Project Formulation Appraisal and Management

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UP Academy of Administration and Management, Lucknow
Financial Analysis: Basic Principles

• Appraisal done in a sequence: Financial, Economic, Stakeholder (social), Risk analyses
• Cash flow approach to project/program appraisal
• Cash flows from different perspectives
• Starting point for project appraisal is construction of cash flows over the project life cycle whether:
  – New investments
  – Replacements, expansions, mergers -- use of existing assets or resources
Construction of the Cash Flow Statement for a Project

• Investment projects can be simple or complex

• **Simple investment:** single capital purchase with a simple benefit stream such as
  – Purchase farmland and rent to tenant farmers
  – Purchase motor vehicle to operate as a taxi

• **Complex investment**
  – Agricultural processing plant, mine, public utility, manufacturing facility
  – Complex investment and operating phases over many years with multiple revenue and expenditure items
  – Requires detailed investment and operating plans
Simple investment in farmland

\[ B_t - C_t \]

Discount rate or opportunity cost of funds = 10%
Annual rental receipts from land = 100
Expected gross benefits = 100/10% = 1,000
Cost of land = 850
Expected net benefit = 150
Complex investment: Resource or Cash Flow Profile of Project

- Year of Project Life

<table>
<thead>
<tr>
<th>Benefits Less Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15</td>
</tr>
</tbody>
</table>

Initial Investment Period

Operating Stage

Stage

Year of Project Life
Components of project cash flows

A. Investment Plan  
- Reconciles technical construction plans with the financing plan and manpower availability

B. Operating Plan  
- Reconciles demand (market) module with operation of the project

C. Treatment of price levels over project time horizon  
- Cash flows capture complex pattern of all revenues and costs over life of project; discounting future flows allows consolidation into a point of time for decision making  
- Changes in real prices, inflation and exchange rate are relevant

D. Cash flow vs. profit and loss account
Key Variables in Cash Flow Statement

a. The issue of the opportunity cost

- All resources used in a project should be charged as the project cost since public or private investor is forgoing value that could be earned in alternative uses – concept of “opportunity cost”

- Not all “cash flows” are actual flows of cash through an account. Where existing resources are used, opportunity cost or the forgone “cash flows” are charged to the investment for using these resources
  - Existing land, building and machinery
  - Time of owner-manager of business
Key Variables in Cash Flow Statement (Contd.)
Interest During Construction Versus Financing Costs of Debt During Construction Period

b. Interest During Construction
• Opportunity cost of investment funds when construction extends over more than one period
• Is it an investment cost?

Actual Financing Costs of Debt During Construction: Alternative situations:
  i. Owner’s point of view
    • Interest paid
    • Interest accrued but not paid
  ii. Point of view of total investment
    • Issue of interest does not arise as debt not included in this perspective
Measuring Investment Costs: An Illustration

What Is The Total Cost of a Three Year Investment?

\[ B_t - C_t \]

\[ \begin{array}{cccc}
  t_0 & t_1 & t_2 & t_3 \\
  50 & 100 & 50 & \text{Time} \\
\end{array} \]
Compounding and Discounting

• We compound capital using the market interest rate as opportunity cost of funds e.g: $0 100 deposited now at 10% for one year, becomes $1 110 next year.

• Alternatively, we can discount the $1 110 received next year back to year 0 values by “discounting” with the discount factor of \[ \frac{1}{1+i} = \frac{1}{1+0.10} = 0.909 \] Multiplying $1 110*[1/(1.10)] = $0 100 (i discount factor).

• We have discounted the 110 of year one, to a “present value” of 100 in year 0.
What Is the Total Cost of a Three Year Investment? (Cont’d)

Opportunity Cost of Funds or discount factor = 10%

**Investment Costs:**

a. Simple Sum = $200

b. At $t_0 = \frac{50}{1.1} + \frac{100}{(1.1)^2} + \frac{50}{(1.1)^3}$
   \[= 45.45 + 82.64 + 37.57 = \$165.66\]

c. At $t_3 = 50 + 100(1.1) + 50(1.1)^2 = \$220.50$

Interest during construction is equal to $\$20.50$
c. Treatment of depreciation

• Why worry about the concept of depreciation expense?
• Why is depreciation expense not a cash flow item?
• Use of depreciation expense in calculating cash flow profile:
  – To estimate taxes (tax depreciation)
  – To estimate residual values of assets at the end of project (economic depreciation)
d. Cash Receipts Versus Sales

\[
\text{Cash Receipts for Period (Inflow)} = \text{Sales for Period} + \text{Accounts Receivable for Beginning of Period} - \text{Accounts Receivable for End of Period}
\]

For Example:
\[
\text{Sales}_1 = 10,000 \\
\text{Accounts Receivable}_0 = 5,000 \\
\text{Accounts Receivable}_1 = 8,000 \\
\text{Receipts} = 10,000 + (5,000 - 8,000) = 7,000
\]

*Do we have accounts receivables in a public sector project?*
e. Cash Expenditures Versus Purchases

\[
Purchases \text{ for Period} \\
+ \\
Accounts Payable \text{ at Beginning of Period} \\
- \\
Accounts Payable \text{ at End of Period} \\
\]

\text{Cash Expenditures for Period (Outflow)}

For Example:
\begin{align*}
Purchases_{1} &= 11,000 \\
Accounts \text{ Payable}_{0} &= 6,000 \\
Accounts \text{ Payable}_{1} &= 4,000 \\
\text{Expenditures} &= 11,000 + (6,000 - 4,000) = 13,000 \\
\end{align*}

Accounts payable in public sector?
g. Cash Held to Carry Out Transactions

- Cash held to carry out transactions (petty cash or imprest account) is a use of cash
- Increases in cash holdings is a cash outflow
- Decreases in cash holdings is a cash inflow

**For Example:** Desired stock of cash = 20% of sales

<table>
<thead>
<tr>
<th>Year</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales</td>
<td>2000</td>
<td>2500</td>
<td>3200</td>
<td>5000</td>
<td>0</td>
</tr>
<tr>
<td>Desired Cash</td>
<td>400</td>
<td>500</td>
<td>640</td>
<td>1000</td>
<td>0</td>
</tr>
<tr>
<td>Impact on Net Cash Flow</td>
<td>-400</td>
<td>-100</td>
<td>-140</td>
<td>-360</td>
<td>+1000</td>
</tr>
</tbody>
</table>
f. Accounting for Working Capital

• Working Capital requirement = Cash + Accounts Receivables - Accounts Payables + Inventories + Prepaid Expenses - Accrued Liabilities

• No further calculation needed to determine cash flow impact of working capital except for cash

• Important to properly plan for adequate financing and accounting for working capital for survival of projects

• Often need for working capital understated in project proposals
Analysis of Financial Profiles from Alternative Points of View

• Critical in analysis to evaluate financial outcome of project from the point of view of each interested party
• Conventional financial analysis considers:
  a. Point of view of owner or equity holder
  b. Point of view of all investors combined (Banker’s point of view or total investment point of view)

Other Perspectives
• Point of view of government budget
• Point of view of suppliers of inputs
• Point of view of downstream processors
• Point of view of competitors
• Point of view of economy as a whole
Cash Flows to Equity

• Cash flows to equity holders are fundamental to project appraisal
  – Equity holders are owners and bearers of the residual risk in the projects – as such are the ultimate decision makers on the design and attractiveness of a project
  – Cash flows to equity
    • Include interest charges and debt flows
    • Include taxes and subsidies
  – Cash flows to equity need to be discounted by the required rate of return of the equity holders reflecting the risks of the project
Cash Flows to Total Investment

- Cash flows to total investment are before (or excluding) cash flows to debt holders. They represent the free cash flows out of which the combined financiers (debt and equity holders) have to be paid.
- Includes taxes and subsidies
- Bankers (or debt holders) analyze cash flows to total capital to check how well the debt service payments will be covered by these flows as part of the risk assessment of the project.
- Discount rate is weighted average of cost of debt and cost of equity
## Analyses of Investment Decisions From Different Viewpoints

### Type of Analysis

<table>
<thead>
<tr>
<th>Viewpoint:</th>
<th>Financial (I)</th>
<th>Economic (II)</th>
<th>Stakeholder (III)</th>
<th>Basic Needs (IV)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Investment (Banker)</td>
<td>Yes</td>
<td>No/Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Owner</td>
<td>Yes</td>
<td>No/Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Government Budget Office</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Country</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Analyses of Investment Decisions from Different Viewpoints
Note: Exchange premium=10%;Receipts & Equipment 100% tradeable; Tradeable Operating cost =100

<table>
<thead>
<tr>
<th>Analysis →</th>
<th>Financial</th>
<th>Economic</th>
<th>Budget</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Banker’s (Total Investment) (A)</td>
<td>Owner (B)</td>
<td>Country (C)</td>
</tr>
<tr>
<td>Viewpoints:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year:</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Receipts</td>
<td>-1000</td>
<td>950</td>
<td>-1000</td>
</tr>
<tr>
<td>Operating Cost</td>
<td>-140</td>
<td>-140</td>
<td>-150</td>
</tr>
<tr>
<td>Equipment</td>
<td>-1000</td>
<td>950</td>
<td>-1000</td>
</tr>
<tr>
<td>Operating Subsidy</td>
<td>50</td>
<td>50</td>
<td>0</td>
</tr>
<tr>
<td>Taxes</td>
<td>-100</td>
<td>-100</td>
<td>0</td>
</tr>
<tr>
<td>Loan</td>
<td>500</td>
<td>-500</td>
<td>0</td>
</tr>
<tr>
<td>Interest</td>
<td>-50</td>
<td>-50</td>
<td>0</td>
</tr>
<tr>
<td>Environ. Externality</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Opp. Cost of Land</td>
<td>-30</td>
<td>-30</td>
<td>-30</td>
</tr>
<tr>
<td>Net Resource Flow</td>
<td>-1030</td>
<td>1130</td>
<td>-530</td>
</tr>
</tbody>
</table>
Mindanao Agro-business Complex: Integrated Agricultural Development

• Basic Facts:
  • Bukidnon Province in Mindanao Island is a rural area with one of the highest poverty levels in the Philippines
  • Bukidnon Resources Company, Inc. (BRCI) proposes to exploit the potential of the region by setting up a plant for the production of tomato paste
  • Under a contractual arrangement with BRCI, the farmers will be organized into cooperatives for the supply of fresh tomatoes to the plant
  • The plant is expected to produce up to 20,200 tons of tomato paste, part of which will be exported, mainly to Japan

• Project Outcome:
  • Deterministic case was good
  • Riskiness was low
  • Project was successfully implemented

**Deterministic Analysis**

<table>
<thead>
<tr>
<th></th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>NPV (Equity Point of View)</td>
<td>$146.95 Million Pesos</td>
</tr>
<tr>
<td>ROE</td>
<td>11.27%</td>
</tr>
<tr>
<td>NPV (Economic Point of View)</td>
<td>$1,139 Million Pesos</td>
</tr>
<tr>
<td>EOCX</td>
<td>10.30%</td>
</tr>
</tbody>
</table>
Figure 1: Project Parameters

Project Parameters, and Real Investment Table
(Tables 1a, 1b, and 1c)

- Inflation and Exchange Rate Projections
  (Table 2)
- Unit Cost of Production
  (End of Table 5)
- Production and Sales
  (Table 3a, 3b, 4 and 5)
- Working Capital
  (Table 6)

Financial Analysis

- Loan Schedule
  (Table 7)
- Tax and Economic
  Depreciation
  Schedule
  (Table 9 and 10)

- Total Investment Cash Flow (Nominal)
  (Table 12)
- Total Investment Cash Flow (Real)
  (Table 13A)
- Debt Service Capacity (Table 13B)

- Equity Holder’s Cash Flow (Nominal)
  (Table 14)
- Equity Holder’s Cash Flow (Real)
  (Table 15)

- (Cost of Good Sold)
- (Interest Expense)
- (Taxes)
**Figure 2: Economic Analysis**

**Step One: National Economic Parameters:**
- Economic Opportunity Cost of Capital
- Foreign Exchange Premium
  
  *(Table 16 for FEP)*

**Step Two: Economic Conversion Factors for:**
- Project Output(s)
- Project Inputs, including
  - Investments
  - Operating Expenses
  - Labor
- Working Capital
- Taxes, Tariffs, Subsidies, and Loans
  
  *(Table 17a, 17b, 17c, 17d and 17e)*

*(Applied to Real Financial Cash Flow Statement)*

**Statement of Economic Costs and Benefits**

*(Table 18)*
Figure 3: Distribution Analysis

A. Economic Real Net Resource Flow
   (Table 18)

- (Minus)

B. Financial Real Net Resource Flow
   (Table 13)

   (Yields)

C. Net Resource Flow of Externalities
   (Table 19)

D. Present Value
   (Table 20)

E. Allocation of Externalities
   (Table 20)
Figure 3: Distribution Analysis (Continued)

F. Summary of Distribution Project’s Net Benefits
(End of Table 21)

G. Reconciliation of Economic and Financial Analyses:
(Top of Table 21)

Economic NPV = Financial NPV + sum(PV Externalities)
Figure 4: Risk Analysis

A. Sensitivity Analysis
   (Table 22)

B. Risk Variables
   (Table 23 and 24)

C. Results
   (Table 25 and 26)
   (Figure 5, 6, and 7)
Construction of cash flows:
VALUATION OF EXISTING ASSETS

• Seldom start with “green field”: usually some existing assets
• Need to define base case without project:
  – Existing project should be first optimized before comparing with expanded project
  – Need to determine opportunity cost of existing assets being employed in activity
• Value of asset in a particular use is present value of the stream of net benefits it can yield in that use
• Value depends upon future net benefit stream; cost of investment depends upon past expenditures
• Opportunity cost of particular use of assets is highest value in alternative uses
Evaluation of Incremental Project Improvements

Continue Old Investment (without project)

Now

Benefit from Continuation of Old Project

Opportunity Cost of Historical Investments

Historical Investment

Old and New Investment Combined (With Project)

Benefit from Old and New

New Investment

Incremental Benefits

New Investment Cost (New+Loss in Output)

Incremental

B - A
Costs associated with continuing a project

• Historical Costs
  – If historical cost of asset is different from its current market value, the historical cost should not be used in the appraisal of the project -- need to determine opportunity costs.

• Opportunity Costs
  – What is the opportunity cost of the continued use of assets of existing facility?
  – Key factor in rehabilitation of projects
  – In-Use Value or Liquidation Value?

• Sunk Costs
  – Unexpected loss in value of assets after an investment has been implemented or capital loss from unexpected decline in market value of asset
  – Sunk Costs = (Net Historical Book Values) - (Greater of Liquidation or In-Use Values)
Simple Case: In-use versus Scrap Value

• Individual owns taxi: considering rehabilitation project
  – Incremental investment: Rehabilitate and operate taxi with benefits of improvements to vehicle?

• Decisions over alternative uses of taxi: Which has highest value?
  – Scrap value: Sell vehicle (without taxi license)?
  – In-use: Continue operating as taxi by current owner?
  – In-use: Sell as ongoing taxi business (with taxi license)?

• Note: In-use values can be affected by the specific skills or attributes of owner/managers to exploit assets relative to others in market
Simple investment in farmland

\[ B_t - C_t \]

Discount rate or opportunity cost of funds \( = 10\% \)

Annual rental receipts from land \( = 100 \)

Present value (PV) of expected gross benefits \( = 100/10\% = 1,000 \)

Cost of land \( = 850 \)

Net present value (NPV) or PV of expected net benefits \( = 150 \)

**In-use value of land?**  **Liquidation value of land?**
Estimation Technique to Determine In-Use Values (Net Replacement Cost Method)

• Most accurate way is to employ services of professional appraiser
• Most accurate is to find price if sold in market
• Short cut method:
  \[
  \text{In-Use Values} = [(\text{Historical cost of machinery, equipment, and structures}) \times 
  \left(\frac{\text{Price index}_T}{\text{Price index}_H}\right) \times (1 - \text{Proportion of asset depreciated}_T)]
  + \text{Land, Inventory, Accounts Receivable}
  - \text{Accounts Payable at current values}
  \]
Land Costs

- Land cost to project is opportunity cost, either annual rental value or capital cost to project for time that it uses land.
- Analysis needs to separate investment in land versus investment in project (one potential use of land).
- **Need to treat land as a separate investment.** Never include capital gains or losses on land as a benefit or cost to investment placed on land unless direct land improvement or development (for example, new landscaping or utilities by property developer) or destruction caused by project (such as with some mining projects).
- Land can be held undeveloped as separate investment project from development or use of land.
- Preferred Method: Rental Charge Approach.