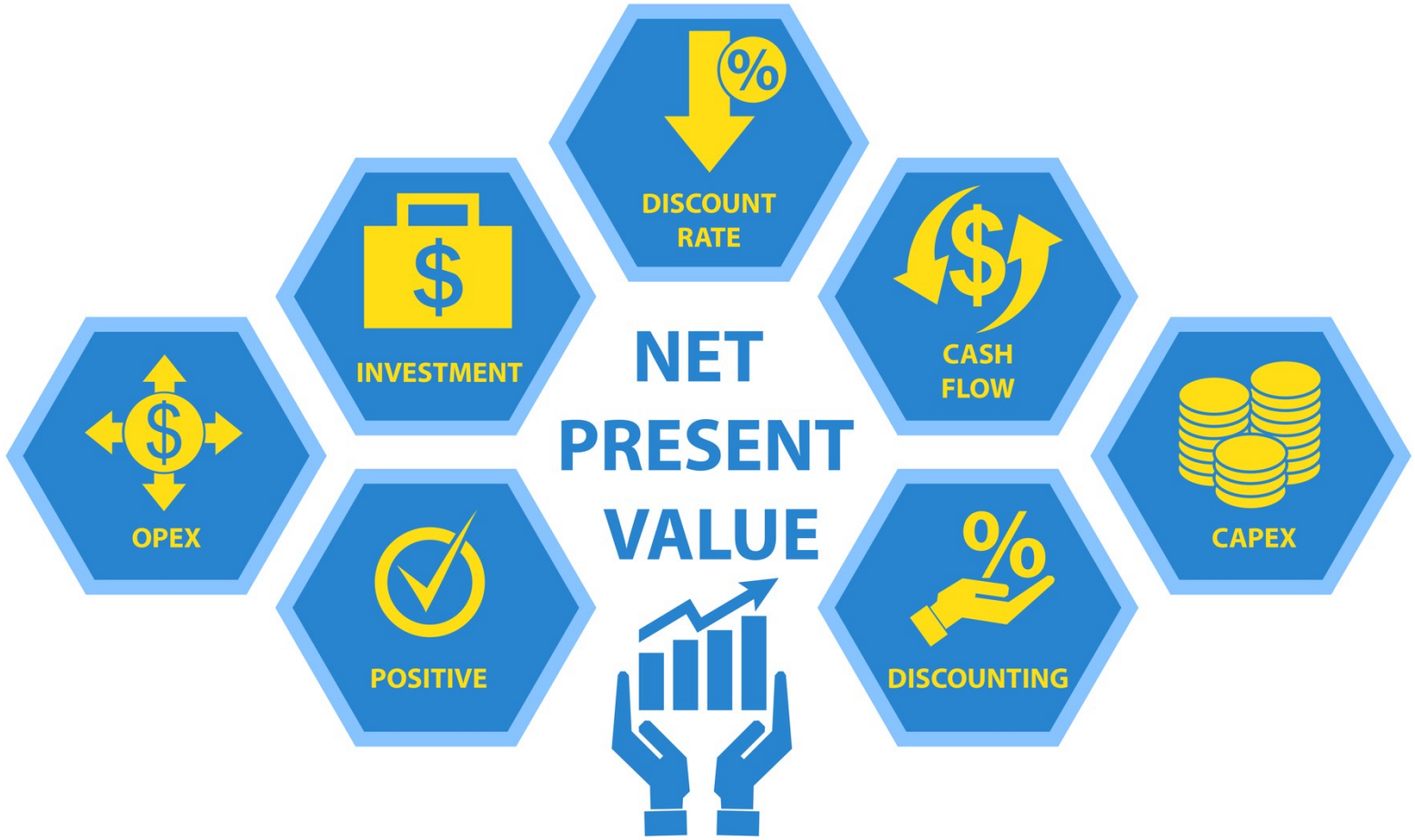
The Net Present Value



Evaluating the Financial Viability of a Project

Most businesses evaluate the financial "worthiness" of a project using 3 common financial metrics:

- ✓ Net Present Value (NPV)
- ✓ Internal Rate of Return (IRR)
- ✓ Payback Period (PBP)

And in special cases:

- ✓ Modified Internal Rate of Return (MIRR)

Is the Project Financially Worthwhile?

Are the cash inflows (benefits) > cash outflows (costs) when Time Value of Money (TVM) is considered?

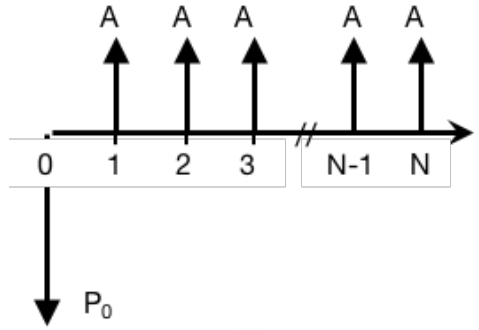
If the Benefits > the Costs, then the project is economically worthwhile.

The Net Present Value ("NPV") Method

Compares the PV of future cash inflows (benefits) to the PV of the cash outflows (costs or investments) – with the PV's determined at the company's discount rate.

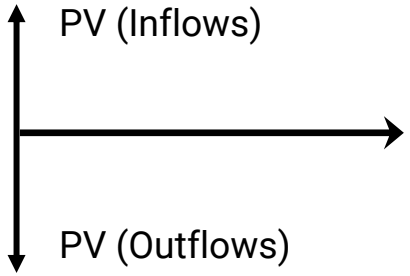
P_0 = the initial investment

A = recurring cash flows resulting from the investment (future profits)



Net Present Value, NPV = PV of Cash Inflows – PV of Cash Outflows

If NPV > 0, the project is financially justified



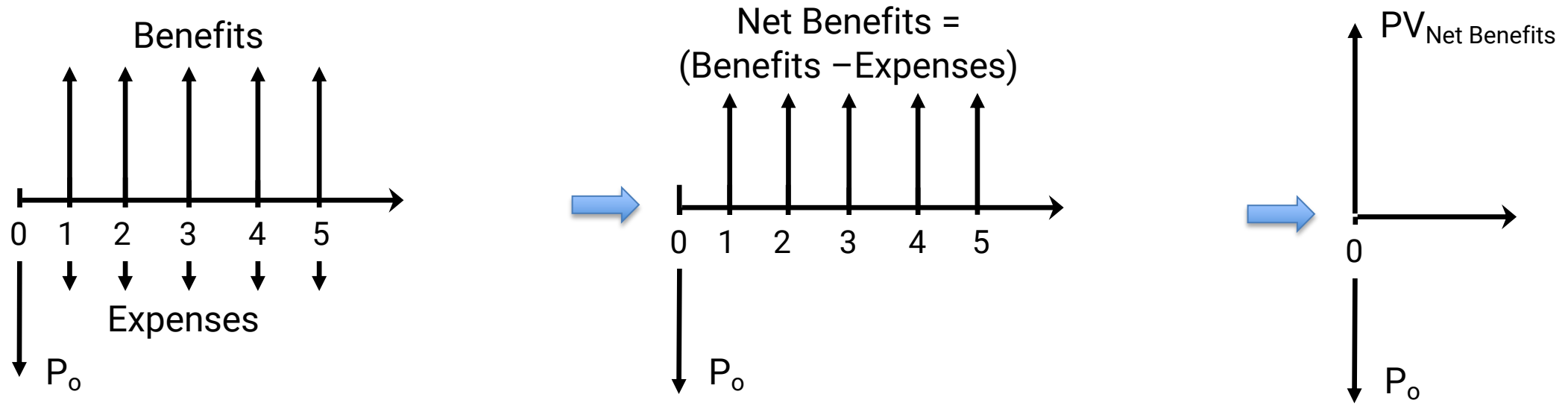
In other words, if the financial benefits exceed the costs when evaluated at the company discount rate, then the project is financially worthwhile.

The Net Present Value ("NPV") Method

Let's simplify our lives a bit…

If there any expenses, it is often easier to take the "net benefits" (benefits – expenses).

Then the PV of cash outflows is just the initial investment, P_o



$$NPV = PV_{Net\ Benefits} - P_o$$

Evaluating the Financial Viability of a Project

Which is the better project? (Corporate Discount Rate = 15%).

	Investment (Today)	End of Year 1	End of Year 2	End of Year 3	End of Year 4	End of Year 5
Project 1	$1,000	$5,000				
Project 2	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000

$$NPV = PV_{Inflows} - P_0$$

For Project 1

$$PV_{Inflows} = \frac{FV}{(1+i)^N} = \frac{\$5000}{(1+.15)^1} = \$4{,}348$$

$$PV_{Outflows} = P_0 = \$1{,}000$$

$$NPV_{Proj1} = \$3{,}348$$

For Project 2

$$PV_{Inflows} = A\left[\frac{(1+i)^N - 1}{i\,(1+i)^N}\right] = \$1{,}000\left[\frac{(1+0.15)^5 - 1}{0.15(1+0.15)^5}\right] = \$3{,}352$$

$$PV_{Outflows} = P_0 = \$1{,}000$$

$$NPV_{Proj2} = \$2{,}352$$

Evaluating the Financial

Both projects are financially worthwhile, but Project 1 delivers greater benefits than Project 2.

Which is the better project?

	Investment (Today)	End of Year 1	End of Year 2	End of Year 3	End of Year 4	End of Year 5
Project 1	$1,000	$5,000				
Project 2	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000

$$NPV = PV_{Inflows} - P_0$$

For Project 1

$$PV_{Inflows} = \frac{FV}{(1+i)^N} = \frac{\$5000}{(1+.15)^1} = \$4{,}348$$

$$PV_{Outflows} = P_0 = \$1{,}000$$

$$NPV_{Proj1} = \$3{,}348$$

For Project 2

$$PV_{Inflows} = A\left[\frac{(1+i)^N - 1}{i\,(1+i)^N}\right] = \$1{,}000\left[\frac{(1+0.15)^5 - 1}{0.15(1+0.15)^5}\right] = \$3{,}352$$

$$PV_{Outflows} = P_0 = \$1{,}000$$

$$NPV_{Proj2} = \$2{,}352$$

Evaluating the Financial Viability of a Project

What is the NPV really telling us?

When evaluated using the company's minimum rate of return (discount rate):

NPV = 0: The project's return = minimum rate of return

NPV > 0: The project's return > minimum rate of return

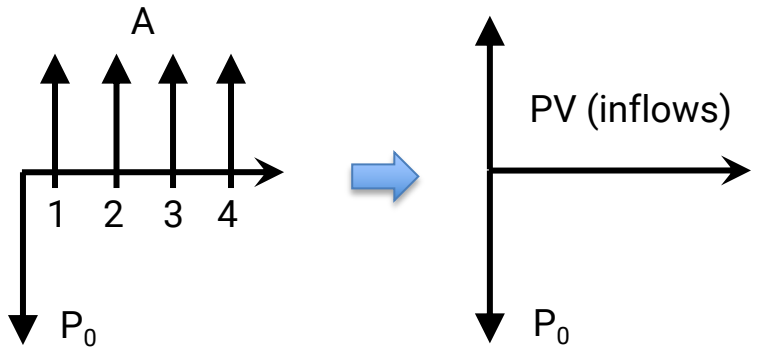
NPV < 0: The project's return < minimum rate of return

Companies want to invest in projects that provide the greatest financial return; the higher the NPV the better.

Evaluating the Financial Viability of a Project

Another example…

Equipment (P_0):	$40,000
Future Profits (A):	$12,000
Timeframe (N):	4 years
Discount Rate (i):	15%



PV of Cash Inflows:

$$PV_{Inflows} = A\left[\frac{(1+i)^N - 1}{i\,(1+i)^N}\right]$$

$$PV_{Inflows} = \$12{,}000\left[\frac{(1+0.15)^4 - 1}{0.15\,(1+0.15)^4}\right]$$

$$PV_{Inflows} = \$34{,}260$$

PV of Cash Outflows:

$$PV_{Outflow} = P_0$$

$$P_0 = \$40{,}000$$

$NPV = PV_{inflow} - PV_{outflow}$

NPV = $34,260 – $40,000

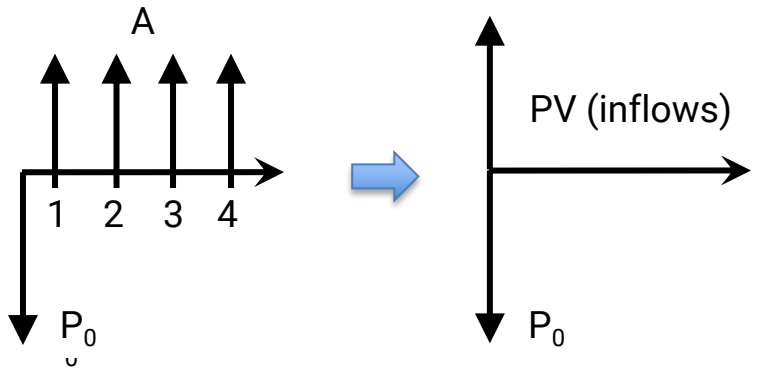
NPV = - $5,740

Since NPV < 0, the project falls below the company's minimum required rate of return, and therefore is NOT financially justified.

Evaluating the Financial Viability of a Project

What if the company had a lower Discount Rate?

Equipment (P_0): $40,000
Future Profits (A): $12,000
Timeframe (N): 4 years
Discount Rate (i): 5%



PV of Cash Inflows:

$$PV_{Inflows} = A\left[\frac{(1+i)^N - 1}{i\,(1+i)^N}\right]$$

$$PV_{Inflows} = \$12{,}000\left[\frac{(1+0.05)^4 - 1}{0.05\,(1+0.05)^4}\right]$$

$$PV_{Inflows} = \$42{,}552$$

PV of Cash Outflows:

$$PV_{Outflow} = P_0$$

$$PV_0 = \$40{,}000$$

$NPV = PV_{inflow} - PV_0$

NPV = $42,552 – $40,000

NPV = $2,552

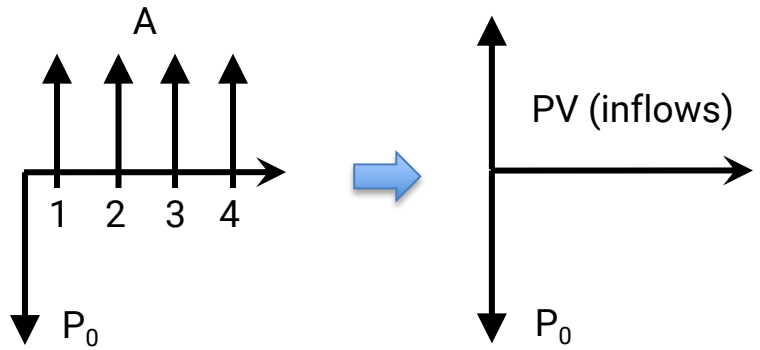
With the lower discount rate, NPV is > 0, and the project now IS financially justified!

The Impact of the Discount Rate

At a Discount Rate of 5%, this project is financially worthwhile.

But at a Discount Rate of 15%, it isn't.

What does this tell us about the Discount Rate (Hurdle Rate or Cost of Capital)?



The higher the Discount Rate, the greater the future profits need to be to cover the investment.

The Impact of the Discount Rate

Think of the Discount Rate as the Hurdle Rate…

15% Minimum
Rate of Return

Only very good projects could clear this one!

5% Minimum
Rate of Return

Many projects might be able to clear this hurdle!

Main Takeaways…

A project is financially worthwhile if the Benefits > Costs on a discounted cash flow basis.

The company's discount rate (also known as the cost of capital, minimum acceptable rate of return or the Hurdle Rate) is company specific; every company has its own figure.

The Net Present Value method compares the $PV_{Inflows}$ to the $PV_{Outflows}$, where

$$NPV = PV_{Inflows} - PV_{Outflows}$$

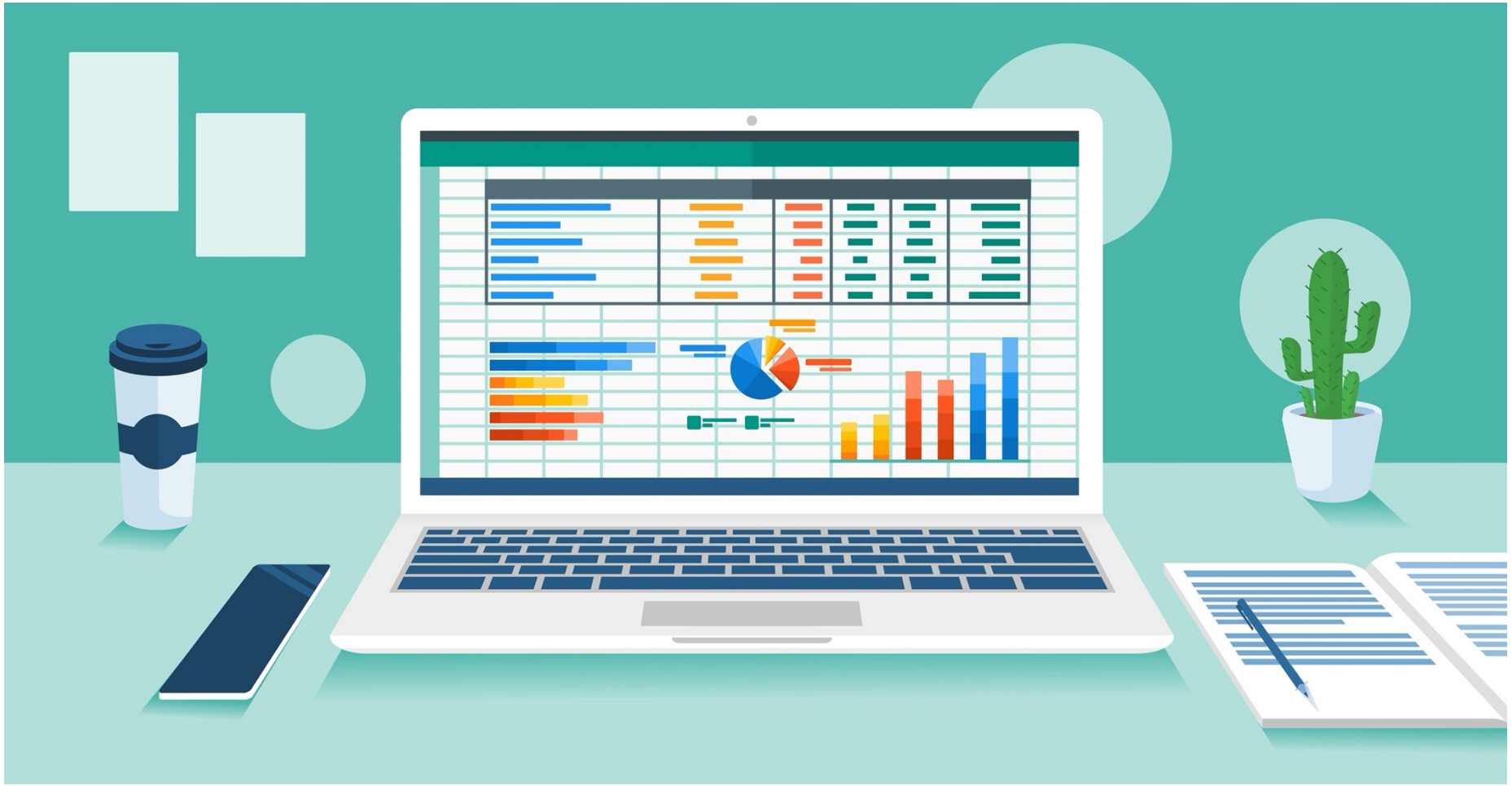
When $PV_{Outflows}$ is just the initial investment, NPV simplifies to:

$$NPV = PV_{Inflows} - P_0$$

If the NPV > 0, the project is financially worthwhile.

Next Time…

Complex Cash Flows and Excel to the Rescue



Credits & References

Slide 1: Concept of NPV - Net Present Value by Elnur, Adobe Stock (402998660.jpeg).

Slide 2: Benefit and cost concept by cacaroot, Adobe Stock (88458915.jpeg).

Slide 12: Athletics hurdle isolated on white background - 3d render by Sashkin, Adobe Stock (39069268.jpeg).

Slide 14: Accounting or Financial Management Software Program on Laptop Screen in Office Desk by Menara Grafis, Adobe Stock (432160164.jpeg).