Capital Budgeting – A Conceptual Framework

Capital Budgeting

- Definition: Capital Budgeting is the process of planning and managing a firm’s investment in long-term assets or projects.
- Key Characteristic: These investments involve substantial current outlay (cost) in exchange for future benefits expected to be realized over several years.
- Examples: Buying new machinery, building a new factory, launching a new product line, or acquiring another company.

Characteristics of Capital Budgeting Decisions

- Long-Term Impact: Decisions have consequences spanning many years, affecting the firm's cost structure, profitability, and competitive standing for the foreseeable future.
- Irreversibility: Once committed, these investments are often difficult, costly, or impossible to reverse without significant loss.
- Large Outlay: They typically involve massive expenditures, requiring careful planning and scrutiny.
- Risk and Uncertainty: The benefits (cash flows) occur in the future, making them subject to economic, market, and technological uncertainty.

Objectives of Capital Budgeting

- Primary Objective: To select those investment projects that will add the most value to the firm.
- Core Goal: To maximize the wealth of the shareholders.
- Operational Objective: To ensure that the firm earns a rate of return on its projects that is greater than the cost of funding those projects (Cost of Capital).

The Capital Budgeting Process: Overview

- The entire process is a systematic flow of evaluation and control designed to allocate scarce capital efficiently.
- Five Major Steps:
  - Project Identification and Generation.
  - Cash Flow Estimation (The most critical step).
  - Project Evaluation and Selection.
  - Project Implementation (Execution).
  - Project Review and Post-Audit.

Step 1: Identification and Generation

- Source of Ideas: Ideas can originate from various departments: production (need for new machinery), R&D (new product development), marketing (expansion into new territory), or top management (strategic acquisitions).
- Need for Structure: A firm must have a clear strategy and screening mechanism to ensure that only viable, strategic projects move forward for detailed analysis.

Step 2: Cash Flow Estimation

- Definition: Determining the relevant cash inflows (benefits) and cash outflows (costs) associated with the project over its entire life.
- Crucial Distinction: Cash flow is NOT the same as accounting profit. Accounting profit includes non-cash items like depreciation.
- Focus: Only incremental, future, after-tax cash flows are relevant.

Project Evaluation and Selection

- Evaluation: Applying various quantitative techniques (like and) to assess the project's financial viability.
- Decision Rule: Compare the calculated metric (e.g., the profitability of the project) against a predetermined minimum acceptance criterion (usually the Cost of Capital).
- Selection: Choosing the best project(s) based on the ranking derived from the evaluation techniques.

Step 4 & 5: Implementation and Review

- Implementation: Putting the selected project into action (e.g., ordering machinery, commencing construction). This requires coordination among technical, financial, and operational teams.
- Post-Audit/Review: Comparing the actual cash flows and returns achieved by the project with the initial projections made during the estimation phase.
- Learning: This step is crucial for identifying biases in forecasting and improving the accuracy of future capital budgeting decisions.

Classification of Investment Projects

- Projects can be categorized based on their purpose and their relationship to other projects.
- By Purpose:
  - Replacement and Modernization.
  - Expansion of Capacity.
  - Diversification (New Products/Markets).
  - Research and Development ().

Independent Projects

- Definition: Projects whose acceptance or rejection does not affect the cash flows or decision criteria of other projects.
- Decision: All financially viable independent projects can be accepted, provided the firm has the necessary funds (no capital rationing).

Mutually Exclusive Projects

- Definition: Projects that compete with each other, such that accepting one automatically means rejecting the others.
- Example: A company needs a new server; it can buy Server A or Server B, but not both.
- Decision: The firm must select the single best project among the mutually exclusive options, even if several are financially viable.

Contingent or Complementary Projects

- Contingent: The acceptance of one project is conditional on the acceptance of another project. (e.g., Building a factory requires investing in environmental compliance equipment).
- Complementary: Two projects enhance each other's profitability (e.g., opening a new distribution center *and* buying trucks to service it). They are often evaluated as a single package.

The Incremental Approach Principle

- Focus: In all evaluation, only the incremental cash flows are relevant.
- Incremental CF: The difference between the cash flow of the firm with the project and the cash flow of the firm without the project.
- Sunk Costs: Costs already incurred and unrecoverable (like preliminary spending) must be ignored as they are not incremental to the decision.

Components of Relevant Cash Flows

- Cash flows are typically grouped into three categories:

1. **Initial Outlay:** Cash flow at time zero (t=0).
2. **Operating Cash Flows:** Cash flows generated throughout the project's life (years 1 to n).
3. **Terminal Cash Flow:** Cash flow at the project's end (t=n).

Calculating the Initial Outlay

- **Components:**
- Cost of new asset (Purchase Price).
- Installation and shipping costs.
- Change in Net Working Capital (typically an increase in inventory/receivables).
- (Less) Net proceeds from selling any old asset being replaced.
- (Add/Less) Taxes/Tax Savings on the sale of the old asset.

Calculating Annual Operating Cash Flow (OCF)

- Formula: $\text{OCF} = (\text{EBIT} \times (1 - \text{Tax Rate})) + \text{Depreciation}$
- Explanation: Since depreciation is a non-cash expense that reduces taxable income, it must be added back to the after-tax profit to find the actual cash flow.
- EBIT: Earnings Before Interest and Taxes (Incremental revenue minus incremental operating costs, excluding depreciation and interest).

The Role of Depreciation in Cash Flow

- **Depreciation is a Tax Shield:** It is a non-cash charge that reduces the firm's tax liability.
- **Tax Savings:** The tax savings generated by depreciation equals $\text{Depreciation} \times \text{Tax Rate}$.
- **Impact:** This tax savings component is included in the OCF calculation and represents a real cash inflow benefit.

Calculating the Terminal Cash Flow

- Components:
  - Net Salvage Value of the asset (Sale Price $\pm$ Tax on Sale).
  - Recovery of Net Working Capital (the initial investment in NWC is recovered).
- Note: The sign of the working capital recovery is usually opposite to its sign in the Initial Outlay (e.g., if NWC increased initially, it decreases/is recovered at the end).

Evaluation Techniques: Introduction

- Capital budgeting techniques provide decision rules for accepting or rejecting a project.
- Two Major Categories:
  - **Non-Discounted (Traditional) Methods:** Ignore the time value of money.
  - **Discounted (Modern) Methods:** Explicitly consider the time value of money (the core of modern finance).

Non-Discounted Method 1: Payback Period (PP)

- **Definition:** The number of years required for the cumulative cash inflows from the project to equal the initial cash outlay.
- **Calculation:** For projects with constant OCF: $\text{PP} = \frac{\text{Initial Investment}}{\text{Annual Cash Flow}}$.
- **Decision Rule:** Accept the project if its PP is less than the firm's maximum acceptable payback period.

Advantages and Disadvantages of Payback Period

- Advantages:
  - Simple to calculate and easy to understand.
  - Emphasizes liquidity and risk reduction (shorter PP means less exposure).
- Disadvantages (Critical Flaws):
  - **Ignores Time Value of Money:** Treats cash flows received today and in the future equally.
  - **Ignores Cash Flows After Payback:** Fails to consider the project's profitability beyond the payback date.

Non-Discounted Method 2: Accounting Rate of Return (ARR)

- Definition: Also known as the Average Rate of Return. It is based on accounting income (profit) rather than cash flow.
- Calculation: $\text{ARR} = \frac{\text{Average Annual Accounting Profit}}{\text{Average or Initial Investment}}.$
- Decision Rule: Accept the project if the ARR is greater than a target rate established by management.

Disadvantages of Accounting Rate of Return (ARR)

- Ignores Time Value of Money: Like Payback Period, this is a fatal theoretical flaw.
- Uses Accounting Profit: Uses profit, which is influenced by accounting rules (like depreciation method), not true economic cash flow.
- Lack of Clear Acceptance Criteria: The target rate is arbitrary and not directly linked to the market or the Cost of Capital.

Discounted Methods: The Time Value of Money (TVM)

- The Foundation of Modern Finance: A rupee today is worth more than a rupee tomorrow.
- Reason: Opportunity to invest, inflation, and uncertainty (risk).
- Cost of Capital (k): The rate of return a firm must earn on its investments to maintain the market value of its shares. This is the Discount Rate used in all discounted methods.

Discounted Method 1: Net Present Value (NPV)

- Definition: The present value of all future cash inflows generated by the project minus the present value of all cash outflows (the initial investment).
- Concept: It represents the net addition to the wealth of the shareholders, measured in today's rupees.

The NPV Formula

- $$\mathrm{NPV} = \sum_{t=1}^{n} \frac{\mathrm{CF}_t}{(1+k)^t} - \text{Initial Outlay}$$

- Where: CF_t is the cash flow at time t.
- k is the firm's Cost of Capital (Discount Rate).
- n is the project's life.

The NPV Decision Rule

- If $\mathrm{NPV} > 0$ (Positive): Accept the project. The project is expected to earn a return greater than the Cost of Capital, adding value to the firm.
- If $\mathrm{NPV} < 0$ (Negative): Reject the project. The project earns less than the Cost of Capital and will destroy shareholder wealth.
- If $\mathrm{NPV} = 0$: Indifferent. The project just meets the required rate of return.

Advantages of the NPV Method

- **Consistent with Wealth Maximization:** Directly measures the increase in shareholder wealth.
- **Time Value Considered:** Correctly incorporates the time value of money by discounting cash flows at the Cost of Capital.
- **Clear Accept/Reject Criterion:** The decision rule is unambiguous (> 0 accept, < 0 reject).
- **Reinvestment Assumption:** Implicitly assumes cash flows are reinvested at the Cost of Capital (k), which is generally realistic.

Discounted Method 2: Internal Rate of Return (IRR)

- Definition: The discount rate at which the Net Present Value (NPV) of a project becomes exactly zero.
- Concept: It is the effective compounded annual rate of return that the project is expected to yield over its life.

The Calculation and IRR Decision Rule

- **Calculation:** Finding the IRR requires solving the NPV equation for the discount rate (r):

$$\sum_{t=1}^{n} \frac{\text{CF}_t}{(1+r)^t} = \text{Initial Outlay}$$

  - This is typically solved through trial and error or using financial calculators/software.
- **Decision Rule:**
  - If $\text{IRR} > k$ **(Cost of Capital):** Accept the project.
  - If $\text{IRR} < k$ **(Cost of Capital):** Reject the project.

Advantages and Disadvantages of IRR

- Advantages:
  - Time Value Considered: Correctly incorporates TVM .
  - Intuitive and Easy to Communicate: Managers prefer to work with a percentage return rather than a rupee value (NPV).
- Disadvantages (Theoretical Problems):
  - **Multiple IRRs:** For projects with unconventional cash flows (e.g., costs late in the project life), it can yield more than one .
  - **Reinvestment Assumption:** Assumes cash flows are reinvested at the **rate**, which is often overly optimistic, especially if the is very high.

Discounted Method 3: Profitability Index (PI)

- Definition: The ratio of the Present Value of Cash Inflows to the Present Value of Cash Outflows (Initial Outlay).
- Concept: Measures the relative profitability or the benefit provided per rupee of investment.

The PI Formula and Decision Rule

- $$\text{PI} = \frac{\text{PV of Future Cash Inflows}}{\text{Initial Cash Outlay}}$$
- **Decision Rule:**
  - If $\text{PI} > 1$: Accept the project. The present value of benefits exceeds the present value of costs (NPV must be positive).
  - If $\text{PI} < 1$: Reject the project.
- **Usefulness:** Extremely useful when a firm faces **Capital Rationing** and needs to prioritize projects based on return per rupee invested.

NPV vs.IRR : The Conflict

- **Conflict:** When ranking mutually exclusive projects, NPV and IRR can sometimes give conflicting rankings.
- **Cause of Conflict:** Differences in the scale of the projects or differences in the timing of cash flows.
- **Resolution:** The NPV rule is theoretically superior and should always take precedence. NPV directly measures wealth maximization, while IRR's reinvestment assumption can be flawed.

Introduction to Risk in Capital Budgeting

- Risk: The possibility that the actual cash flows of a project will differ from the projected cash flows.
- Need for Adjustment: Since riskier projects are less certain, they should require a higher expected rate of return than less risky projects.
- Techniques to Handle Risk:
  - Risk-Adjusted Discount Rate (RADR).
  - Certainty Equivalent Method.
  - Sensitivity and Scenario Analysis.

Risk-Adjusted Discount Rate (RADR)

- **Principle:** Instead of discounting all projects at the same Cost of Capital (k), riskier projects are discounted at a higher rate (k').

$$k' = k + \text{Risk Premium}$$

- **Impact:** Using a higher discount rate gives a lower NPV, penalizing the project for its higher risk.

Capital Rationing (Constraints on Funds)

- **Definition:** A situation where a firm has accepted several profitable projects (Positive NPV) but does not have sufficient capital (funds) to undertake all of them.
- **Decision Criterion:** In capital rationing, the firm should prioritize projects that maximize the **total** NPV from the limited budget.
- **Role of PI:** The PI (which measures return per rupee) is often a useful tool for selecting the optimal combination of projects under rationing.

Conclusion: The Core of Corporate Finance

- Summary: Capital budgeting is the art and science of allocating scarce resources to value-adding projects.
- Key Takeaway: The discounted cash flow methods (NPV,IRR) are the cornerstones of modern capital budgeting, providing the best link between investment decisions and the core financial goal of maximizing shareholder wealth.

Thank you

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