



## hp calculators

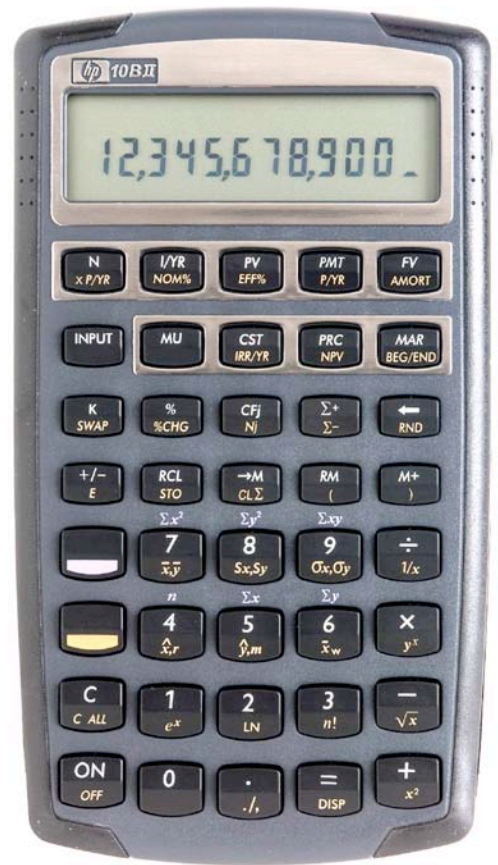
HP 10BII Discounted cash flow – Internal Rate of Return

The time value of money application

Discounted cash flow analysis

Internal Rate of Return

Practice solving Internal Rate of Return problems



### The time value of money application

The time value of money application built into the HP 10BII is used to solve compound interest problems and annuities that involve regular, uniform payments. Compound interest problems require the input of 3 of these 4 values:

$\boxed{N}$   $\boxed{I/YR}$   $\boxed{PV}$   $\boxed{FV}$ . Annuity problems require the input of 4 of these 5 values:  $\boxed{N}$   $\boxed{I/YR}$   $\boxed{PV}$   $\boxed{PMT}$   $\boxed{FV}$ . Once these values have been entered in any order, the unknown value can be computed by pressing the key for the unknown value.

The time value of money application operates on the convention that money invested is considered positive and money withdrawn is considered negative. An analysis of the monetary situation should indicate which values are being invested and which values are being withdrawn. This will determine which are entered as positive values and which are entered as negative values.

Interest rates are always entered as the number is written in front of the percent sign, i.e., 5% is entered as a 5 rather than as 0.05.

### 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 10BII 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 10BII calculator is more flexible, allowing for the more general analysis of uneven and irregular payment situations.

### Internal Rate of Return

The Internal Rate of Return (IRR) is defined as the interest rate that makes the present value of all future cash flows equal to the initial cash flow. By definition, this will be where the Net Present Value (NPV) is equal to zero. The IRR is computed so that it can be compared to a target or hurdle return. This rate to which it is compared is usually either the company's cost of funds or a required rate of return.

On the HP 10BII, DCF problems involving IRR are solved using the  $\boxed{CFj}$ ,  $\boxed{I/YR}$ , and the yellow-shifted  $\boxed{\text{■}} \boxed{Nj}$  and  $\boxed{\text{■}} \boxed{IRR/YR}$  functions. The initial cash flow is keyed (and changed to a negative number if appropriate) and entered using the  $\boxed{CFj}$  key. Then the next cash flow is entered using the  $\boxed{CFj}$  key. This process continues until all cash flows have been entered. If any of the cash flows occur more than one time in a row (three consecutive periods where the cash flows are all \$5,000, for example), then immediately after the cash flow is entered using the  $\boxed{CFj}$  key, enter the number of times the cash flow's value is repeated and press the  $\boxed{\text{■}} \boxed{Nj}$  key.

The first time the  $\boxed{CFj}$  key is pressed, the HP 10BII enters its cash flow mode and displays C-FLOW at the top of the display. Below this C-FLOW display are two symbols: CF and N. CF indicates that a cash flow was just entered while N indicates the frequency of a cash flow was entered using  $\boxed{\text{■}} \boxed{Nj}$  key. Each time the  $\boxed{CFj}$  key is pressed, the HP 10BII display will briefly display a number corresponding to the number of cash flow groups entered so far.

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The number of periods per year should be set to the appropriate value using the key (annual = 1, monthly = 12, etc).

**Practice solving Internal Rate of Return 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 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:

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

Example 2: A company is considering introducing a new product. It will require an initial cash outlay of \$1,250,000 and the company expects to get cash flows the next 6 years of -\$300,000, \$200,000, \$450,000, \$700,000, \$300,000 and \$20,000. If the company’s cost of funds is estimated at 12%, compute the IRR and compare it to the cost of funds? Should the company introduce the new product?

Solution:

Answer: 2.16%. Since this is less than the cost of funds, the company should not introduce the new product. Note that both of the first two cash flows were negative or cash outflows. Introducing a new product can often cause that situation.

Example 3: A company is considering expanding a product line, which will require an investment today of \$800,000. Future cash inflows are estimated to be \$190,000 a year for 6 years followed by \$90,000 a year for the 4 years thereafter. If the company’s cost of funds is 15%, compute the IRR and compare it to the cost of funds. Should the product line be expanded? As a check, enter the IRR as the cost of funds and compute the NPV. Verify that it is equal to zero.

Solution:

Answer: 16.13%. Since this is larger than the company’s cost of funds, the product line should be expanded. Also note that when the NPV is evaluated using the IRR as the cost of funds, the NPV is equal to zero (or very, very close to zero).