Capital Budgeting Techniques

1. Capital budgeting analysis deals with decisions about long-term investments (assets).

2. Capital budgeting projects are classified as either:
   a. Replacement decisions—whether to replace older, worn out assets to maintain existing operations.
   b. Expansion decisions—whether to add new assets to increase operations.

3. Decisions as to whether to purchase a capital budgeting project can be categorized as being either:
   a. independent—the decision to purchase one particular asset does not affect decisions to purchase any other assets, or
   b. mutually exclusive—the decision to purchase one particular asset means that other assets being considered cannot be purchased.
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4. Capital budgeting analysis entails two basic steps:
   a. Decision as to which projects are acceptable—acceptable projects increase the value of the firm.
   b. Decision as to which acceptable projects will be purchased—some acceptable projects cannot be purchased because they are mutually exclusive.

5. Following are the steps that should be followed when evaluating the acceptability of capital budgeting projects, or any other investments:
   a. Estimate the cash flows the project is expected to generate during its life.
   b. Determine the project’s required rate of return (based on its risk).
   c. Using the required rate of return, compute the present value of the cash flows the project is expected to generate during its life.
   d. If the present value of the expected cash flows is greater than the amount that must be invested to purchase the project, it is considered acceptable.
6. Valuing any investment (asset):

\[ \text{Value} = \sum_{t=0}^{n} \frac{\hat{\text{CF}}_t}{(1+r)^t} \]

7. Basic capital budgeting techniques:
   a. Net present value (NPV) = Project’s value – Initial investment; a project is acceptable if its NPV > 0.
   b. Internal rate of return (IRR)—the average annual return the project will generate during its life; interpretation is the same as the yield to maturity (YTM) for a bond; a project is acceptable if its IRR > Required rate.
   c. Payback period—how long it takes to recover the initial investment; a project is acceptable if its payback period is “low enough.”
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• Net present value (NPV):

\[ NPV = \frac{\hat{CF}_0}{(1 + r)^1} + \frac{\hat{CF}_1}{(1 + r)^2} + \cdots + \frac{\hat{CF}_n}{(1 + r)^n} \]

If NPV > 0, the project is acceptable, because investing in it will increase the value of the firm; i.e., the present value of the future cash flows is greater than the cost of the project.

• Internal rate of return (IRR):

\[ \hat{CF}_0 = \frac{\hat{CF}_1}{(1 + IRR)^1} + \frac{\hat{CF}_2}{(1 + IRR)^2} + \cdots + \frac{\hat{CF}_n}{(1 + IRR)^n} \]

If IRR > r (the firm’s required rate of return), the project is acceptable, because investing in it will increase the value of the firm; i.e., the return earned on the project is greater than required.

• In every case, when NPV > 0, IRR > r, and vice versa.
8. NPV profile—a graph that shows NPV values at various required rates of return. An NPV profile provides the following information:
   a. The required rates of return for which the project has positive NPVs as well as the required rates of return for which the project has negative NPVs.
   b. The project’s IRR.
   c. The project’s initial investment.

9. Cash flow patterns:
   a. Conventional—generally negative cash flow(s) in the beginning of the project’s life, followed by positive cash flows throughout the remaining life.
   b. Unconventional—positive cash flow pattern interrupted with negative cash flows more than one time during the project’s life.

10. Multiple IRRs—generally occur with unconventional cash flow patterns.
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11. Modified internal rate of return (MIRR)—solves the multiple IRR problem
   a. Compute the present value (PV) of all cash outflows (current and future); sum the PVs.
   b. Compute the future value (FV) of all cash inflows using the firm’s required rate of return; sum the FVs.
   c. Determine what rate of return equates the sum of the PVs of the cash outflows with the sum of the FVs of the cash inflows; this is the project’s MIRR.
   d. A project is acceptable if its MIRR > r.

12. Payback period—length of time it takes to recapture (pay back) a project’s initial investment from the future cash flows:
   a. Traditional payback period (PB)—unadjusted cash flows are used; using this technique, a project is acceptable if PB < (Years set by the company).
   b. Discounted payback period (DPB)—PVs of cash flows are used; using this technique, a project is acceptable if DPB < (Life of project).
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13. Following are the capital budgeting techniques that are based on the time value of money (TVM):
   a. NPV
   b. IRR
   c. MIRR
   d. DPB

14. If a project is determined to be acceptable using NPV—that is, NPV > 0—it must be determined to be acceptable if any of the other techniques that are based on TVM are used—that is IRR > r, MIRR > r, and DPB < Project’s life—and vice versa.

15. The traditional payback period (PB) is not based on TVM. As a result, if a project is found acceptable using PB, no information is provided regarding the project’s NPV, IRR, MIRR, or DPB.