

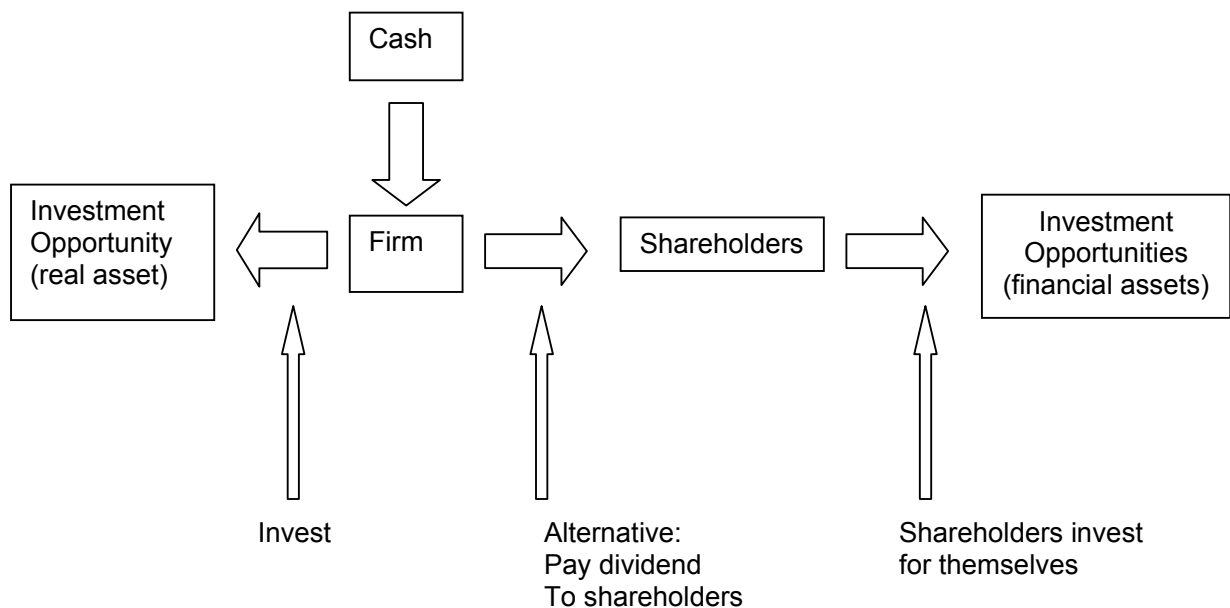
Why net present value leads to better investment decisions than other criteria

Introduction:

When deciding, whether or not it is worth making an investment, or leaving the capital in the bank, there are a few opportunities to do a calculation and come to the right decision. Managers have the choice between several possibilities, but they are not all equal and if not applied properly, the decision for an investment may be wrong. However, which calculation leads to the right decision? This chapter examines ways of calculating the the payback rule, net present value and the method of the internal rate of return.

The net present value

The basis for the net present value method is the assumption that a hundred Euros today is worth more than a hundred Euros will be worth tomorrow, because the Euros today can be invested to start earning interest immediately. An Advantage is, that present values are all measured in today's dollars, you can add them up.



All investments whose net present value:

- is zero, then, it will be the same as the alternative investment;
- is greater than zero, in comparison to alternative investment, it is better to invest
- is less than zero, then do not invest

$$NPV = C_0 + \frac{C_1}{1.10} + \frac{C_2}{1.10^2} + \frac{C_3}{1.10^3} = \text{result}$$

The payback rule:

Some companies require that the initial outlay on any project should be recoverable within a specified period. This means, at the beginning of the investment the managers make the decision in which period they will get their invested money back. They set a cut-off date.

Example:

If we examine the three projects we will see, that we would make a mistake if we insisted on only taking projects with a payback period of 2 years or less:

Project:	Co	C1	C2	C3	Payback Period	NPV 10%
A	-2000	500	500	5000	3	+ 2,624
B	-2000	500	1800	0	2	- 58
C	-2000	1800	500	0	2	+50

The net present value rule advises us to accept projects A and C and to reject project B. The rule ignores all cash flows after the cut-off date. If the cut-off date is two years, the payback rule rejects project A regardless of the size of the cash flow in year three.

In order to use the payback rule, a firm has to decide on an appropriate cut-off date. If it uses the same cut-off regardless of project life, it will tend to accept many poor short-term projects and reject many good long-term ones.

Further, we have to distinguish between the average and the cumulative method:

The average method (if the cash flows are always equal):

$$t = \frac{C_0}{C_1}$$

Project:	Co	C1	C2	C3
A	-2000	500	500	500
B	-2000	500	1800	0
C	-2000	1800	500	0

$$\frac{-2000}{500} = 4$$

The cumulative method (repayments are different):

$$\Sigma = C_1 + C_2 + C_3 + \dots$$

Project:	Co	C1	C2	C3	Payback Period
A	-1500	500	1000	0	2
B	-5000	500	1800	300	-
C	-2000	1800	0	200	3

As we see below, the payback rule should not be the sole basis for an investment decision.

Project:	Co	C1	C2	C3	Payback Period	NPV 10%
A	-600	300	300	300	2	+ 146,06
B	-2000	500	1800	0	2	- 57,85
C	-2000	1800	500	0	2	+49,58

Only the use of the net present value method allows a decision according to an economic point of view, because investment B looks like a good decision; but, if it is proofed with the NPV, you will get another result.

IRR Internal rate of return

It is possible to calculate the NPV if we know the Internal rate of return. If this is not given, we have to work it out by adjusting the following formula.

$$NPV = C_0 + \frac{C_1}{1 + \text{discount rate}} = 0$$

implies

$$\text{Discount rate} = \frac{C_1}{-C_0} - 1$$

The internal rate of return is defined as the rate of discount that makes NPV= 0. To calculate it, we start with the following formula, a two year example and a discount rate at zero (C0= - €4,000 C1= +€ 2,000 C3 = + €4,000).

$$NPV = C_0 + \frac{C_1}{1 + IRR} + \frac{C_2}{1 + IRR^2} = 0$$

discount rate at zero:

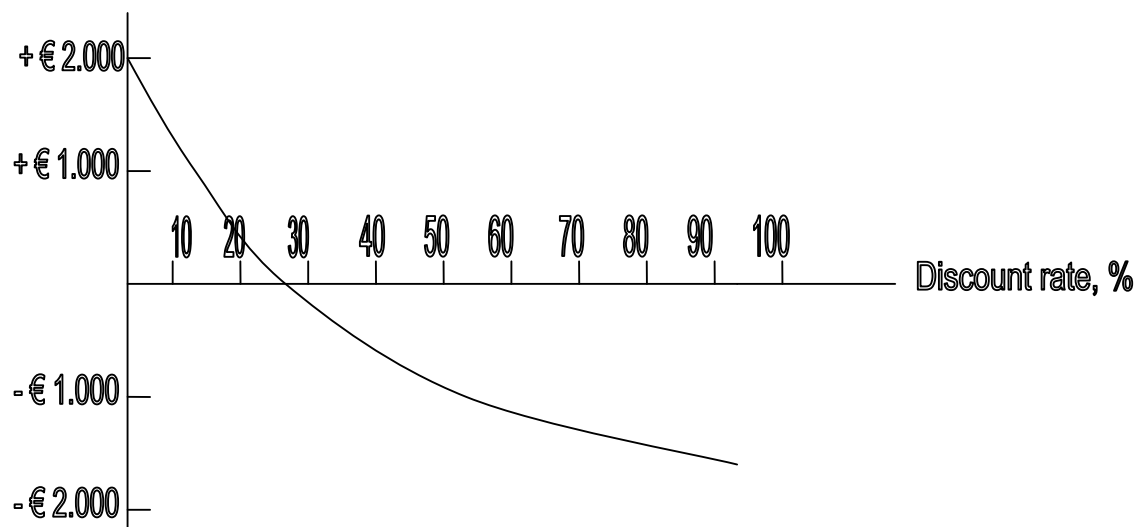
$$NPV = -4000 + \frac{2,000}{1.0} + \frac{4,000}{1.0^2} = 2,000$$

The NPV is positive; therefore, the IRR must be greater than zero. Next step is to try a discount rate of 50%. In this case net present value is -\$ 889:

$$NPV = -4,000 + \frac{2,000}{1.5} + \frac{4,000}{1.5^2} = -889$$

The NPV is negative (-) therefore the IRR must be less than 50%.

The easiest way to calculate IRR; is to calculate three or four NPVs and plot them on a graph:



Connect the points with a line and read off the discount rate at which NPV is zero. From this we can see the discount rate is 28%.

When comparing different investments, the alternative with the highest internal rate of return is the most advantageous solution. However, investors have to be careful because a very bad investment may also look good even with a successful IRR:

	C1	C2	IRR
Project 1	-40	40	0%
Project 2	-40	80	100%
Project 3	50	-100	100%

Conclusion

After the comparison of the three investment strategies, there is a clear result. The Net Present Value method is the one investors are most able to trust. Present values are all measured in today's dollars, you can add them up. The net present value rule tells us which projects we have to accept, and which we should reject. However, the payback rule ignores all cash flows after the cut-off date, and will tend to accept many poor short-term projects and reject many good long-term ones. Applying the internal rate of return method, we have to find out the NPV. It is not possible to make an exact investment decision because it states the same IRR, even if you lose a lot of money.