Net Present Value (NPV) and Internal Rate of Return (IRR)

When it comes to calculating the net present value and internal rate of return, we are always talking about a series of payments that are uneven. After all, if the payment amount was the same we would just calculate the present value of an annuity (we covered that back in module 3).

Net Present Value

With the NPV, we are looking for a number; whereas with the IRR, we are looking for the return. NPV can be calculated on a financial calculator, in excel, or by hand. NPV is very simply the present value (PV) of Cash inflows minus the present value (PV) of Cash outflows. Let's look at an example. Let's assume that you want to consider an investment of $5,000, and you are currently making 11% on that money. The payments that you will receive over the next 5 years are:

Year 1	$1500
Year 2	$1000
Year 3	$ 500
Year 4	$ 500
Year 5	$4000
Total	$7500

So in total you will receive $7500.

	Payments	Required rate of return	Formula	Present Value
0				
1	1500	11%	=1500/(1.11)	1,351.35
2	1000	11%	=1000/(1.11)(1.11)	811.62
3	500	11%	=500/(1.11)(1.11)(1.11)	365.60
4	500	11%	=500/(1.11)(1.11)(1.11)(1.11)	329.37
5	4000	11%	=4000/(1.11)(1.11)(1.11)(1.11)(1.11)	2,373.81

5231.74

So the total present value (PV) of the cash inflows is $5,231.74. Now you need to calculate the present value of the outflows. Since the outflow happened right at the beginning, there is nothing to calculate because it is already in today's dollars.

PV of cash inflows	$5231.74
Minus PV of cash outflows	(5000.00)
Net present value	231.74

So what does this mean?

When the NPV is positive, it means that the internal rate of return is greater than the required rate of return, and therefore the investment should be accepted. If our required rate of return in this example, were 15%, then the net present value would calculate out to be ($336.17) or $4663.82 minus $5000. In that case you would not accept the investment because you aren't going to achieve your desired result.

	Payments	Required rate of return	Present Value
0			-
1	1500	15%	1,304.35
2	1000	15%	756.14
3	500	15%	328.76
4	500	15%	285.88
5	4000	15%	1,988.71
			4,663.83

In excel, you enter the formula below:

- Rate is the required rate of return
- Value1… are the payments

=NPV(rate,value1,value2,value3…)
=NPV(11%,1500,1000,500,500,4000)
$5,231.74

Please note that excel is giving you the present value of the cash inflows, you still need to subtract the present value of the cash outflow.

Take the value calculated above and subtract the PV of the cash outflow

5231.74
-5000

NPV = 231.74

Internal Rate of Return (IRR)

IRR is also known as dollar weighted return. IRR measures the total return based on cash inflows and outflows. I have included a sample Excel spreadsheet for calculating IRR, but I wanted to make sure that you understand how to calculate IRR. Personally, I use the dollar weighted return method or my financial calculate far more often because I think they are much easier to use.

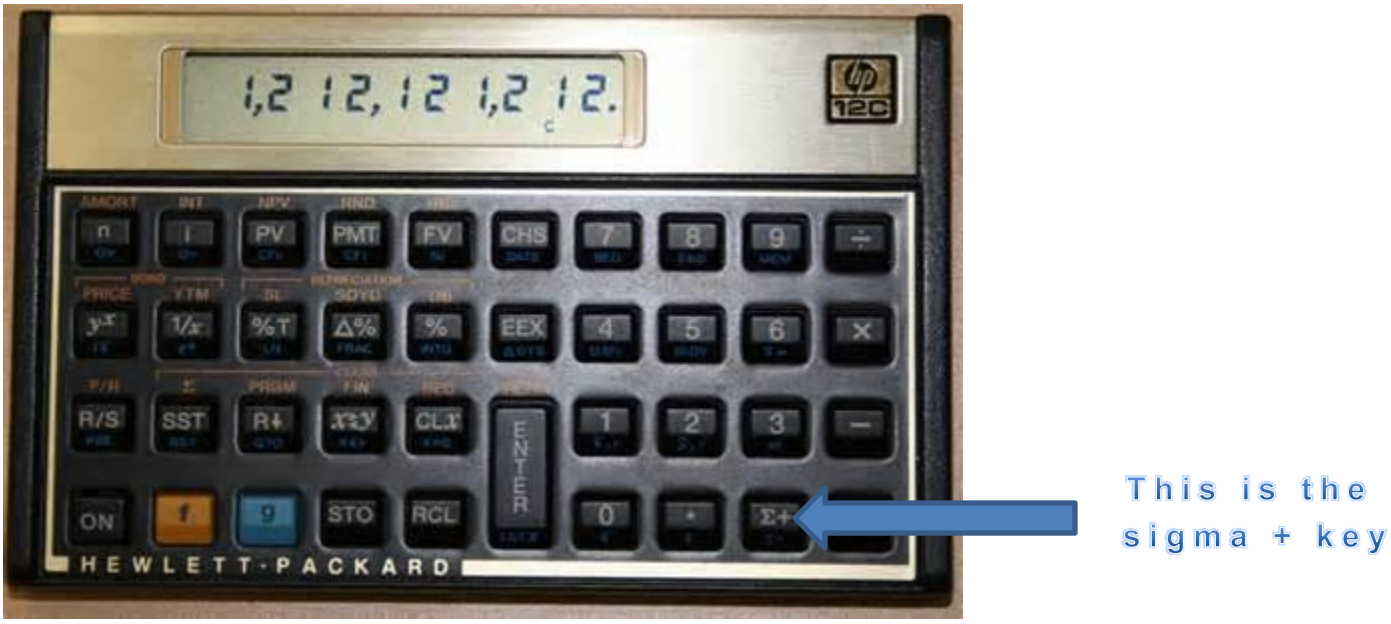
The dollar weighted return is a very simple spreadsheet to setup, use and understand. The fair market value and expected return are given numbers. To get the weighting of the portfolio you calculate that the stock is of the total and then multiply by the expected return. You repeat for all the investments to get your weighted return.

Option A: Dollar Weighted Return

Stock	Fair Market Value (FMV)	Expected Return	% of Portfolio	Weighted Return
A	23000	9.50%	0.2875	2.73%
B	15000	12.90%	0.1875	2.42%
C	42000	6.90%	0.525	3.62%
	80000		1	8.77%

For, Internal rate of return I prefer to use my HP12C. Although any financial calculator will do, you will just have to look in your manual for the correct sequence.

For the HP12C, IRR for the above example would be done as follows:



Clear all
Key in 9.5 hit enter
Key in 23000 hit sigma + (this is the key in the bottom right corner to the left of the + sign)
Key in 12.9 hit enter
Key in 15000 hit sigma +
Key in 6.9 hit enter
Key in 42000 hit sigma +
Hit the blue g key (located bottom right 3rd from left)
Hit XW (the number 6 key)
Answer comes up at 8.77