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Project Management - 2019

Net Present Value (NPV)

What is Net Present Value (NPV)?

Net present value (NPV) is the present value of an investment's expected cash inflows minus the costs of acquiring the investment.

NPV = (Cash inflows from investment) – (cash outflows or costs of investment)

Let's assume Company X wants to implement a project A. It takes a careful look at project s A projections for the next 10 months. It discounts those projected cash inflows back to the present using its weighted average cost of capital (WACC) and then subtracts the cost of implementing the projects A.
[To learn how to calculate present value (PV), be sure to read A Primer on Present Value and Its Many Uses]

Cost to implementing project A today: $1,000,000

Present value (PV) of cash flows from completing project A:

month 1: $200,000

month 2: $150,000

month 3: $100,000

month 4: $75,000

month 5: $70,000

month 6: $55,000

month 7: $50,000

month 8: $45,000

month 9: $30,000

month 10: $10,000

Total: $785,000

Now that we know the total cash flow for the next 10 months (the total cash inflows from the investment), along with total cost of the investment in project A, we can use the formula to calculate NPV:

Net Present Value (NPV) = $785,000 - $1,000,000 = -$215,000

At this point, management for Company X would use the net present value rule to decide whether or not to implement the project A. Because the NPV is negative, they should say, "No."

NPV is used to analyze an investment decision and give company management a clear way to tell if the investment will add value to the company. Typically, if an investment has a positive net present value, it will add value to the company and benefit company shareholders. Net present value calculations can be used for either acquisitions (as shown in the example above) or future capital projects. For example, if a company decides to open a new product line, they can use NPV to find out if the projected future cash inflows cover the future costs of starting and running the project. If the project has a positive NPV, it adds value to the company and therefore should be considered.

Discounted cash flow is also called Opportunity cost of capital

- It is the lost opportunity on the capital that is being invested in the projects
- Rate of return that an organization could have earned if not invested in the current project.
- In other words, it's the rate of return that an organization is willing to loose in an expectation to earn more by investing in this project.
- For example: Let's say If an organization earns 10% interest per annum on its capital by putting the money in bank instead of investing in the project, then the opportunity cost of the capital is 10% of its capital, which is a lost opportunity and this 10% is taken in to consideration for the projects as a discounted rate, since it is the minimum that an organization could have earned.

Capital Budgeting Techniques

Discounted Cash Flow

- NPV - Net present Value
- IRR - Internal Rate of Return
- PI – Profitability Index
- Payback period

Non-Discounted Cash flow

- Payback period (Payback period is usually calculated considering the Non discounted cash flow.

Future Value & Present Value

Net present value considers the "Time value of money"
Money grows over time, when it earns interest.
Therefore a dollar in hand today is worth more than a dollar in future.

$$FV = PV\,(1 + k)^n$$

FV = Future Value
PV = Present Value
K = Discounted Rate
n = Number of Years

Future Value

Example

If $ 100 dollars is invested in a bank today may earn 8% per year.

what is the future value of the $ 100 dollars for 1st, 5th and 15th year?

$$FV = PV\,(1 + k)^n$$

PV =	100	=	=	=	100
K =	8%	=	8/100	=	0.08
(1+K)=	(1+0.08)	=	1.08	=	1.08

After one year(n=1): FV = $\$100_*(1+(8/100))^1 = 100(1.08)^1 = 108$

After five years (n=5): $\$\ 100\ (1.08)^5 = 100*1.08*1.08*1.08*1.08*1.08 = 146.93$

After fifteen years: $\$\ 100\ (1.08)^{15} = \$\ 317.22$

Present Value

Example

If $ 100 dollars is to be received after 1 year, what is the present value of $100 dollars today?

If $ 100 dollars is to be received after 5 years, what is the present value of $100 dollars today?

If $ 100 dollars is to be received after 15 years, what is the present value of $100 dollars today?

Note: Discounted rate is 8% per year.

$$PV = FV \times \frac{1}{(1+k)^n}$$

FV=	100	=	=	=	100
K =	8%	=	8/100	=	0.08
(1+K)=	(1+0.08)	=	1.08	=	1.08

PV for 1 year	=	100 X	$1/(1+8/100)^1$	=	100 X	$1/(108/100)^1$	=	100 X	$1/(1.08)^1$	=	100 X	1/1.08	=	100 X	0.925925926	=	92.59259259	=	$93
PV for 5 years	=	100 X	$1/(1+8/100)^5$	=	100 X	$1/(108/100)^5$	=	100 X	$1/(1.08)^5$	=	100 X	1/1.469328	=	100 X	0.680583233	=	68.05832326	=	$68
PV for 15 years	=	100 X	$1/(1+8/100)^{15}$	=	100 X	$1/(108/100)^{15}$	=	100 X	$1/(1.08)^{15}$	=	100 X	1/3.172169	=	100 X	0.315241716	=	31.52417163	=	$32

The Present value of $ 100 to be received after 1 year is $93 dollars today.

The Present value of $ 100 to be received after 5 years is $68 dollars today.

The Present value of $ 100 to be received after 1 year is $32 dollars today.

Net Present Value

- NPV realistically predicts the future cash flows
- NPV discounts future cash flows at an appropriate industry discount rate, the appropriate discount rate is the project's opportunity cost of capital.
- NPV is the sum of all discounted cash flows
- IF NPV > 0 (positive), The project can be accepted, The greater the NPV, the better the project financial benefits.
- Net present value = "Present value of cash Inflows" – "Present value of cash Outflows".

Net Present Value

Example: Calculating NPV
A sum of $ 400,000 dollars invested today in an IT project may give a series of below cash inflows in future:
$ 70,000 in year 1
$ 120,000 in year 2
$ 140,000 in year 3
$ 140,000 in year 4
$ 40,000 in year 5
If Opportunity cost of capital is 8% per annum, then should we accept or reject the project?

Solution: Calculating NPV
Step 1: Calculate the PV value of year 1, year2, year3, year4, and year5
Step 2: Sum the PV of all years
Step3: NPV = Present value of all cash inflows – Present value of all cash outflow.
Step 4: If NPV is positive, Accept the project, if not Reject the project.

Formula for calculating Present value = $\mathbf{PV = FV \times \frac{1}{(1+k)^n}}$

PV for year1	=	70000/1.08	64814.81
PV for year2	=	$120000/(1.08)^2$	102880.7
PV for year3	=	$140000/(1.08)^3$	111136.5
PV for year4	=	$140000/(1.08)^4$	102904.2
PV for year5	=	$40000/(1.08)^5$	27223.33
Cash Inflow of all PVs	=		408959.5

Cash Inflow of all Present Values is : $ 408,959

Present value of Cash outflow is : $400,000

Net Present Value = PV of Cash inflows – PV of Cash Outflows = ($408959 – $400000) = $8959 dollars.

Since NPV is positive, (i.e., $8959, This project can be accepted)

IRR - Internal Rate of Return

IRR (Internal Rate of Return) is a discount rate at which NPV (Net Present Value) becomes Zero.
In other words, IRR is the opportunity cost at which the NPV becomes Zero.
IRR as the name suggests, it tells how much rate of return are we getting from the project.

Why IRR, what is the use of calculating IRR?

- IRR is used to rank different projects.
- The higher a project's internal rate of return, the more desirable it is to undertake the project.
- If all the other factors are same for different projects then the project with the Highest Internal rate of return value should be considered.

Note:
For Constant rate of Cash inflow for every year, Internal Rate of Return can be calculated with the help of a formula
For Uneven rate of Cash inflows for every year, IRR can be calculated by little trail & error adjustments.