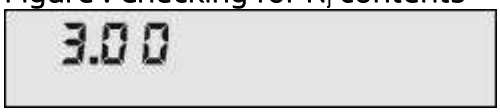
This is the number of the last register used to store the cash flow data.

Keystroke	Display
RCL 6	Figure : Displaying the amount of CF_6 

This is the amount of CF_6. Now check CF_3 and verify N_3 as well.

Keystroke	Display
RCL 3	Figure : Checking the CF_3 value 

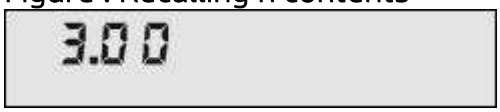
This is CF_3 contents. To randomly check for N_j contents, n register contents must be set to indicate which N_j will be recalled.

Keystroke	Display
3 n RCL g Ni	Figure : Checking for N_j contents 

Now check CF_2 and CF_0.

Keystroke	Display
RCL 2	Figure : Checking the contents of CF_2 
RCL 0	Figure : Checking the contents of CF_0 

Recall 'n' contents to the display:

Keystroke	Display
RCL n	Figure : Recalling n contents 

Answer

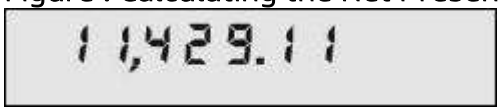
The entries are correct.

Example 3

The investment is considered attractive if the calculated net present value is positive for a given interest rate. Now that all data is stored and checked, calculate the NPV for a given interest rate of 8%.

Solution

If n had its contents changed, it must be restored prior to calculating either IRR or NPV:

Keystroke	Display
6 n f NPV	Figure : Calculating the Net Present Value 

Answer

Yes, the investment is attractive based on a net present value of $11,429.11 for an interest rate of 8%.

How to modify cash flow entries

If it happens that a cash flow entry was wrongly entered, modifying its amount is not difficult. There are two ways to correct entries.

Example 4

Update the amount of CF_2 to $-9,500.00 and compute the new NPV after this change.

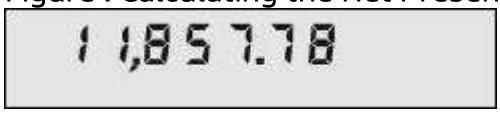
Solution 1

Type in the correct amount and store it in R_2:

Keystroke	Display
9 5 0 0 CHS STO 2 f NPV	Figure : Storing the amount in R_2 

Solution 2

Set n register to (j-1), type in the correct amount, press g CFj, then restore n prior to compute NPV:

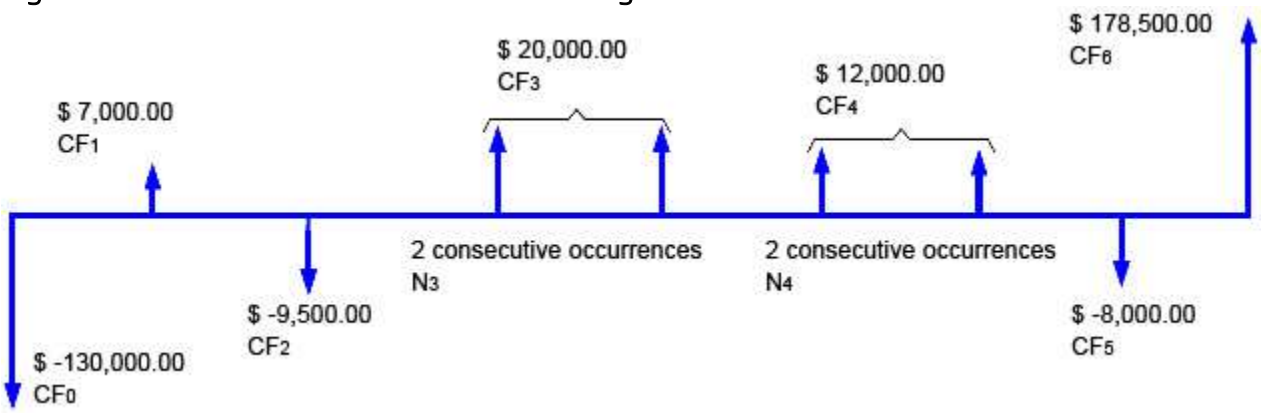
Keystroke	Display
1 n 9 5 0 0 CHS g CFj 6 n f NPV	Figure : Calculating the Net Present Value 

To modify a wrongly entered N_j, it is necessary to change the value stored in register n.

Example 5

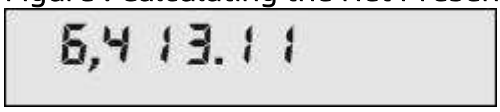
Now change both N_3 and N_4 to 2 and calculate NPV again. The cash flow diagram now looks like this:

Figure : Values entered in the cash flow diagram



Solution

For each correction, set n to match j, type in the correct N_j and press [g] [N_j]. After all corrections, set n to its original value and press [f] [NPV].

Keystroke	Display
[3] [n] [2] [g] [N_j] [4] [n] [2] [g] [N_j] [6] [n] [f] [NPV]	Figure : Calculating the Net Present Value 

Answer

The newly computed NPV is $ 6,413.11.