hp calculators

HP 10BII Discounted cash flow – Net Present Value

The time value of money application

Discounted cash flow analysis

Net Present Value

Practice solving Net Present Value problems

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The time value of money application operates on the convention that money invested is considered positive and money withdrawn is considered negative. An analysis of the monetary situation should indicate which values are being invested and which values are being withdrawn.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

Net Present Value

The Net Present Value (NPV) is defined as the present value of future cash inflows net of the initial cash outflow. If this result is positive, then this is the amount in today's dollars by which the inflows exceed the outflows – it will be the amount of incremental benefit for entering into the transaction. If this result is negative, then this is the amount by which the outflows exceed the inflows – it will be the amount of incremental cost for entering into the transaction.

The present value is found using an interest rate representing the cost of funds involved.

On the HP 10BII, DCF problems involving NPV are solved using the $\boxed{CFj}$, $\boxed{I/YR}$, and the yellow-shifted $\boxed{}$ $\boxed{Nj}$ and $\boxed{}$ $\boxed{NPV}$ 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 $\boxed{}$ $\boxed{Nj}$ 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 ⬛ [Nj] key. Each time the [CFj] key is pressed, the HP 10BII display will briefly display a number corresponding to the number of cash flow groups entered so far.

The cost of funds is entered using the [I/YR] key. The number of periods per year should be set to the appropriate value using the ⬛ [P/YR] key (annual = 1, monthly = 12, etc).

Practice solving Net Present Value 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%, what is the Net Present Value? Should the machine be replaced?

Solution: ⬛ [C ALL] [1] ⬛ [P/YR]
[2] [0] [0] [0] [0] [+/−] [CFj] [1] [0] [0] [0] [0] [0] [CFj] [1] [5] [0] [0] [0] [CFj] [2] [0] [0] [0] [0] [CFj]
[1] [0] [I/YR] ⬛ [NPV]

Answer: $16,513.90. If the company replaces the machine, they will be better off by $16,513.90.

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%, what is the Net Present Value? Should the company introduce the new product?

Solution: ⬛ [C ALL] [1] ⬛ [P/YR]
[1] [2] [5] [0] [0] [0] [0] [+/−] [CFj] [3] [0] [0] [0] [0] [0] [+/−] [CFj] [2] [0] [0] [0] [0] [0] [CFj]
[4] [5] [0] [0] [0] [0] [CFj] [7] [0] [0] [0] [0] [0] [CFj] [3] [0] [0] [0] [0] [0] [CFj]
[2] [0] [0] [0] [0] [CFj]
[1] [2] [I/YR] ⬛ [NPV]

Answer: -$412,893.92. No, the company should not introduce the new product, since they will be over $400,000 worse off if they do. 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: Find the present value of $200 three months from today, $400 four months from today, $200 a month from months 7 through 10, and $1000 twelve months from today. Assume interest is assessed at 8%, compounded monthly.

Solution: This example will illustrate how to use the DCF functions to solve non-annuity, irregular payment problems. The cash flows or payments for this example could be summarized as:

Month 0: $0	Month 5: $0	Month 10: $200
Month 1: $0	Month 6: $0	Month 11: $0
Month 2: $0	Month 7: $200	Month 12: $1000
Month 3: $200	Month 8: $200	
Month 4: $400	Month 9: $200	

⬛ [C ALL] [1] [2] ⬛ [P/YR]
[0] [CFj] [0] [CFj] [0] [CFj] [2] [0] [0] [CFj] [4] [0] [0] [CFj] [0] [CFj] [0] [CFj]
[2] [0] [0] [CFj] [4] ⬛ [Nj] [0] [CFj] [1] [0] [0] [0] [CFj]

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8 [I/YR] [▬] [NPV]

Answer: $2,265.01.

Example 4:   Find the present value of deposits of $10 a year for 19 years with a final deposit at year 20 of $100.
             Assume interest is 9%, compounded annually.

Solution: This is another example of how to use the DCF functions to solve non-annuity, irregular payment problems.

[▬] [C ALL] [1] [▬] [P/YR]
[0] [CFj] [1] [0] [CFj] [1] [9] [▬] [Nj] [1] [0] [0] [CFj]
[9] [I/YR] [▬] [NPV]

Answer: $107.34

Example 5:   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%, should the product line be expanded?

Solution: [▬] [C ALL] [1] [▬] [P/YR]
             [8] [0] [0] [0] [0] [0] [+/−] [CFj] [1] [9] [0] [0] [0] [0] [CFj] [6] [▬] [Nj]
             [9] [0] [0] [0] [0] [CFj] [4] [▬] [Nj]
             [1] [5] [I/YR] [▬] [NPV]

Answer: $30,137.45. Yes, the product line should be expanded.