# 3.7: Uneven Cash Flow Streams

Sometimes you will encounter a situation where you have more than one payment, but it is not the same each year. Remember that an annuity requires the payment to be the same each year. If you have multiple cash flows, but they are not the same, you have an uneven cash flow stream. In order to solve a problem like this, treat it as a series of single cash flows (or possibly a series of smaller annuities).

## Net Present Value of an Uneven Cash Flow Stream

Consider the following example: you have an investment project that will pay the following cash flows:

Year 1 $1000
Year 2 $500
Year 3 $2000
Year 4 $2000

The discount rate is 15%. Find the Present Value.

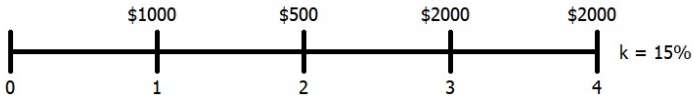


Figure 3.7.3: Net present value with a set discount rate

**Calculator Steps to Compute PV of an Uneven Cash Flow Stream**

| HP10BII | TI-BAII+ | TI-83/84 |
|---|---|---|
| Step 1:<br>Clear All<br>Step 2:<br>0 CFj<br>Step 3:<br>1000 CFj<br>Step 4:<br>500 CFj<br>Step 5:<br>2000 CFj<br>Step 6:<br>2 Nj<br>Step 7:<br>15 I/YR<br>Step 8:<br>NPV | Step 1:<br>CF CLR Work<br>Step 2:<br>0 Enter ↓<br>Step 3:<br>1000 Enter ↓↓<br>Step 4:<br>500 Enter ↓↓<br>Step 5:<br>2000 Enter ↓<br>Step 6:<br>2 Enter<br>Step 7:<br>NPV 15 Enter ↓<br>Step 8:<br>CPT | Go to APPS⇒Finance⇒<br>Step 1: Select npv(<br>Step 2: Enter the given information in the following format:<br>npv(InterestRate, CF0, {CF Stream}, {CF Frequencies}<br>npv(15,0,{1000,500,2000},{1,1,2}<br>Step 3: Press the SOLVE key |

Solution $3706.18

Note for HP10BII+: The Nj key is used to tell the calculator the number of times that the same cash flow will be received consecutively. If the cash flow only occurs once (in a row) then we do not need to use the Nj key. However, when we have the same cash flow multiple times in a row (such as the $2000 for two years), we can use the Nj key to tell the calculator that this $2000 will occur in two consecutive years.

Note for TI-BAII+: The F screen that appears after you enter a cash flow and down arrow is used to tell the calculator the number of times we have that same cash flow consecutively. If the cash flow only occurs once (in a row) then we do not F screen and just down arrow past it. However, when we have the same cash flow multiple times in a row (such as the 2000 for two years), we use the F screen to tell this to the calculator. The calculator does not have a F screen after the initial cash flow, so we do not need the double down arrow after entering the initial CF.

The above calculator methods are referred to as your Cash Flow Register or Cash Flow Worksheet. It is essential that you always clear all/clear work before entering any cash flows. If you do not do this you will be adding cash flows to a previous problem instead of starting a new problem. The TI-83/84 does not utilize this type of register and does not need to be cleared.

### Future Value of an Uneven Cash Flow Stream

The NPV function gives you the present value. You may alternatively want to know how much you will have at the END of the time period (solve for the future value). If this is the case, you start by solving for the NPV. Once you have that, use the 5-key approach to bring that present value forward to the end of the time horizon. For example, if we wanted to know what the above cash flow stream was worth at the END of the fourth year, we would start by solving for the NPV and get the same $3706.18 we calculated earlier. Then, we would go to our 5-key and solve for the future value as follows:

Step 1: 4 N
Step 2: 15 I/YR
Step 3: 3706.18 PV
Step 4: 0 PMT
Step 5: Solve for FV⇒$6482.13

When calculating the PV of an uneven cash flow stream, it should always be less than the sum of the cash flows. When calculating the FV of an uneven cash flow stream, it should always be more than the sum of the cash flows. Also, many financial calculators allow you to solve directly for the future value of an uneven cash flow stream. To see if yours does this, consult your user manual or ask your instructor.

### Finding the discount rate of an Uneven Cash Flow Stream

We can also find the discount rate (I/Y) if we have uneven cash flows. Consider the following example: We have an investment project that will pay the following cash flows:

Year 1 $1000
Year 2 $500
Year 3 $2000

If the present value of this investment is $3000, what is the discount rate?

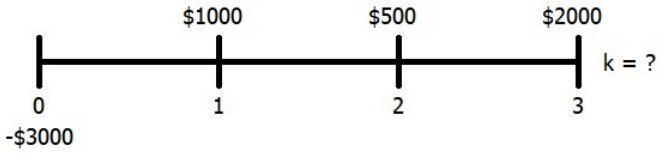


Figure 3.7.4: Finding the discount rate with an uneven cash flow stream

**Calculator Steps to Compute I/Y of an Uneven Cash Flow Stream**

| HP10BII | TI-BAII+ | TI-83/84 |
|---|---|---|
| Step 1:<br>Clear All<br>Step 2:<br>-3000 CFj<br>Step 3:<br>1000 CFj<br>Step 4:<br>500 CFj<br>Step 5:<br>2000 CFj<br>Step 6:<br>IRR/YR⇒ | Step 1:<br>CF CLR Work<br>Step 2:<br>-3000 Enter ↓<br>Step 3:<br>1000 Enter ↓↓<br>Step 4:<br>500 Enter ↓↓<br>Step 5:<br>2000 Enter<br>Step 6:<br>IRR<br>Step 7:<br>CPT | Go to APPS⇒Finance⇒<br>Step 1: Select irr(<br>Step 2: Enter the given information in the following format:<br>irr(CF0,{CF Stream},{CF Frequencies}.<br>irr(-3000,{1000,500, 2000},{1,1,1}<br>Step 3: Press the SOLVE key |

Solution 7.06%

Note for HP10BII+: The IRR/YR is not the same key as you used for the I/YR, but it serves a similar role — finding the discount rate (or rate of return) for a cash flow stream. The difference is that they I/YR key only works with single cash flows or annuities while the IRR/YR key works with uneven cash flows.

Note for TI-BAII+: The IRR is not the same key as you used for the I/Y, but it serves a similar role — finding the discount rate (or rate of return) for a cash flow stream. The difference is that the I/Y key only works with single cash flows or annuities while the IRR key works with uneven cash flows.

CF0 will always be negative when calculating IRR. If you end up with an error message when calculating the IRR, one of the first things you should do is make sure that your CF0 was a negative value.

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