



hp calculators

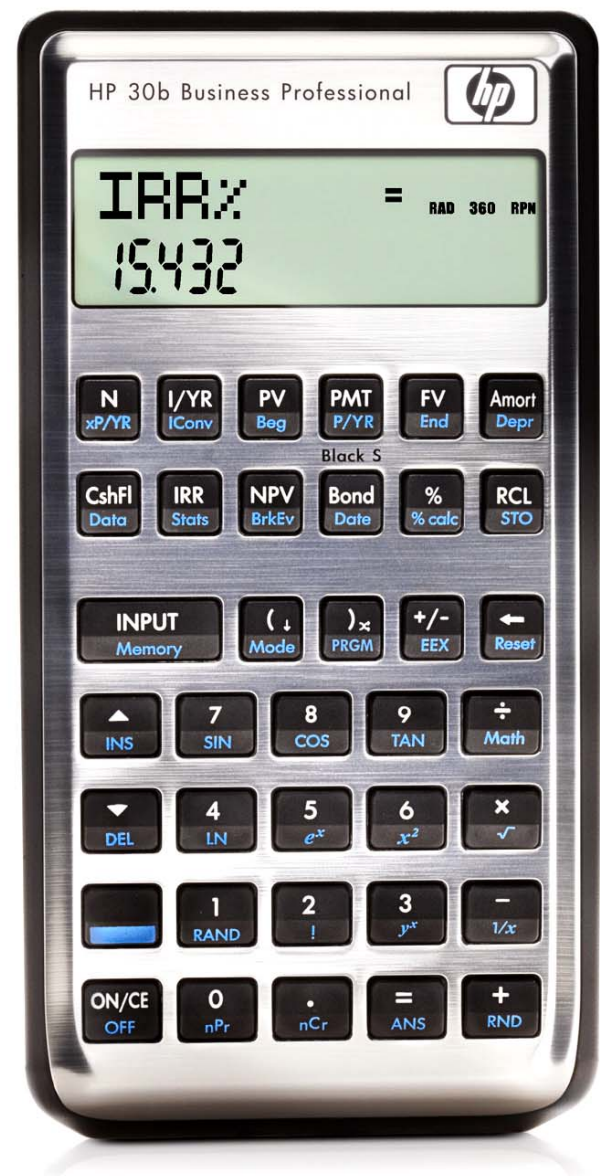
HP 30b Financial Management Rate of Return

Discounted cash flow analysis

Financial Management Rate of Return

FMRR on the HP 30b

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Discounted cash flow analysis

There are times when a financial problem has either irregular or unequal payments. Since the time value of money application is not designed for these situations, the HP 30b contains functions that solve these types of problems, commonly referred to as discounted cash flow (DCF) analysis.

As usually presented, DCF problems have an initial negative cash flow followed by several positive cash flows. This might occur when a company is evaluating the purchase of a new machine. There would be an initial cash outlay to pay for the machine and then (hopefully) several periods of positive cash inflow as the result of the acquisition. Cash outflows are considered negative while inflows are considered positive.

DCF problems routinely occur within financial applications such as capital budgeting, but the functionality built into the HP 30b calculator is more flexible, allowing for the more general analysis of uneven and irregular payment situations.

Financial Management Rate of Return


DCF problems are often analyzed using the Internal Rate of Return, Modified Internal Rate of Return and Net Present Value. The Financial Management Rate of Return (FMRR) is another measure of the return generated by an investment. Both the FMRR and the MIRR address problems underlying the IRR as an evaluative technique when there are sign changes in the cash flows generated by an investment.

The MIRR discounts negative cash flows back to the starting date. This modifies the approach taken by the IRR by evaluating the n th root of the future value of all positive cash flows at the investment rate expressed as a negative number divided by the present value of all negative cash flows at a safe rate minus 1, where the n th root is the number of cash flows present in the problem after the original cash flow, if any.

The FMRR takes a slightly different approach from the MIRR. The FMRR discounts negative cash flows only back to the closest previous positive cash flow rather than all the way to the starting date. For example, if the cash flows were an initial -\$5,000 followed by \$10,000 then -\$4,000 and then \$20,000, the FMRR technique would discount the negative \$4,000 cash flow back to the previous, closest positive cash flow, in this case, the \$10,000 cash flow. This in effect removes negative cash flows from the analysis. The MIRR, on the other hand, would discount the negative \$4,000 cash flow all the way back to the original investment time horizon.

Note: The FMRR uses a repetitive approach to this discounting – if the addition of the discounted negative cash flow causes the previous positive cash flow to now be negative, this newly negative cash flow will be discounted back to the next previous positive cash flow, and so on. If there are no previous positive cash flows remaining, the FMRR discounts the negative cash flow(s) back to the initial investment time frame and adds this discounted amount to the initial investment. It then computes the IRR on these adjusted values.

FMRR on the HP 30b

On the HP 30b, FMRR problems are set up by entering the problem's cash flows into the Cash Flow environment using the  key. When pressed, the keys shown in the table below allow you to enter, edit and view cash flows. In the HP30b, a cash flow list is a set of numbered pairs, $CF(n)$ and $\#CF(n)$, where n refers to the position in the cash flow list, beginning with cash flow 0. $CF(n)$ represents the monetary value of the cash flow; $\#CF(n)$ is the number of consecutive occurrences of that cash flow. By default, $\#CF(n)$ is equal to 1, as most cash flows occur only once. However, in cases where a cash flow is repeated multiple times, using $\#CF(n)$ instead of entering the cash flow value multiple times saves calculation time and memory space in the calculator as well as keystrokes.

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To enter a cash flow list, press **CshFl** to open the cash flow menu. For each cash flow item, enter the cash flow followed by **INPUT**; then enter the number of times the cash flow occurs followed by **INPUT**. If a cash flow occurs once, you do not need to type **1** **INPUT**; you can simply press **INPUT**, as 1 is the default. So, to quickly enter cash flows that occur one time, press **INPUT** **INPUT** between them.

Cash Flow Keys

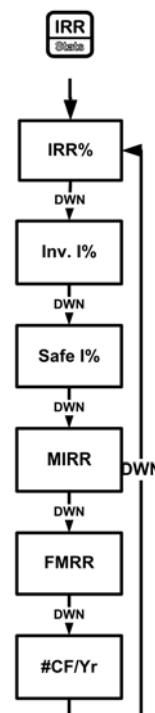
Key	Description
CshFl	Opens the cash flow list.
INPUT	Inputs (saves) entered values to variables in the cash flow list.
▲ ▼	Scrolls up and down.
INS	Inserts cash flows into a cash flow list.
DEL	Removes the displayed cash flow from a cash flow list.
IRR	Opens internal rate of return (IRR) menu containing the FMRR calculation.

Once the cash flows have been entered, press to display the internal rate of return. Pressing **IRR** opens the IRR menu containing the items shown in the table and menu maps below. Note that it is possible to specify the number of cash flows per year. Usually, it will be sufficient to leave this at the default for the value of one for the number of cash flows per year, implying annual cash flows. However, in some circumstances, a problem might be encountered that requires cash flows with a different frequency, such as monthly, quarterly, etc. In these circumstances, pressing **▼** will display the menu item #CF/Yr. Key in the new value, 12 for monthly for example, and press **INPUT**. Then press **▼** to scroll through the IRR% menu items to see the automatically updated values. The menu map for the IRR menu is shown below along with a table describing each of the menu items.

IRR Menu Items

Item	Description
<i>IRR%</i>	Internal rate of return. This is the discount rate for the cash flow that returns a Net Present Value of 0.
<i>Inv. I%</i>	The investment rate for MIRR and FMRR problems.
<i>Safe I%</i>	The safe rate for MIRR and FMRR problems.
<i>MIRR</i>	Modified internal rate of return.
<i>FMRR</i>	Financial management rate of return.
<i>#CF/Yr</i>	The number of cash flows per year. The default is 1. Enter a value and press INPUT to change.

To reset a cash flow list to its default values, with any cash flow displayed, press **Reset**. The number of cash flows in the list is displayed on the bottom line, along with *Cash Flow=*. At this prompt, press **INPUT**. You will be asked to confirm your choice. Either press **INPUT** to confirm



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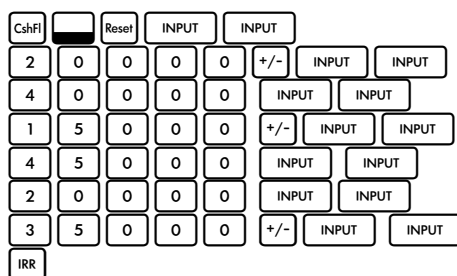
and **ON/CE** to return to the cash flow list, or press **ON/CE** to cancel. Pressing **ON/CE** once again after you cancel the reset command also returns you to the cash flow list.

Note that if you press **IRR** before you have entered any cash flows, the HP 30b will automatically open up the **CshFl** cash flow menu so that you can enter them for a problem.

Practice solving FMRR problems

Example 1: A company is considering replacing a machine. It will require an initial cash outlay of \$20,000 and then is expected to generate cash flows the next 5 years of \$40,000, \$-15,000, \$45,000, \$20,000 and \$-35,000. If the cost of funds for the company is estimated at 8%, compute the IRR and compare it to the cost of funds. Should the machine be replaced?

Solution:



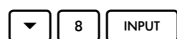
IRR% =
115.52

Figure 1

Answer: 115.52%. Since this is larger than the cost of funds, the IRR suggests the machine should be replaced. However, the cash flow sign changes that occur suggest IRR may not be the best method to evaluate this decision.

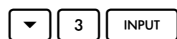
Example 2: What is the MIRR for the problem in example 1? Assume an investment rate of 8% and a safe rate of 3%. Also assume that this example is worked immediately after example 1.

Solution:



Inv. I% =
8.00

Figure 2



Safe I% =
3.00

Figure 3



MIRR% =
14.84

Figure 4

Answer: 14.84%. Replacing the machine still generates a 14.84% return even after assuming a lower rate of return on the reinvested cash flows.

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Example 3: What is the FMRR for the problem in examples 1 and 2? Assume an investment rate of 8% and a safe rate of 3%. Also assume that this example is worked immediately after example 2.


Solution: 



Figure 5

Answer: 28.93%. The FMRR indicates a higher rate of return than the MIRR. This is due to the different handling of negative cash flows.

Example 4: A company is considering replacing a machine. It will require an initial cash outlay of \$20,000 and then is expected to generate cash flows the next 3 years of \$10,000, \$15,000 and \$20,000. If the cost of funds for the company is estimated at 10%, compute the IRR and compare it to the cost of funds. Should the machine be replaced?

Solution:

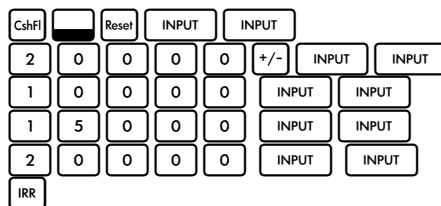



Figure 6

Answer: 47.15%. Since this is larger than the cost of funds, the IRR suggests the machine should be replaced.

Example 5: What is the FMRR for the problem in Example 4? Assume a safe rate of 4% and an investment rate of 8%. Also assume that Example 4 has just been completed.

Solution:  8 INPUT



Figure 7


 4 INPUT



Figure 8



Figure 9

Answer: 33.76%. Note that the FMRR and MIRR are equal since there are no negative cash flows.