Frankfurt School
FS-UNEP Collaborating Centre
for Climate & Sustainable Energy Finance

Certified Expert in Climate & Renewable Energy Finance

Module 5

Part 2: Financing Instruments

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5. KEY FINANCIAL PARAMETERS AND INVESTMENT CALCULATIONS

Different approaches can be used to assess the attractiveness of investment opportunities from a private investor's perspective (who is usually primarily driven by financial consideration). You can differentiate between static and dynamic investment calculation:

Static investment calculation

- Profit-/ cost comparison
- Profitability comparison
- Payback period

Dynamic investment calculation

- Final value
- Net present value
- Internal rate of return

5.1. STATIC INVESTMENT CALCULATION

The payback period in capital budgeting refers to the period of time required for the return on an investment to "repay" the sum of the original investment. The time value of money is not taken into account in a simple payback calculation.

Rule: Choose investment with the shortest payback period!

Due to the higher capital intensity of renewable energy investments compared to that of traditional sources of electricity an investment assessment exclusively based on the payback period is inappropriate.

Profit/cost comparisons and profitability comparisons measure a company's earnings relative to revenues, assets and/or equity and analyse its ability to generate profits and cash flows. Respective results need to be benchmarked against industry average or investment opportunities in the same sector as well as historic data of the same company as profitability ratios vary significantly across industry sectors.

Rule: Choose investment with the highest profitability!

5.2. TIME VALUE OF MONEY

The "time value of money" concept is a key driver in dynamic investment calculation. A cash flow occurring now has not the same value than a cash flow of the same amount in two years' time.

Try to answer the following questions to understand the challenge:

- What do you prefer: 100 USD today or 100 USD in one year?
- What do you prefer: 100 USD today or 110 USD in one year?
- What do you prefer: 100,000 UGX today or 110,000 UGX in one year?

While the response to the first question is most likely a unanimous one, the responses to question 2 and 3 might vary, depending on your financial situation as well as your expectations on the FX development.

The time value of money is the principle that the current value of a cash flow of a defined amount varies depending on when the cash flow is expected to occur. The future value of a today's cash flow can be calculated taking into account the interest income earned on the cash flow until the future point in time.

The future value of a cash flow can be calculated by compounding the cash flow as follows:

$$FV_n = PV * (1 + i)^n$$

with:

$FV_n =$ Future value of the cash flow in period n
$PV =$ Present value of the cash flow
$i =$ interest rate
$n =$ Number of periods between the FV and PV period

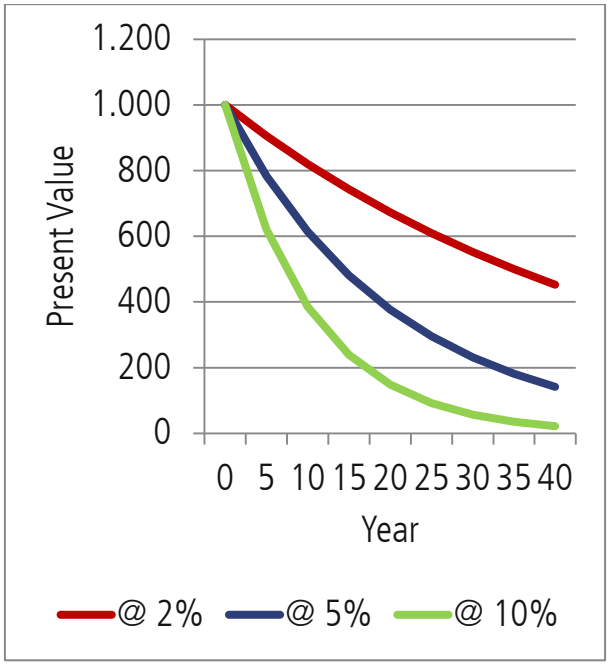
→ Check out the short video "PV_FV" for a concrete example

Accordingly, the present value of a cash flow can be calculated by discounting the cash flow as follows:

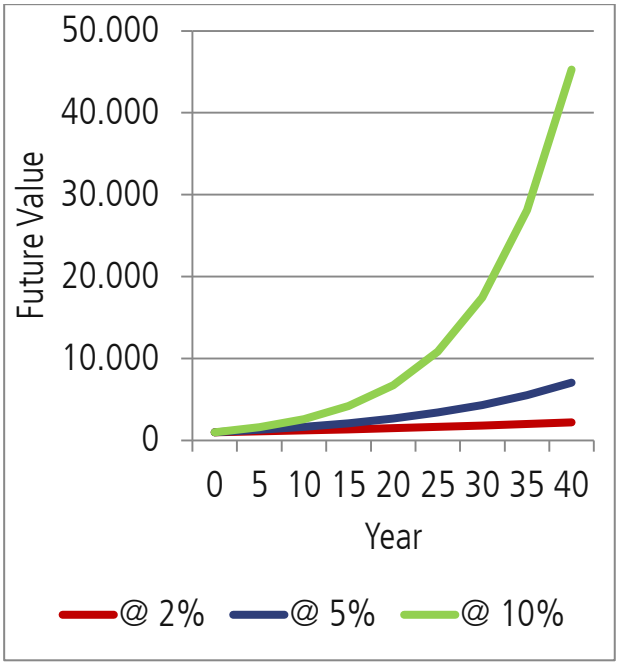
$$PV = FV_n/(1 + i)^n$$

The effect of compound interest is shown in the following charts:

Present value of Euro 1,000 in x years



Future value of Euro 1,000 in x years



These charts highlight the strong effect of high financing costs for capital intense investments like renewable energy assets. If an initial investment in a RE generation asset is only paid back over a lifetime of

20 years and assuming a high financing cost environment, the present value of the cash flows occurring in the later years is relatively small.

5.3. NET PRESENT VALUE

The Net Present Value is the present value of future cash flows discounted at a certain hurdle rate or discount rate i. The cash flows usually start with a negative cash flow, i.e. an investment, which then triggers positive cash flows in the following years.

In order to calculate the NPV, the discount rate needs to be determined. Large organisations typically have a set of discount rates they apply for different types of projects. Alternatively, professional advice can be sought from bankers or other advisors.

The discount rate should be consistent with the type of cash flows that one considers, i.e. nominal versus real cash flows and pre-tax versus post-tax cash flows. Nominal cash flows have to be discounted at a nominal discount rate. Real cash flows have to discounted at a real rate. Pre-tax cash flows have to be compared to a pre-tax benchmark. Post-tax cash flows have to be compared to a post-tax benchmark

Rule: Accept investments that have a positive NPV!

Rule: If you compare two investment opportunities, choose the one with the higher NPV!

→ Check out the short video "NPV" for a concrete example

5.4. INTERNAL RATE OF RETURN

The IRR is the discount rate which, when applied to a stream of cash flows, generates a NPV of zero. The IRR can be compared to a hurdle rate or discount rate and at least to come in at a similar level as the current WACC.

Rule: Accept investments that offer rates of return in excess of the benchmark or hurdle rate!

Rule: If you compare two investment opportunities, choose the one with the higher IRR!

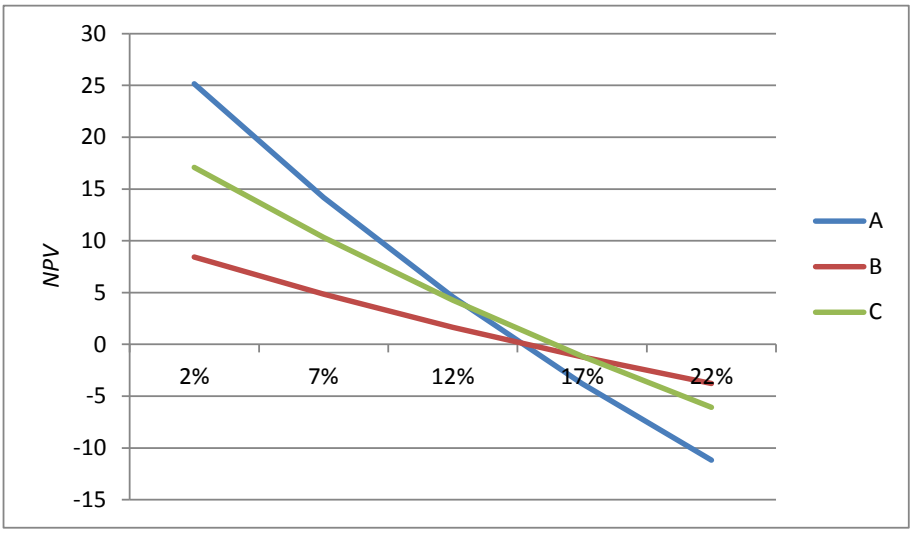
→ Check out the short video "IRR" and "XIRR" for a concrete example

A note of caution: The IRR calculation only considers the capital tied up in the project. For the capital that is not tied up, it is assumed that it is paying the same return as the capital still tied up in the project. Depending on the predictability of cash flows but also the potentially changing investment environment this assumption can be far away from reality.

NPV and IRR – the problem…

While the IRR is a very popular metric, it is not recommended to use it as an exclusive instrument to compare two or more investments. The following chart compares three investment opportunities (A-C):

N (number of years) =	0	1	2
A	(100)	10	120
B	(50)	40	20
C	(100)	90	30



Applying the NPV rule with a benchmark rate of 7% would result in the following project priority: A (NPV of 14.1), C (NPV of 10.3), B (NPV of 4.9).

Applying the IRR rule would result in a different project priority: C (IRR of 15.9%), B (IRR of 14.8%) and A (IRR of 14.7%).

Consequently, the two approaches might lead to contradicting recommendations. The results need to be interpreted taking into account the broader context of the investment opportunities and more sophisticated approaches like sensitivity analysis (which will be covered in module 10 of this course).

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