



College of Engineering and Technology Department of Construction Technology and Management

Course: Financial Management of Construction

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Chapter 4

Investment Decisions (Capital Budgeting)

Chapter Summary

1. Discuss the time value of money and standard calculations showing the relationship b/n PV and FV.
2. Discuss different methodologies of economic analysis for investment appraisal.
3. Discuss how to budget capital on contract investment and how to establish ROCE and Mark-up in corporate budget planning.
4. Identify the different systems of control levels to monitor capital allocated for investment.

Introduction

- ***Investment (Capital Budgeting)*** is decision making process by which firms evaluate the purchase of fixed assets

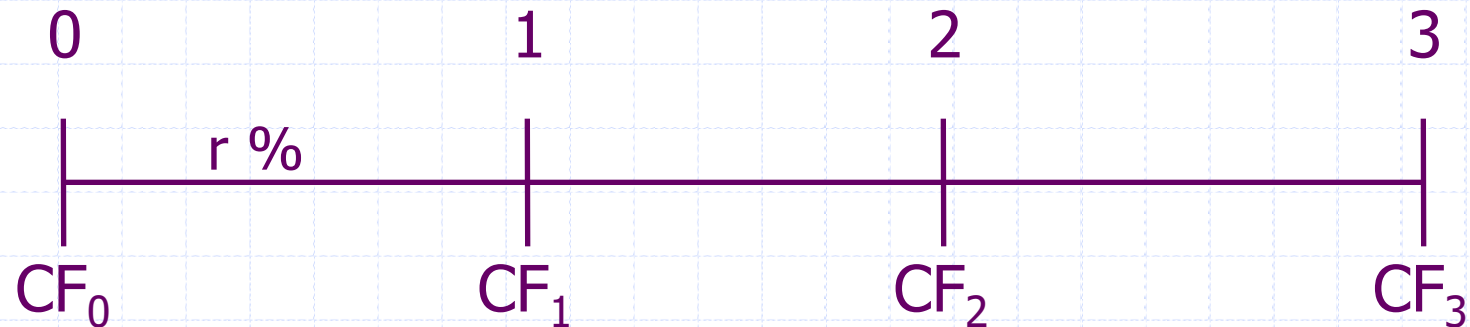
It is the whole process of analyzing projects and deciding which ones to include in the capital budget.

- ***Capital Budget*** is an outline of the planned investment in fixed assets
- ***Significance of investment:***
 - substantial expenditure
 - long time period
 - sales forecasts

4.1. The time value of money

- **Investor** prefer to receive payment of a fixed amount of money today, rather than an equal amount in the future.
- *Why?*
 - people prefer current consumption to future
 - to account for opportunity cost (to the least the interest payment)

4.1. The time value of money(cont...)



- Show the timing of cash flows.
- **Time Line**:- Tick marks occur at the end of periods, so Time 0 is today; Time 1 is the end of the first period (year, month, etc.) or the beginning of the second period.

4.1. The time value of money(cont...)

General Assumption:

- Cash Flows (CFs) occur at the END of the period, unless stated otherwise.
- Payments (PMTs) occur at the END of the period (ordinary annuity), unless stated otherwise.

4.1. The time value of money(cont...)

CFs can either be:

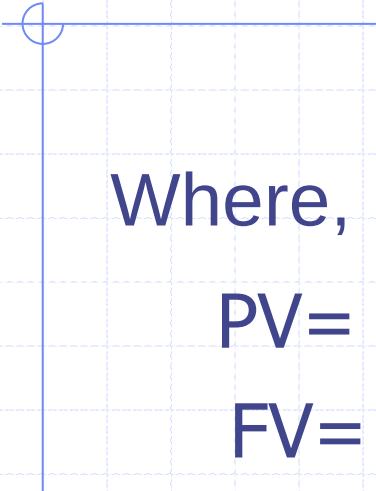
- a) Lump Sum*** (Birr1000 to be received in 1 year or 5 years, or Birr1000 invested today), or
- b) Recurring CFs (non-constant CFs)***, e.g. B100 in YR1, B200 in YR 2, B300 in YR3) or
- c) Stream of Constant PMTs*** (constant CFs, e.g. B100 per year for 3 years).

- **Financial investments** involve cash flows occurring at different points in the **time series**.
→ cash flows have to be brought to the same point

1. Present and future value of a single amount

- **Simple interest**: **no** interest is earned on the interest
→ interest is accounted only for the principal

$$\mathbf{FV_n = PV (1+nr)}$$


$$\mathbf{FV_n = PV (1+nr)}$$

Where,

PV= is the value at time=0

FV= is the value at time=n

r= is the rate at which the amount will be compounded each period

n= is the number of periods

- Compound interest: interest payment is reinvested.

$$FV = PV (1+r)^n$$

Where,

PV= is the value at time=0

FV= is the value at time=n

r= is the nominal interest rate
(stated interest rate or annual
%age rate)

n= is the number of years

Classifications of interest rates

- ◆ **Nominal rate (r)** – also called the quoted or state rate. An annual rate that ignores compounding effects.
 - r is stated in contracts. Periods must also be given, e.g. 8% Quarterly or 8% Daily interest.
- ◆ **Periodic rate (i)** – amount of interest charged each period, e.g. monthly or quarterly.
 - $i = r/m$, where m is the number of compounding periods per year. $m = 4$ for quarterly and $m = 12$ for monthly compounding.

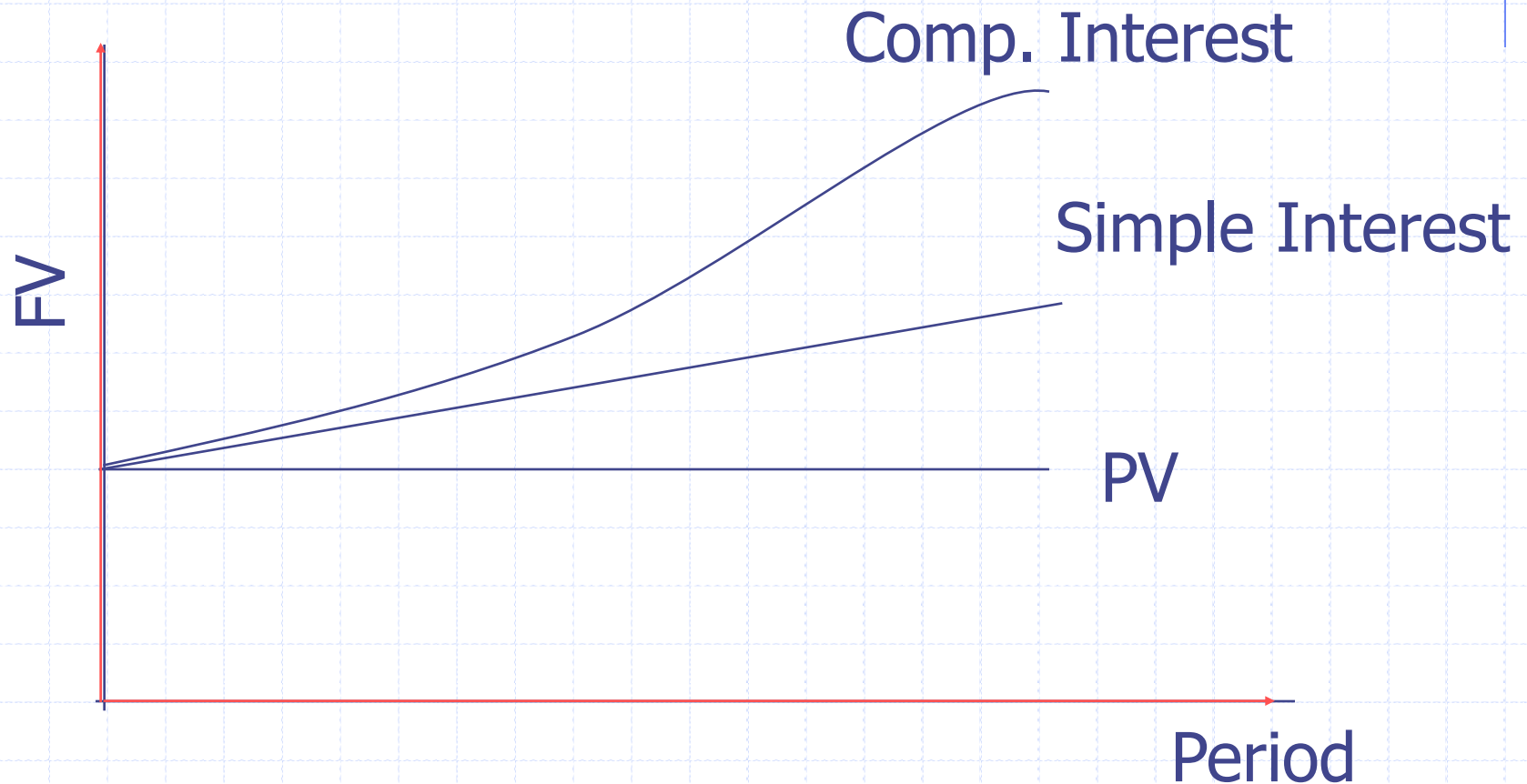
Classifications of interest rates

◆ Effective (or equivalent) annual rate (r_{eff}) – the annual rate of interest actually being earned, accounting for compounding.

■ r_{eff} for 10% semiannual investment

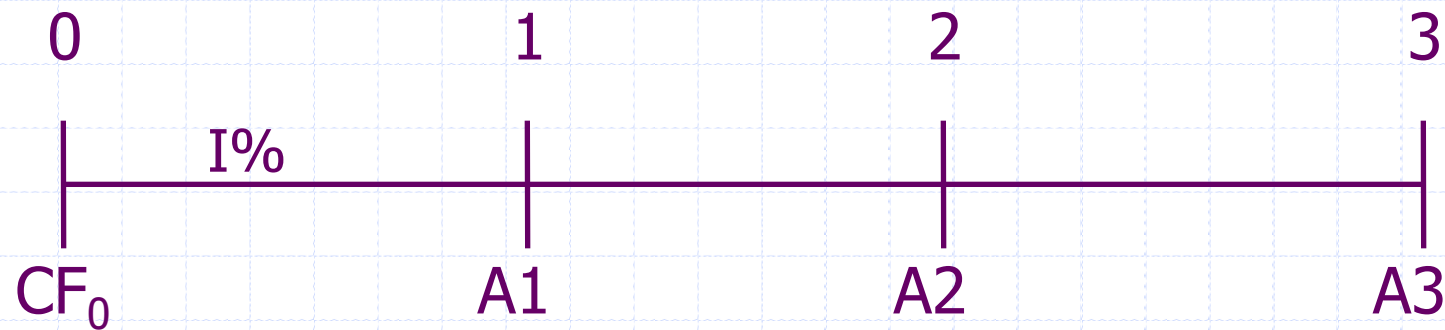
$$\begin{aligned} r_{\text{eff}} &= (1 + r/m)^m - 1 \\ &= (1 + 0.10 / 2)^2 - 1 = 10.25\% \end{aligned}$$

Relationship b/n PV and FV



2. Present Value of uneven series

- Present value of uneven cash flow stream

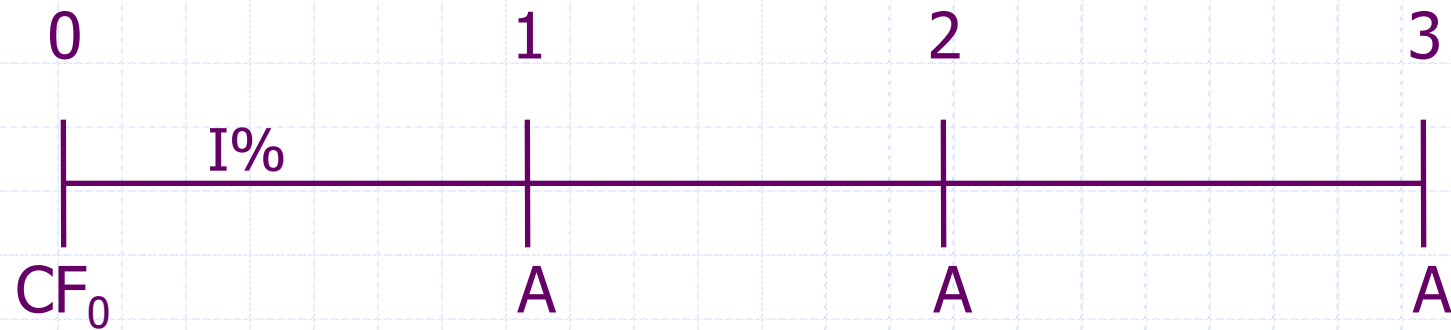


r = discount rate

$$PV_n = \frac{A_1}{(1+r)^1} + \frac{A_2}{(1+r)^2} + \dots + \frac{A_n}{(1+r)^n}$$

3. Present Value of Annuity

- Constant cash flow at regular interval of time.



$$PV_n = A \left(\frac{1}{r} \right) \left(1 - \frac{1}{(1+r)^n} \right)$$

4. Future Value of Annuity

$$FV_n = A \left(\frac{(1+r)^n - 1}{r} \right)$$

4.2 Investment Appraisal

- ◆ Investment proposals are evaluated from different dimensions:
 - ***Economic evaluation***
 - Social benefit
 - Environmental impact
 - Consistent with local and nation development plan
 - Others....
- ◆ Topic focus: ***Economic evaluation for investment appraisal***

4.2 Investment Appraisal (cont...)

- Important investment evaluation methods:
 1. *payback period*
 2. *Net Present Value (NPV)*
 3. *Internal Rate of Return (IRR)*
 4. *Cost-Benefit Ratio /Analysis / (CBR)*
 5. Cost-effective Analysis
 6. Multi-criteria Analysis
 7. Linear programming
 8. Dynamic Programming

4.2.1 The Payback Period

- **Payback period** is the expected number of years required to recover the original investment.
- It measures risk, **not** return.
- **The shorter the payback period**, the more desirable will be the project
- First the maximum acceptable payback period (n_{max}) is specified against which the calculated payback period (n) is compared.

4.2.1 The Payback Period (cont...)

If...	It means...	Then...
$n < n_{\max}$	the investment would return the cost earlier than the expected time.	The project may be accepted.
$n > n_{\max}$	the investment would return the cost later than the expected time.	The project should be rejected.
$n = n_{\max}$	The investment would return the cost exactly at the expected time.	The project may be accepted but other evaluation method can also be used.

4.2.2 The Net Present Value (NPV)

- Standard method for the financial appraisal of long-term projects
- Used for capital budgeting, and widely throughout economics, it measures the excess or shortfall of cash flows, in present value (PV) terms, once financing charges are met.
- Indicator of how much value an investment or project adds to the value of the firm.

4.2.2 NPV (cont...)

- **NPV** is calculated as:

$$\text{NPV} = \sum_{t=1}^n B_t (1 + r)^{-t} - \sum_{t=1}^n C_t (1 + r)^{-t}$$

Where, B_t = Benefit or return at the end of year **t**

C_t = Cost outlay or investment at the end of year **t**

r = required return (discount rate)

t = time of the cash outlay

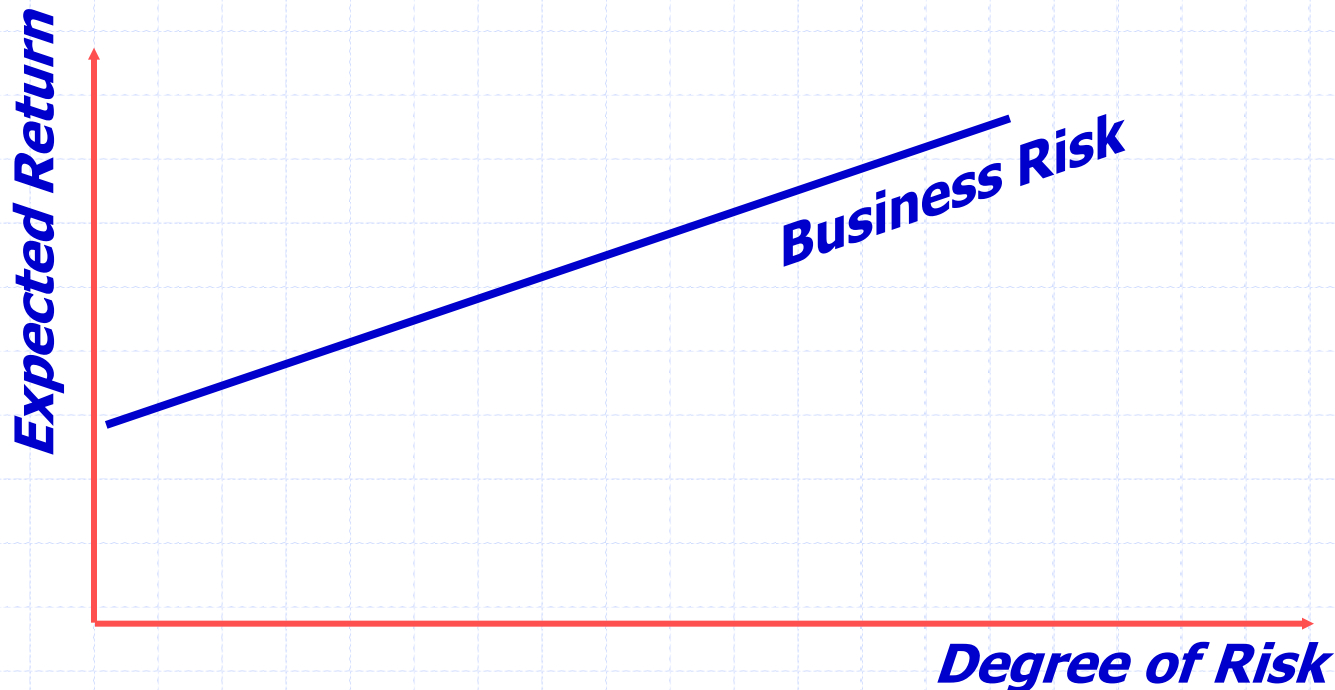
n = total time of the project

4.2.2 NPV (cont...)

- *In financial theory*, if there is a choice between two mutually exclusive alternatives, the one yielding the higher NPV should be selected
- The rate used to **discount** future cash flows to their present values is a key variable of this process
- Most firms have a well defined policy regarding their capital structure, so the weighted average cost of capital (after tax) is used as the discount rate
- Another method is to use a variable discount rate with higher rates applied to cash flows occurring further along the time span, (reflecting the yield curve premium for long-term debt).

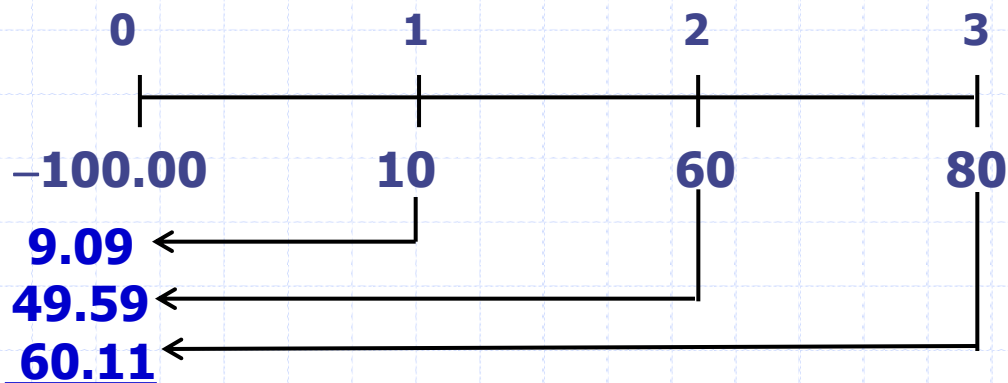
4.2.2 NPV (cont...)

- It is appropriate to use higher discount rates to adjust for risk for riskier projects
- If a project offers a high risk, the required return on the project will also be high.



4.2.2 NPV (cont...)

- **Procedure for analysis using NPV**
 1. Find the present value of each cash flow, including both **inflows** and **outflows**, discounted at the projects cost of capital
 2. Sum this discounted cash flows: NPV
 3. Evaluate based on the value of 2 above



NPV = 18.79

4.2.2 NPV (cont...)

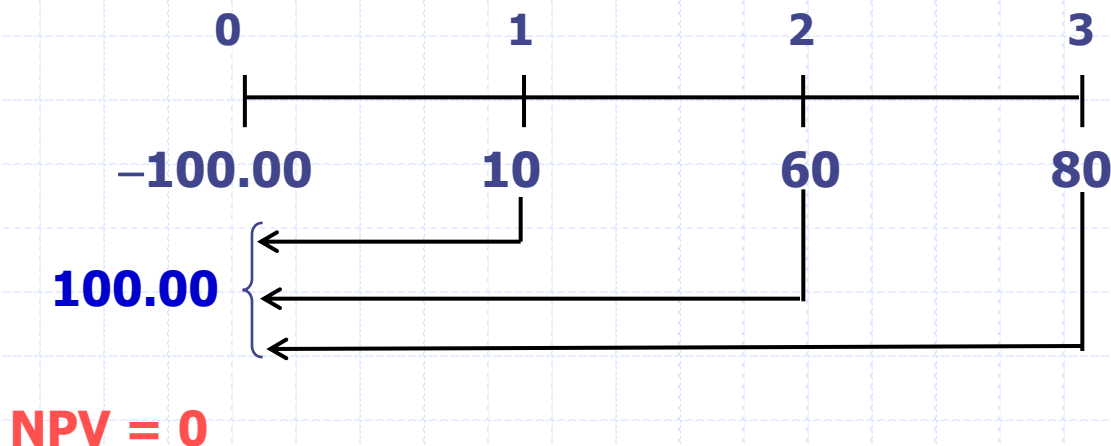
If...	It means...	Then...
$NPV > 0$	the investment would add value to the firm	The project may be accepted
$NPV < 0$	the investment would subtract value from the firm	The project should be rejected
$NPV = 0$	the investment would neither gain nor lose value for the firm	We should be indifferent in the decision whether to accept or reject the project. This project adds no monetary value. Decision should be based on other criteria, e.g. strategic positioning or other factors not explicitly included in the calculation.

4.2.3 Internal Rate of Return (IRR)

- **Is the discount rate** that equates the **present value** of the project's expected cash inflow's to the present value of the project's costs.

PV infows = PV investment costs

IRR is a rate that brings NPV=0



Comparing NPV and IRR

- The use of the IRR always leads to the selection of the same project,
- project selection using the NPV method depends on the discount rate chosen,
- NPV and IRR could result in different selections

4.2.4 The Cost Benefit Ratio (CBR)

- It is similar to NPV in the way one compares the value added.
- Compares the value added per the cost incurred and used to evaluate projects of different sizes.

$$CBR = \frac{\sum_{t=1}^n B_t (1+r)^{-1}}{\sum_{t=1}^n C_t (1+r)^{-1}}$$

Cash Flow Forecasting

- The most important, but also the most difficult, step in capital budgeting is estimating projects' cash flows
 - The investment outlays and the annual net cash inflows after a project goes into operations
- **Relevant Cash flows**

The specific cash flows that should be considered in a capital budgeting decisions. **Rules:**

1. Capital budgeting decisions must be based on ***cash flows***, not accounting income.
2. Only ***incremental cash flows*** are relevant. Costs that occur *iff* we accept the project.

Cash Flow Forecasting

- Annuity

- Constant stream of payments
- Lease, rent, etc

- Random

- Construction business for contractors is expected to be increasing
- Individual contract amount takes the form of the S-curve

The Cash flows typically include the following items:

1. Initial investment outlay
2. Operating cash flows over the project's life
3. Terminal year cash flows

4.3 Capital Budgeting on Contract investment

Cash flows of a construction company occur as a result of the *contractual and credit arrangements* existing on a series of contracts within any trading period.

Sources of finance on contracts:

- **Internal Source**
 - generated from the companies operation
 - most of them are locked up b/c:
 - Stage payment
 - Disagreement
- **External Sources**
 - from lenders based on interest

4.3.1 Establishing ROCE and Mark up in Corporate Budget Planning

The two parameters that affect a construction company's profitability:

1. The company's **ROCE**
2. The **mark-up** on contract costs to achieve the desired ROCE

To determine firm's **mark-up target**, it is required establish:

i) **Return on Capital Employed (ROCE)**

Represents return anticipated by the company in relation with the total capital employed.

- Successful measurement of profitability
- Starting parameter for budgeting and performance measurement
- Determined at the head office level
- Collected from cash flow of individual contract through inclusion of Mark-up

ROCE is made to account for the following costs:

- The average weighted cost of capital (interest of capital employed)
- Profit margin (dividends, capital reserves...)
- Corporate obligations such as taxations and depreciation costs
- Contingencies to cover uncertainties (Risks)

ii) Annual Turnover on contracts.

- This can be obtained from the firm's short-term plan committed or planned for execution in the current year.

iii) General overhead costs (off-site administration):

- One of the items in the Mark-up
- Costs entitled in administering the company and providing off-site services
- The amount of GOC for individual project is decided by management as part of their policy.
- Vary with individual firms, but broadly includes (within a company's accounts)
 - rent on office and yard
 - fees, salaries and wages for directors and office staff
 - office equipment, stationary, telephones, cars
 - office heating and lighting
 - insurance on office and staff
- **Estimated as the percentage of expected turnover**

Steps to reach at company's Mark- up

Step 1. *Estimate total capital to be employed for the fiscal year (TCE)*

- estimated from the Balance Sheet of the Company

Assets	Liabilities
<u>Current Assets</u>	<u>Current Liabilities</u>
Cash.....	Short term loans.....
Marketable securities	Account payable.....
Account Receivables.....	Accrued income taxes.....
Inventories.....	Current payments due on
Other current assets....	Long-term dept....
<u>Fixed assets</u>	Other current liabilities....
Buildings.....	
Machineries.....	
Equipments.....	
Land.....	

Steps to reach at company's Mark-Up (cont...)

Step 2. *Determine ROCE as the percentage of the TCE.*

- Average weighted cost of capital (interest of capital employed).....***% TCE
- Profit Margin (dividends and reserves).....***% TCE
- Corporate obligations (tax, depreciation).....***% TCE
- Contingencies to cover uncertainties (risk)***% TCE

ROCE.....Σ***% TCE

Step 3. *Estimate expected turnover for the fiscal year*

- This can be obtained
 - from the firm's short-term plan committed, or
 - planned for execution in the current year.

Steps to reach at company's Mark-Up (cont...)

Step 4. Determine the *General Overhead Cost (GOC)*

- Estimated as the percentage of the annual turnover
- based on the previous year's turnover

*GOC.....***% Turnover*

Step 5. Determine the Mark-up

Mark-up (Head Office) = GOC + ROCE

Step 6. Determine the Total Production Cost (TPC)

Σ Production Cost = Turnover - Mark-up

Step 7. Determine Mark-up individual Project

$$\text{mark-up at individual project} = \frac{\text{mark-up}}{\text{TPC}} * 100\%$$

Example

The following is the balance sheet of a **G5** contractor. Additional information are also outlined following this.

Assets		Liabilities	
Current Assets		Current Liabilities	
	550,000		450,000
Fixed assets		Loans	153,234
	230,000	Preference shares	11,766
		Share Capital	32,080
		Retained Earnings	<u>132,920</u>
Total Assets:	<u>780,000</u>	Total L and E	780,000

Example (cont'd)

1. Total Capital Employed (TCE from the BS)

2. The following shows return on the capital employed:

- i. Average weighed cost of capital.....6.5%
- ii. Profit margin: 6%
- iii. Corporate obligations.....4.5%
- iv. Contingences to cover uncertainties 3%

3. Planned total turnover

The company is planning for a total turnover of **Birr 2,500,000** in the fiscal year (*bejet amet*)

4. Administrative Expense

The previous year's overhead cost was **Birr150,000** while its total turnover was **Birr2,000,000**.

1. Estimate the **total mark-up** of the company at the head office and the mark-up on **individual contracts**.
2. The company is invited to tender for a construction of a school building with a direct cost of **Birr2,000,000** and estimated site **overhead of 6%**. What will be the minimum amount of the contract price that will be offered by the procurement committee?

4.3.2 The Corporate Budget

- is the starting point for setting up a monitoring and reporting system
- reference point against which the measurement of financial performance and the achievement of planned objectives are made

Corporate Budget (Cash Outlay)

= Administrative Cost + Σ Capital Required by Individual Contracts

This has to be balanced with:

Capital Budget (Cash Inflow)

= Net Working Capital + Finance Sources (Debt, Sales of stocks, Sales of Fixed Assets)

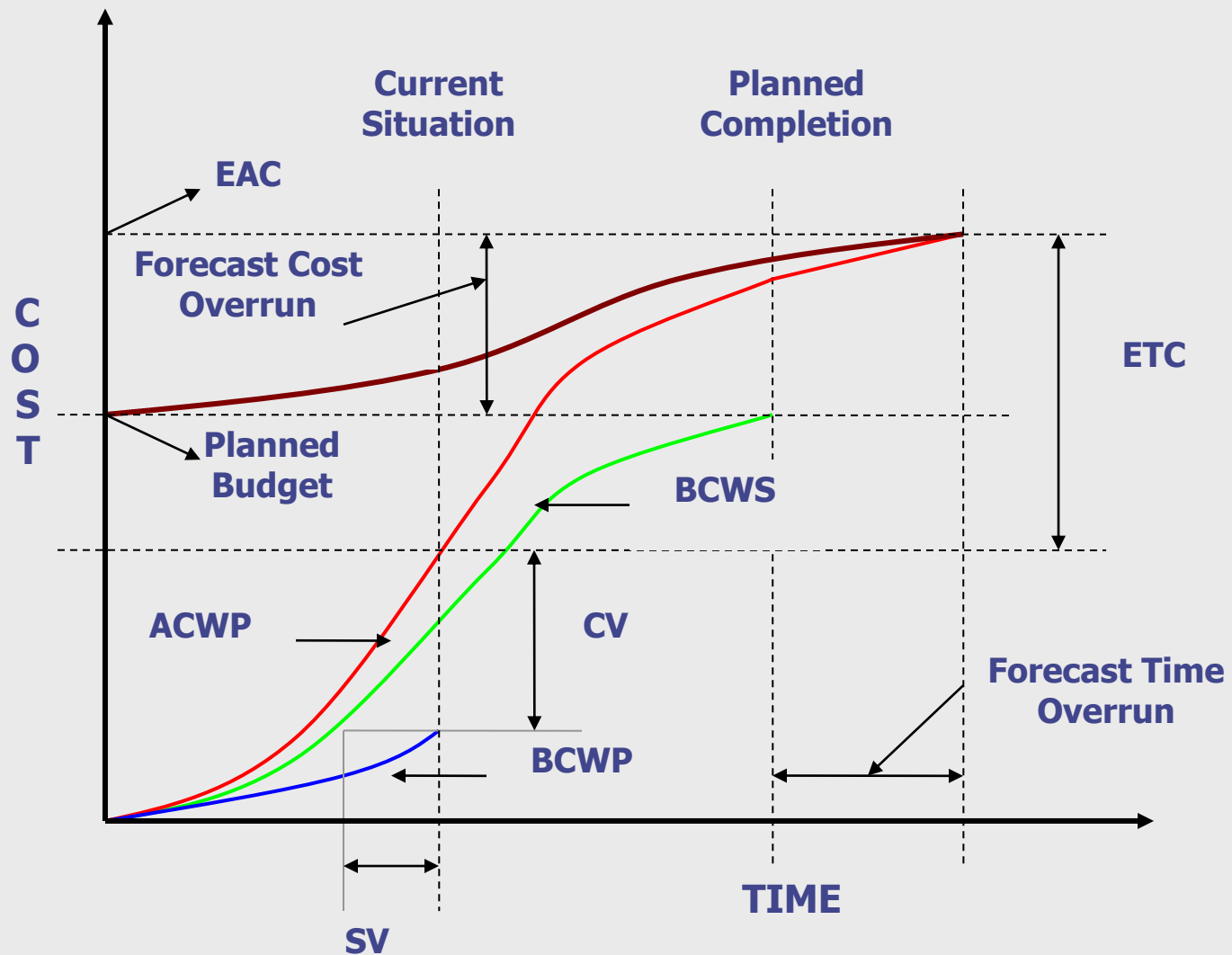
4.4 A System of control levels

- There are different control levels in a construction company:
 1. Managing Director Level
 2. Contracts Management level
 3. Site management level

Control Responsibility Components

- **Managing Director Level**
 - Major Contracts production Costs
 - Administrative Expenses
 - Return on Capital Employed
- **Contract Management Level**
 - Production Costs of Different Contracts
- **Site Management Level**
 - Direct Cost of projects:
 - Labor Cost
 - Material Cost
 - Plant Cost

Performance Measurement & Evaluation



Performance Measurement & Evaluation

Earned Value Management Terms:

Term	Description	Interpretation
PV (BCWS)	Planned Value	What is the estimated value of the work planned to be done?
EV (BCWP)	Earned Value	What is the estimated value of the work actually accomplished?
AC (ACWP)	Actual Cost	What is the actual cost incurred?
BAC	Budget at Completion	How much did you BUDGET for the TOTAL JOB?
EAC	Estimate at Completion	What do we currently expect the TOTAL project to cost?
ETC	Estimate to Complete	From this point on, how much MORE do we expect it to cost to finish the job?
VAC	Variance at Completion	How much over or under budget do we expect to be?

Responsibility level	Responsibilities	Statement used
General Management	- Turnover Control - Overhead control - Account Management	Corporate budget (master Budget)
Contracts Management	Contract Cost Management	- Contract Budget Statement - Operational Budget Statement - Control Statement
Site Management	Activity Cost Control	- Activity Cost Statement - Operational statement

Monitoring and Control at Contract Management Level

- At this level comparison between the estimated and actual cash flow takes place
- Contract Managers produce **three** basic control statements at Contract Management Level with the help of quantity surveyors.
 1. Contract Budget Statement
 2. Operational Budget Statement
 3. Control Statement

1. Contract Budget Statement

Operations	Labor cost	Material cost	Equip. Cost	Sub-Cont.	Total Cost (BCWS)	Value	Margin
Site Overhead							
Earth Work							
Concrete Work							
Exterior Works							
Roofing							
<i>TOTAL</i>					*	**	***

* Production Costs

** Tender Sum

*** Contract Markup by the corporate

2. Operational Budget Statement

- After the contract budget is prepared, operational budget is produced on monthly basis using the contract work Program
- Has two primary functions:
 1. Provide managers with cost data on monthly basis
 2. Enable managers at each level to take decisions or implement corrective actions when necessary

Operational Budget Statement/sample

Operations	Total Budget Cost	Sep., 2007			Oct., 2007		
		Cost (BCWP)	Value	Margin	Cost (BCWP)	Value	Margin
Site Overhead	BCWS						
Earth Work							
Concrete Work							
Exterior Works							
Roofing							
Monthly Total							
Cum. Total							

3. Control Statements

It is of vital importance that the value of the work carried out is accurately monitored and adequately recorded and presented for agreement and subsequent payment by the client

Item	October 2007			Previous Month (September)		
	Actual	Estimated	Variance	Actual	Estimated	Variance
Materials Delivered						
Materials on site						
Materials Fixed						
Labour Cost						
Plant Cost						
Sub-Contractors						
Overhead Costs						
Contract Cost (Total)						