GEPM-375
Professional Practices and Construction Management

Net Present Value (NPV)

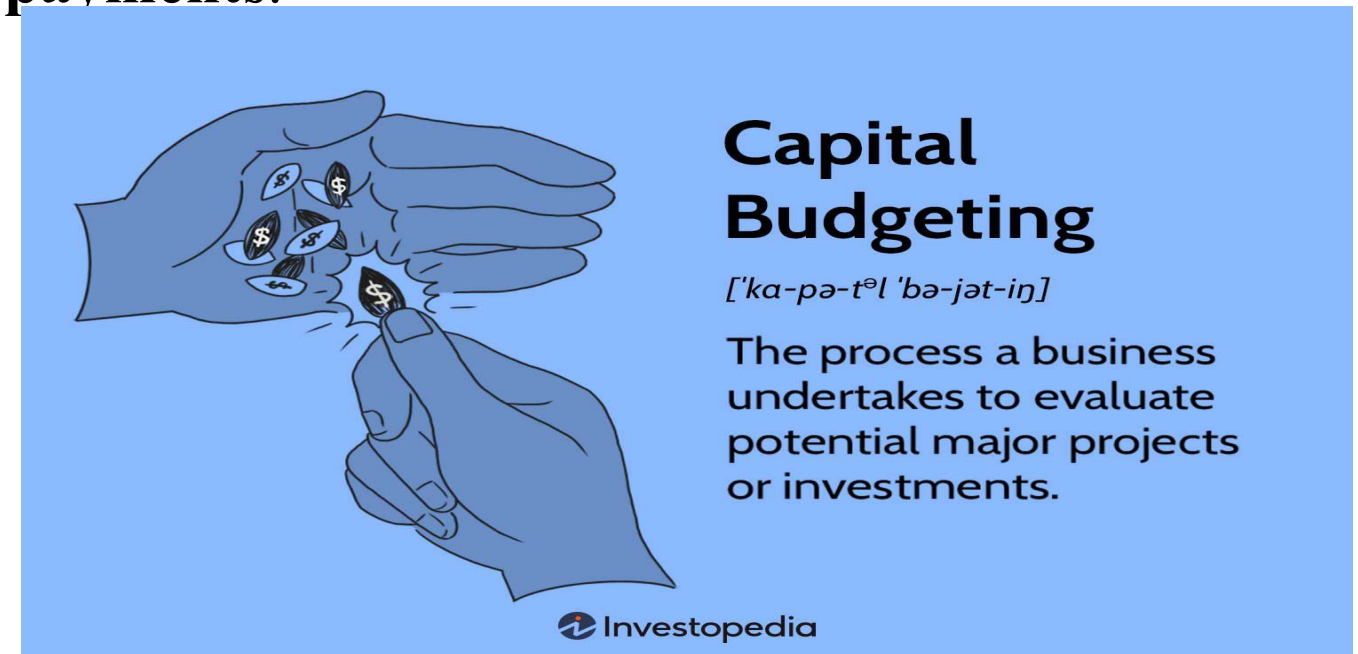
NPV

What is NPV?

- **Difference between the present value of cash inflows and the present value of cash outflows over a period of time.**

- Used in **capital budgeting** and **investment planning** to **analyze** the **profitability of a projected investment or project.**

- NPV is the **result of calculations used** to **find the current value of a future stream of payments.**





What Net Present Value Can Tell You?/Implications of NPV:

- NPV **accounts for the time value of money (TVM)** and can be used to **compare the rates of return (ROR) of different projects,** or to **compare a projected rate of return with the hurdle rate** required to approve an investment.

- **TVM** is represented in the **NPV formula** by the **discount rate**, which might be **a hurdle rate for a project based** on a company's cost of capital.



- No matter how the discount rate is determined, **a negative NPV shows the expected rate of return will fall short of it, meaning the project will not create value.**

- In the context of **evaluating corporate securities**, the **NPV** calculation is often called discounted cash flow **(DCF)** analysis.

- **Discount rate accounts** for the fact that, **so long as interest rates are positive, a dollar today is worth more than a dollar in the future.**

- **Inflation erodes the value of money over time**. Meanwhile, today's dollar can be invested in a safe asset like government bonds; investments riskier than Treasuries must offer a higher rate of return.

- However it's determined, the **discount rate is simply the baseline rate of return that a project must exceed to be worthwhile.**

NPV

For example discount rate,

- An investor could receive $100 today or a year from now.
- Most investors would not be willing to postpone receiving $100 today.
- However, what if an investor could choose to receive $100 today or $105 in one year?
- The 5% rate of return might be worthwhile if comparable investments of **equal risk, offered less** over the same period.
- If, on the other hand, an investor could earn 8% **with no risk over the next year**, the offer of $105 in a year **would not suffice**.
- In this case, **8% would be the discount rate**.

Positive vs. Negative NPV:

- A positive NPV indicates that the **projected earnings** generated by a project or investment, **discounted for their present value—exceed the anticipated costs**, also in **today's dollars**.
- It is assumed that an investment with a **positive NPV will be profitable**.
- An investment with a **negative NPV** will **result in a net loss**. This concept is the basis for the Net present value rate, which says only investments with a positive NPV should be considered.
- NPV can be calculated using tables, spreadsheets (for example, Excel), or financial calculators.

Limitations of Net Present Value:

- A notable limitation of NPV analysis is that it **makes assumptions about future events** that **may not prove correct**.
- **Discount rate** value used is **a judgment call**, while the **cost of an investment and its projected returns** are necessarily **estimates.**

Net Present Value vs. Payback Period:

- **NPV doesn't evaluate a project's Return on Investment** (ROI), a key consideration for anyone with finite capital.

- NPV **estimates how much value a project will produce**, it **doesn't tell** you whether it is an **efficient use** of your investment dollars.

Pay back period

- **Payback period**, is a **simpler alternative to NPV**.

- Payback method **calculates how long it will take to recoup an investment**.

- **One drawback** of this method is that it **fails to account for the time value of money. f**or this reason, payback periods calculated for **longer-term investments** have a greater potential for inaccuracy.

- An **investment's rate of return can change significantly over time**, comparisons using payback periods assume otherwise.

NPV vs. Internal Rate of Return (IRR)

- IRR is calculated by solving the **NPV formula** for the **discount rate required to make NPV equal zero.**

- Used to **compare projects of different time spans** on the basis of their projected return rates.

For example, IRR could be used to **compare the anticipated profitability** of a three-year project with that of a 10-year one.

- Although the IRR is **useful for comparing rates of return**, it may obscure the fact that the rate of return on the three-year project is only available for three years, and **may not be matched once capital is reinvested.**

- NPV and IRR are closely related concepts, in that the **IRR of an investment is the discount rate that would cause that investment to have an NPV of zero.**

What Is a Good NPV?

- In theory, an NPV is "**good" if it is greater than zero**.
- After all, the NPV calculation already **takes into account the factors** such as the investor's cost of capital, opportunity cost, and risk tolerance **through the discount rate**.
- And the **future cash flows of the project**, together with the time value of money (TVM), are also captured.
- Therefore, even an **NPV of $1 should theoretically qualify as "good,"** indicating the project is worthwhile.
- In practice, since estimates used in the calculation are **subject to error many planners** will set a **higher bar for NPV** to give themselves an additional margin of safety.

NPV Calculation:

Net Present Value (NPV) is a calculation that helps project managers **determine the profitability of a project.**

The formula for calculating NPV is:

$$\mathbf{NPV} = \frac{\boldsymbol{Cash\ Flow}}{(\mathbf{1}+\boldsymbol{i})^{\boldsymbol{t}}} \mathbf{-\ Initial\ investment}$$

In this formula, (i) is the discount rate, and (t) is the number of time periods

Example 1 of Calculating NPV

Imagine a company can **invest in equipment** that would **cost $1 million** and is expected to **generate $25,000 a month in revenue for five years**. Alternatively, the company could invest that money in securities with an **expected annual return of 8%.** Management views the equipment and securities as comparable investment risks.

Step 1: NPV of the Initial Investment

- Because the equipment is **paid for upfront**, this is the **first cash flow** included in the calculation.

- **No elapsed time needs to be accounted for**, so the **immediate expenditure** of $1 million **doesn't need to be discounted**.

Step 2: NPV of Future Cash Flows

•**Identify the number of periods (t):** The equipment is expected to generate monthly cash flow **for five years**, which means that there will be **60 periods** included in the calculation after multiplying the number of years of cash flows by the **number of months in a year**.

Step-3 Identify the discount rate (i):

• Alternative investment is **expected to return 8% per year**.

•However, because the **equipment generates a monthly stream of cash flows**, the **annual discount rate needs to be turned into a periodic, or monthly, compound rate.**

Using the following formula, we find that the periodic monthly compound rate is 0.64%.

$$\textbf{Periodic Rate} = (1.0 + 0.08)^{\frac{1}{12}} - 1 = 0.64\%$$

$$NPV = -\$1{,}000{,}000 + \Sigma_{t=1}^{60} \frac{25000x60}{(1.0+0.0064)^{60}}$$

$$NPV = -\$1{,}000{,}000 + \$1{,}242{,}322.82 = \$242{,}322.82$$

- In this case, the NPV is positive; the **equipment should be purchased**.
- If the net present value of these **cash flows had been negative** because the **discount rate was larger** or the **net cash flows were smaller**, then the **investment would not have made sense**.

NPV calculation:

Net Present Value (NPV) is calculated by subtracting the initial investment from the sum of discounted future cash inflows.

$$NPV = \sum \left| \frac{\text{Cash Flow}}{(1+i)^t} \right| - \text{Initial Investment}$$

Where, i=discount rate

t= time period

A positive NPV value suggest positive investment.

Example 2: Machinery Investment

- **Initial Investment:** 100,000$ (year 0)
- **Expected Annual Cash Inflows:** $30,000$ (Years 1-4)
- **Discount Rate (10%) (0.10)**

1. **Calculate Present Value (PV) for each year:**

- **Year 1:** $30,000/(1+0.10)1=$27,272.73
- **Year 2:** $30,000(1+0.10)2=$24,793.39
- **Year 3:** $30,000(1+0.10)3=$22,539.44
- **Year 4:** $30,000(1+0.10)4=$20,490.40

2. Sum the Present Values: $27,272.73+$24,793.39+$22,539.44+$20,490.40=$95,095.96$

3. Subtract Initial Investment: NPV=$95,095.96−$100,000=−$4,904.04

Result: The NPV is **−$4,904.04.**

Because the NPV is negative, this project would not be considered a good investment at a 10% discount rate

Example 3: An electronics manufacturing factory plans to undertake a new investment opportunity i.e. manufacturing a new generation home theatre. The estimated life is four years. Also the discount rate is 10%. Whereas, cash flow in the subsequent years are given in the following table:

Year	Cash Flow ($)
0	-25,000
1	1,10,000
2	89,000
3	81,000
4	72.000

NPV Calculation

Year	Cash Flow		Present value
0	-250,000	1.0	-250,000
1	1,10000	1.10	100,000
2	89,000	1.21	73,554
3	81,000	1.33	60,902
4	72,000	1.46	49,315
NPV			33,771

Net present value is always shown in numerical value. Therefore The three possible outcomes of this computation are as follows:

Negative NPV: A negative NPV shows that the present value i.e., PV of the cash inflow is lower than its outflow. This type of investment opportunity is not worth it. It is denoted as:

$$\mathbf{NPV < 0}$$

Zero NPV: It is when both the cash inflow and outflow have equivalent present values, i.e.:

$$\mathbf{NPV = 0}$$

Positive NPV: Here, the PV of cash inflow is higher than that of its outflow. Therefore, it is a favourable investment idea. It is shown as:

$$\mathbf{NPV > 0}$$

The value so acquired from the above computation is considered to be profitable if it provides a positive value. In the above example, the NPV is $33771; therefore, it is a suitable investment opportunity.

Thanks