Foundations of Accounting & Finance

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Lecture – 49

Technique of Evaluating Capital Investment Decisions

Introduction

So far in corporate finance, we have discussed concepts such as annuities, perpetuities, growing annuities and growing perpetuities. We discussed how to determine the initial investment required to yield fixed or growing perpetual cash flows.

Moving beyond these foundational topics, we also touched on the crucial concept of the time value of money. Essentially, we have examined the notion that the value of money changes over time due to factors such as inflation. Therefore, understanding the time value of money is essential in assessing the worth of future cash flows in present terms.

This understanding leads us to discount future cash flows to their present value. However, it is crucial to note that the discount rate is not uniform across all investments. It varies based on factors such as the expected return and the associated risks and time frames.

For instance, when considering bond valuation, we observe that the prevailing interest rates in the market influence the discount rate. If the market interest rate are higher than the bond's coupon rate, we discount the future cash flows at the market rate, reflecting the current investment environment.

Moreover, the risk associated with different investment instruments also influences the expected return and, consequently, the discount rate. For instance, investing in equities typically entails higher risk compared to fixed-income securities such as bonds. Therefore, to compensate for this increased risk, investors demand higher returns, resulting in a higher discount rate for equity investments.

These fundamental principles extend to the valuation of both bonds and equities, where we apply various models such as the dividend discount model for equities and discounted cash flow analysis for bonds.

How these information cascade into making an investment decision?

Now, how do all these pieces of information translate into making an investment decision? Let us explore how these concepts come into play in the decision-making process. As an entity with various investment opportunities, the goal is to identify the most viable option for deploying funds. So, how do we evaluate and choose the best investment option? This is where capital investment decisions come into play.

We utilize the concepts of time value of money, to assess the viability of investment options. By discounting future cash flows, we account for the fact that a dollar today is worth more than a dollar in the future due to factors like inflation and risk. Essentially, we are determining the present value of future returns, allowing for a comparison of different investment opportunities on a level playing field.

By applying these valuation techniques, we can quantify the potential returns and risks associated with each investment option. This enables us to make informed decisions about where to allocate capital for maximum return on investment.

In essence, the concepts of valuation and the time value of money serve as fundamental tools in the process of evaluating and selecting the best investment opportunities. They provide a structured framework for assessing potential returns and risks, ultimately guiding decision-makers towards making sound investment choices.

Why Use Net Present Value?

Net Present Value (NPV) is a foundational tool in investment decision-making. It involves comparing the present value of cash outflows (initial investment) with the present value of cash inflows (returns) expected over a specified period. Essentially, NPV allows us to assess the profitability of an investment by converting future cash inflows into their current value and comparing them to the initial outlay.

If the present value of inflows exceeds that of outflows, indicating a positive NPV, the investment is typically considered worthwhile. Conversely, a negative NPV suggests that the investment may not yield sufficient returns to justify the initial expenditure. NPV focuses solely on cash flows and utilizes a discount rate based on the expected return on the investment. It is important to note that NPV assumes all cash flows can be reinvested at the specified discount rate—an assumption we make for simplicity in our analysis.

The Net Present Value (NPV) Rule

- Net Present Value (NPV) =

Total PV of future CF's + Initial Investment

- Estimating NPV:

1. Estimate future cash flows: how much? and when?

2. Estimate discount rate

3. Estimate initial costs

- Minimum Acceptance Criteria: Accept if NPV > 0
- Ranking Criteria: Choose the highest NPV

Example of NPV

Now, let us work on an example to illustrate NPV. Imagine the present year, which we will denote as year 0.

I am making an investment of ₹1,00,000. Now, over the next four years (year 1, year 2, year 3, year 4), there will be cash inflows. Specifically, in year 1, I will receive ₹20,000. In year 2, another ₹30,000. Year 3 will bring in ₹40,000, and finally, in year 4, another ₹30,000.

So, these are the cash flows we are dealing with. Now, the question arises: should you invest in this project? Well, you can compare it to another project with different cash flows.

Let us call the first option Project A. Now, let us introduce Project B. In this case, we still have an initial outlay of ₹1,00,000. However, the cash flow pattern is different. We receive ₹40,000 in the first year, ₹30,000 in the second year, ₹20,000 in the third year, and ₹20,000 again in the fourth year. In total, this amounts to ₹1,10,000.

Comparing the two options, we find that the total cash flows for Project A amount to ₹1,20,000, while for Project B they sum up to ₹1,10,000.

Now you would say which project is better?

Based solely on the surface numbers, Project A seems superior. It offers a total cash flow of ₹1,20,000, whereas Project B yields only about ₹1,10,000.

However, it is crucial to note that the cash flow distributions differ between the two projects. In Project A, the larger cash flows occur later, whereas in Project B, the larger cash flows are front-loaded.

To accurately assess the value of these cash flows, we need to consider their present values. Let us assume a discount rate of 10% for this analysis.

Let us calculate the present values for both projects at a 10% discount rate.

For Project A:

- Year 1: ₹20,000 discounted to ₹18,182
- Year 2: ₹30,000 discounted to ₹24,793
- Year 3: ₹40,000 discounted to ₹30,523

- Year 4: ₹30,000 discounted to ₹23,294

Adding these up, the total present value of cash flows for Project A is approximately ₹93,518.

Given that the initial outlay is ₹1,00,000, the NPV for Project A is negative, amounting to approximately ₹6,482. Thus, Project A appears to be unviable.

Now, let us move on to Project B:

- Year 1: ₹40,000 discounted to ₹36,364
- Year 2: ₹30,000 discounted to ₹24,793
- Year 3: ₹20,000 discounted to ₹15,026
- Year 4: ₹20,000 discounted to ₹13,660

The total present value of cash flows for Project B is approximately ₹89,843.

Comparing this to the initial outlay of ₹1,00,000, the NPV for Project B is negative, approximately ₹10,157.

Summary of decisions

In this scenario, even when discounted at 10 percent, both projects yield a negative NPV. Specifically, Project A's NPV is -₹ 6482 and Project B's NPV stands at -₹10,157. Unfortunately, this indicates that neither project is economically viable. The cash flows from these projects fail to offset the initial investment of ₹1,00,000, as the present value of the expected returns is less than the investment amount.

This illustrates a critical aspect of NPV analysis: the longer the duration until cash inflows are received, the greater the impact of discounting on their present value. This disparity emphasizes the importance of considering the timing of cash flows when evaluating investment options.

In summary, NPV serves as a guiding principle in investment decision-making. A project is deemed acceptable only if its NPV is greater than zero, indicating that the present value of the expected returns exceeds the initial investment. However, in this case, with NPVs below zero, neither Project A nor Project B meets this criterion, leading to the decision not to proceed with either project.

The Payback Period Method

Another method for evaluating investment options is the payback period method. While relatively simple, it is not widely used due to its failure to consider the time value of money.

Using the same example as before, let us consider the payback period. In this case, we choose the project that repays the initial investment the quickest. For instance, in Project A, the cumulative cash inflows reach ₹50,000 in the second year and ₹90,000 in the third year. Considering that we need ₹1,00,000, it takes three years and one-third of the fourth year to recoup the investment in Project A.

Now, examining Project B, the cumulative cash inflows amount to ₹70,000 in the second year, ₹90,000 in the third year, and we need another ₹10,000 to reach ₹1,00,000. Therefore, it takes three and a half years to recover the investment in Project B.

Comparing the payback periods, Project A offers a quicker return, providing the full investment back in three years and one-third of a year, whereas Project B takes three and a half years.

Essentially, the payback period method simply involves adding up the cash flows without considering the time value of money. It focuses solely on the time it takes to recoup the initial investment, making it a straightforward yet limited evaluation criterion.

Disadvantages:

- Ignores the time value of money
- Ignores cash flows after the payback period
- Biased against long-term projects
- Requires arbitrary acceptance criteria
- A project accepted based on the payback criteria may not have a positive NPV

Advantages:

- Easy to understand
- Biased toward liquidity

Summary of payback period

- How long does it take the project to "pay back" its initial investment?
- Payback Period = number of years to recover initial costs
- Minimum Acceptance Criteria:
    - Set by management
- Ranking Criteria:

- Set by management

The Discounted Payback Period

Discounted payback period essentially involves applying discounting to the cash flows. Once discounted, the goal is to determine at what point the cumulative cash inflows will equal the initial investment of ₹1,00,000. Unfortunately, in this specific example, neither option achieves this within the desired timeframe. Consequently, neither option is deemed viable.

To elaborate, we follow a similar calculation method as before. For instance, we add up the discounted cash flows, such as ₹18,182 for the first year, and so forth, until we reach the cumulative cash inflow of ₹1,00,000.

Now, does the discounted payback period method find widespread use? On one hand, it offers a nuanced perspective by considering discounted cash flows. On the other hand, the process of discounting cash flows is quite similar to calculating net present value (NPV). Consequently, some argue that if you're already conducting discounted cash flow analysis, you might as well proceed with NPV calculations.

In essence, while the discounted payback period serves as an additional reference point, it doesn't hold the same weight as NPV in practical investment analysis.

Summary of discounted payback period

- How long does it take the project to “pay back” its initial investment, taking the time value of money into account?
- Decision rule: Accept the project if it pays back on a discounted basis within the specified time.
- By the time you have discounted the cash flows, you might as well calculate the NPV.

The Internal Rate of Return

The IRR essentially signifies the rate at which the project's returns become feasible. It is the threshold rate above which the project becomes viable and below which it is not. In other words, it is the rate at which the Net Present Value (NPV) of a project equals zero.

To illustrate, consider the minimum acceptable criteria for a project. If, for instance, the project's expected return is 15 percent, we examine the IRR. If the IRR, where NPV is zero, is determined to be 12 percent, then the project is deemed feasible. Conversely, if the IRR surpasses the expected return—for instance, if the IRR is 16 percent for a project with an expected return of 15 percent—the project is considered non-viable.

Therefore, the IRR serves as a crucial benchmark. It signifies the discount rate at which the NPV equals zero, establishing the minimum acceptable criteria. If the project's expected return exceeds the IRR, it is deemed viable.

In practical terms, let us revisit our example. Had we discounted the cash flows at 5 or 6 percent, resulting in a positive NPV, and if the IRR were, say, 7 percent, it indicates that the project's returns exceed the cost of capital. Consequently, the project is deemed feasible, and one may proceed with it.

Summary of IRR decision

IRR: the discount rate that sets NPV to zero

Minimum Acceptance Criteria:

- If the expected return on the project is higher than the IRR accept

  Or

- If the discount rate (cost of capital) is lower than the IRR then accept

Ranking Criteria:

- Select alternative with the highest IRR

Reinvestment assumption:

- All future cash flows assumed reinvested at the IRR

Disadvantages:

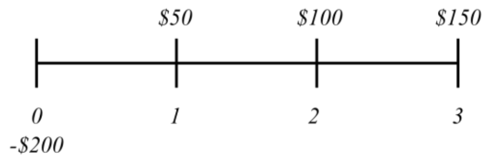
- Does not distinguish between investing and borrowing
- IRR may not exist, or there may be multiple IRRs
- Problems with mutually exclusive investments

Advantages:

- Easy to understand and communicate

IRR: Example

Consider the following project:



The internal rate of return for this project is 19.44%

$$NPV = 0 = -200 + \frac{\$50}{(1+IRR)} + \frac{\$100}{(1+IRR)^2} + \frac{\$150}{(1+IRR)^3}$$

NPV versus IRR

NPV and IRR will generally give the same decision.

NPV measures the difference between the initial outlay and the present value of future cash flows, determining acceptance if positive and rejection if negative. On the other hand, IRR provides the discount rate at which NPV equals zero. If a project's return exceeds the IRR, it is accepted; otherwise, it is rejected.

While IRR is generally reliable, it may weaken with non-conventional cash flows or mutually exclusive projects. In such cases, NPV is the more dependable choice.

The Profitability Index (PI)

$$\text{PI} = \frac{\text{Total PV of Future Cash Flows}}{\text{Initial Investent}}$$

The Profitability Index (PI) is calculated by dividing the total present value of all cash flows by the initial investment, resulting in a percentage representing the value of the cash flows relative to the initial investment.

In essence, it measures the efficiency of an investment by assessing how much value the cash flows generate relative to the initial outlay. The acceptance criterion for the profitability index is straightforward: it should be greater than 1. If the PI exceeds 1, it indicates a viable project.

However, like other evaluation methods, the profitability index faces challenges in scenarios involving mutually exclusive projects and other complexities. Despite these limitations, the PI remains a valuable tool for assessing the potential returns of an investment.

Disadvantages:

- Problems with mutually exclusive investments

Advantages:

- May be useful when available investment funds are limited
- Easy to understand and communicate
- Correct decision when evaluating independent projects

Summary of profitability index

Minimum Acceptance Criteria:

- Accept if PI > 1

Ranking Criteria:

- Select alternative with highest PI