Lecture 1

INSTITUTE OF ACTUARIAL & QUANTITATIVE STUDIES

Class: TY BSc

Subject : Financial Modelling

Chapter Name: Project Valuation – Creating a model for NPV and IRR

Today's Agenda

1. Basics of Capital budgeting
2. Categories of Capital budgeting projects
3. Principles of Capital budgeting projects
4. NPV – Net Present Value
5. IRR – Internal Rate of Return
6. Why choose NPV over IRR
7. What is project cost management?
   1. What are project costs?
   2. Direct cost
   3. Indirect cost

1 Basics of Capital Budgeting

The capital budgeting process is the process of identifying and evaluating capital projects; that is, projects where the cash flow to the firm will be received over a period longer than a year. Any corporate decisions with an impact on future earnings can be examined using this framework. Decisions about whether to buy a new machine, expand business in another geographic area, move the corporate headquarters to Cleveland, or replace a delivery truck, to name a few, can be examined using a capital budgeting analysis.

2 Categories of Capital Budgeting Projects

Capital budgeting projects may be divided into the following categories;

1. **Replacement projects to maintain the business** are normally made without detailed analysis. The only issues are whether the existing operations should continue and, if so, whether existing procedures or processes should be maintained.

2. **Replacement projects for cost reduction** determine whether equipment that is obsolete; but still usable, should be replaced. A fairly detailed analysis is necessary in this case.

3. **Expansion projects** are taken on to expand the business and involve a complex. decision-making process since they require an explicit forecast of future demand. A very detailed analysis is required.

4. **New products or market development** also entails a complex decision making process that will require a detailed analysis due to the large amount of uncertainty involved.

2 Categories of Capital Budgeting Projects

5. **Mandatory projects** may be required by a governmental agency or insurance company and typically involve safety-related or environmental concerns. These projects typically generate little to no revenue, but they accompany new revenue-producing projects undertaken by the company.

6. **Other projects.** Some projects are not easily analyzed through the capital budgeting process. Such projects may include a pet project of senior management (e.g., corporate perks), or a high-risk endeavor that is difficult to analyze with typical capital budgeting assessment methods (e.g., research and development projects).

3 Principles of Capital Budgeting Projects

1. Decisions are based on cash flows, not accounting income. The relevant cash flows to consider as part of the capital budgeting process are incremental cash flows, the changes in cash flows that will occur if the project is undertaken.

- Sunk costs are costs that cannot be avoided, even if the project is not undertaken. Since these costs are not affected by the accept/reject decision, they should not be included in the analysis. An example of a sunk cost is a consulting fee paid to a marketing research firm to estimate demand for a new product prior to a decision on the project.
- Externalities are the effects the acceptance of a project may have on other firm cash flows. The primary one is a negative externality called cannibalization, which occurs when a new project takes sales from an existing product. When considering externalities, the full implication of the new project (loss in sales of existing products) should be taken into account. An example of cannibalization is when a soft drink company introduces a diet version of an existing beverage. The analyst should subtract the lost sales of the existing beverage from the expected sales of the diet version when estimating incremental project cash lows. A positive extemality exists when doing the project would have a positive effect on sales of a firm's other project lines.

3 Principles of Capital Budgeting Projects

2. Cash flows are based on opportunity costs. Opportunity costs are cash flows that a firm will lose by undertaking the project under analysis. These are cash flows generated by an asset the firm already owns that would be foregone if the project under consideration is undertaken. Opportunity costs should be included in project costs. For example, when building a plant, even if the firm already owns the land, the cost of the land should be charged to the project since it could be sold or rented to an outside party if not used.

3. The timing of cash flows is important. Capital budgeting decisions account for the time value of money, which means that cash flows received earlier are worth more than cash flows to be received later.

4. Cash flows are analyzed on an after-tax basis. The impact of taxes must be considered when analyzing all capital budgeting projects. Firm value is based on cash flows they get to keep, not those they send to the government,

5. Financing costs are reflected in the project's required rate of return. The required rate of return is a function of its risk. Ordinarily, the level of risk is measured relative to the firm's overall risk and the required return relative to the firm's cost of capital. Only projects that are expected to return more than the cost of the capital needed to fund them will increase the value of the firm.

4 NPV - Net Present Value

This is one of the best techniques to help in deciding the best and the most rewarding alternative. As per this technique, the expected cash flow from the entire project (including the outflows) is discounted at the applicable cost of capital to the firm, to find out its present value. The resulting figure after adding the present value of all the cash inflows and reducing from it the present value of expected cash outflow is the present value of the project.

$$NPV = \sum_{t=1}^{n} \frac{CF_t}{(1+r)^t} - Outlay$$

Where,
CF_t = after tax cashflow at time t
r = required rate of return for investment
Outlay = investment cashflow at time zero

4 NPV - Net Present Value

The decision rule for the NPV is:

- invest in the project if NPV > 0;
- do not invest in the project if NPV < 0; and
- stay indifferent if NPV = 0.

In other words, positive NPV investments are wealth increasing, while negative NPV investments are wealth decreasing.

5 IRR - Internal rate of return

IRR is the discounting rate at which the present value of all the expected future cash inflows becomes equal to the present value all the expected future cash outflow. It is the rate of return generated internally by the project.

The project with the highest IRR should be selected over others and if there is no choice (i.e. there is a single project), select the project if IRR is greater than/equal to the required rate of return or the weighted average cost of capital (WACC).

$$\sum_{t=1}^{n} \frac{CF_t}{(1+r)^t} = Outlay$$

Where,
CF_t = after tax cashflow at time t
r = required rate of return for investment
Outlay = investment cashflow at time zero

5 IRR – Internal rate of return

The decision rule for the IRR is to:

- invest in the project if the IRR exceeds the required rate of return for the project i.e. invest if IRR > r; and
- do not invest if IRR < r.

In instances where the outlays for a project occur at times other than time 0, a more general form of the IRR equation is:

6 Why choose NPV over IRR

1. NPV shows the exact currency amount of returns earned.
2. NPV is considered a more realistic method, economically, of calculating returns.
3. In the case of non-conventional cash flows, there could be multiple IRRs, as well.

7 What is project cost management?

Project cost management is a process that involves the estimation and allocation of the project budget and subsequent costs, as well as project cost control.

Project cost management allows you to have a clear picture of the financial status of your project. It helps project managers predict future expenses and act accordingly.

Some of the benefits of project cost management are:

- Decreased expenses,
- Increased efficiency, and
- Progress tracking.

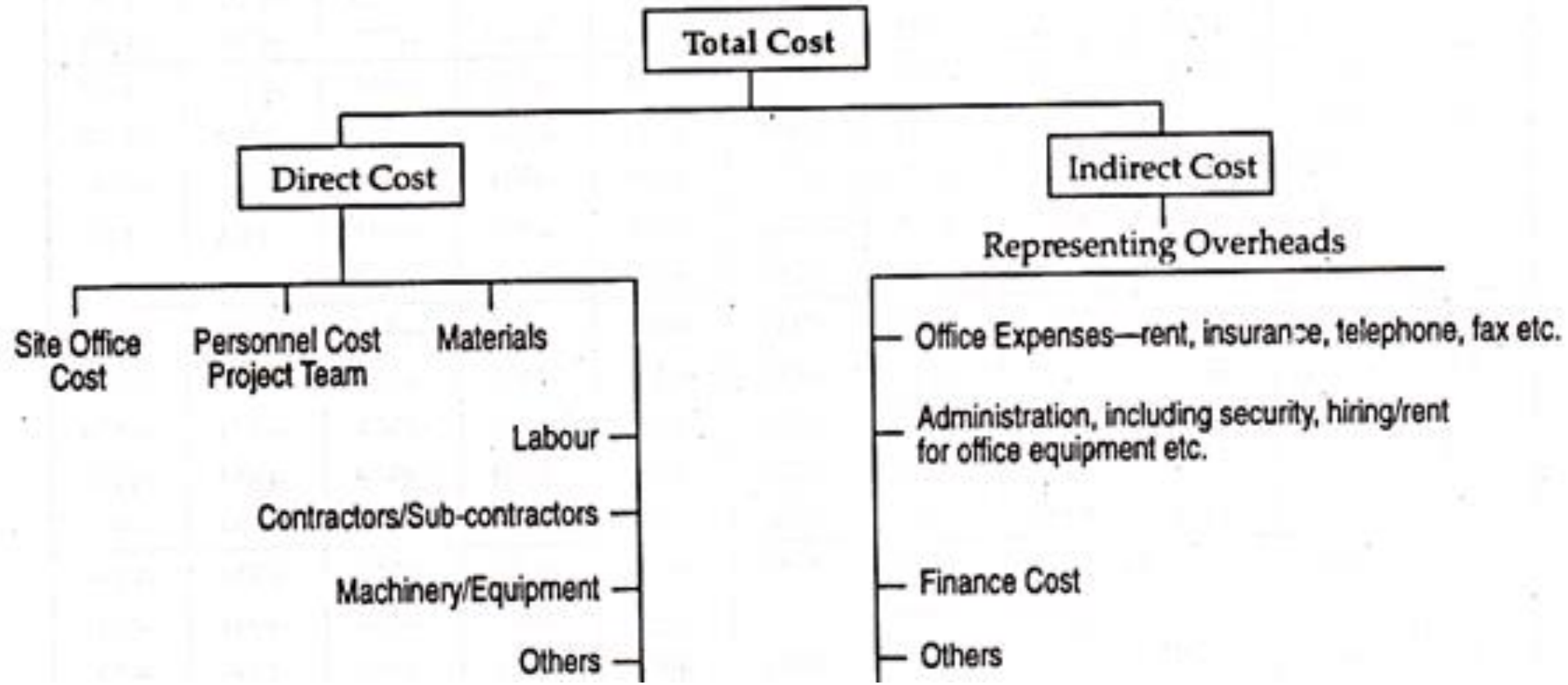
7.1 What are project costs?

Project costs are the total funds needed to monetarily cover and complete a business transaction or work project.

Project costs involve:

1. Direct costs — Direct costs are those directly involved with the project and necessary in order to complete said project.
2. Indirect costs — Indirect costs for a project are costs that do not directly lead to project completion but are still vital for the company or individual working on said project. As such, they are a part of individual project costs.

7.1 What are project costs?



7.2 Direct costs

Direct costs include the cost of:

- **Professionals working on the project** — i.e. company employees or outsourced contractors and freelancers.
- **Equipment** — i.e. the tools and machines the employees, contractors, or freelancers use to finish the project.
- **Materials** — i.e. physical materials (that are not tools or machines) needed to finish the project.
- **Project management tasks** — i.e. all tasks meant to facilitate project completion before a given time, and according to specific requirements.
- **Engineering tasks** (if needed) — i.e. all research, design work, and installation of equipment made in order to finish the project.
- **Transportation** (if any) — i.e. custom rates, bringing the finished product to retailers, etc.

7.3 Indirect costs

Indirect Cost is further sub-divided in Fixed and Variable, depending upon the incidence of cost.
Indirect costs include the cost of:

- **Operating overhead expenses** — i.e. office rent, utilities, insurance, general office equipment, and materials.
- **Target annual salary** — i.e. the clean profit the company or individual wants to make, in addition to the money needed to cover overhead and other expenses.