📘 Chapter 8: Cost Analysis and Estimation

🔹 1. Economic vs. Accounting Costs

- **Historical Cost**: Actual outlay at the time of purchase.
- **Current Cost**: Cost of replacing an item now.
- **Opportunity Cost**: Value of the next best alternative use of a resource.
- **Replacement Cost**: Cost of replacing existing assets using current technology.
- **Explicit Cost**: Actual cash outflow (e.g., wages, rent).
- **Implicit Cost**: Non-cash cost (e.g., owner's time or capital).

🔹 2. Role of Time in Cost Analysis

- **Incremental Cost**: Additional cost from a specific decision; may affect multiple units.
- **Marginal Cost (MC)**: ΔTotal Cost / ΔOutput (for one extra unit).
- **Sunk Cost**: Past, irreversible costs that shouldn't affect current decisions.

🔹 3. Short Run vs. Long Run

- **Short Run**: At least one input is fixed (e.g., capital).
- **Long Run**: All inputs are variable.
- **Fixed Costs**: Do not vary with output; exist only in the short run.
- **Variable Costs**: Change with the level of output; all costs are variable in the long run.

🔹 4. **Short-run Cost Curves**

- **Total Cost (TC)** = Fixed Cost (FC) + Variable Cost (VC)
- **Average Total Cost (ATC)** = AFC + AVC
- **Marginal Cost (MC)** = ∂TC / ∂Q
- Short-run curves are **U-shaped**, representing efficiency at certain output levels.

🔹 5. **Long-run Cost Curves**

- Reflect **minimum total cost** when all inputs are variable.
- **Economies of Scale (EOS)**:
  - **Increasing Returns to Scale** → Falling AC.
  - **Constant Returns to Scale** → Constant AC.
  - **Decreasing Returns to Scale** → Rising AC.

🔹 6. **Cost Elasticities & Economies of Scale**

- Analyzes how cost reacts to changes in output.
- Measures efficiency in scaling production.

🔹 7. **Minimum Efficient Scale (MES)**

- **MES**: Smallest level of output where long-run average cost is minimized.
- Most competitive markets occur when:
  - MES is small relative to total industry output.
  - Small scale producers don't suffer large cost disadvantages.

🔹 8. Transportation Costs and MES

- **Terminal Charges**: Costs of loading/unloading.
- **Line-haul Costs**: Cost of moving goods (fuel, distance).
- **Inventory Costs**: Tied to shipping time.
- Firms near customers can overcome lack of scale via proximity.

🔹 9. Firm Size and Plant Size

- **Multi-plant Economies**: Cost savings from operating several plants.
- **Diseconomies**: Coordination problems when managing multiple plants.
- **Larger Plants**: Lower average costs.
- **Smaller Plants**: More flexible for capacity changes.

🔹 10. The Learning Curve

- **Concept**: Per-unit costs decline with cumulative production experience.
- **Formula**:

$$Z_u = K \cdot (u^n)$$

Where:

- Z_u = time for unit u
- K = time for first unit
- n = learning exponent (log learning rate / log 2)

🧮 **Example (Learning Curve)**:

- First unit time = 3 hrs, Learning rate = 75%
- **(a)** Time to assemble 8th unit: Use learning curve formula.
- **(b)** Time to assemble first 6 units: Add individual times from curve formula.

> *Learning curves shift LRAC downward as efficiency improves.*

🔹 11. Economies of Scope

- Cost savings from producing multiple products together.
- Encourage **multi-product firms** instead of specialization.
- Key in **new product strategies**.

🔹 12. Cost-Volume-Profit (CVP) Analysis

- Examines how cost and volume affect a firm's profits.
- **Break-even Point**: Level where total revenue = total costs (zero profit).
- **Degree of Operating Leverage (DOL)**:

$$DOL = \frac{Q(P - AVC)}{Q(P - AVC) - TFC}$$

Where:

- Q = quantity
- P = price per unit
- AVC = average variable cost
- TFC = total fixed cost

📊 Strategic Implications

- Breakeven is more sensitive to variable costs than fixed costs.
- Small changes in **selling price** have **huge impact** on profitability.
- Understanding MES, learning, and scope economies helps in long-term planning.