Engineering Economics

Lecture 2

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Asset Management Analysis

A set of ratios which measure how effectively a firm is managing its assets

- Inventory turnover ratio
- Days sales outstanding ratio
- Total assets turnover ratio

Inventory Turnover

- What It Measures: How effectively a firm is managing its inventories.
- How You Compute: This ratio is computed by dividing sales by inventories

$$\text{Inventory turnover ratio} = \frac{\text{Sales}}{\text{Average inventory balance}}$$

$$= \frac{\$25{,}265}{(\$273 + \$332)/2}$$

$$= 76.10 \text{ times}$$

Days Sales Outstanding

- What It Measures: The average length of time the firm must wait after making a sale before receiving payment (also known as, average collection period)
- How You Compute: The ratio computed by dividing accounts receivables by average sales per day

$$\text{DSO (Average collection period)} = \frac{\text{Receivables}}{\text{Average sales per day}}$$

$$= \frac{\$2{,}608}{\$25{,}265 / 360}$$

$$= 37.16 \text{ days}$$

Total Asset Turnover

- What It Measures: How effectively the firm uses its plant and equipment in generating its sales
- How You Compute: The ratio computed by dividing sales by total assets

$$\text{Total assets turnover ratio} = \frac{\text{Sales}}{\text{Total assets}}$$

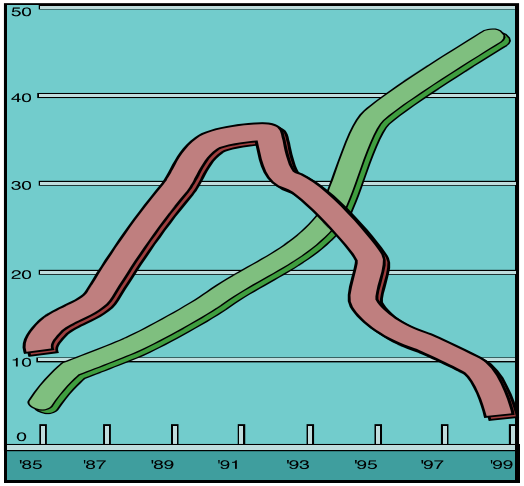
$$= \frac{\$25{,}265}{\$11{,}471}$$

$$= 2.20 \text{ times}$$

Profitability Analysis

A set of ratios which show the combined effects of liquidity, asset management, and debt on operating results

- Profit margin on sales
- Return on total assets
- Return on common equity



Profit Margin on Sale

- How It Measures: the profit per dollar of sales
- How You Compute: Computed by dividing net profit after taxes by sales

$$\text{Profit margin on sale} = \frac{\text{Net income available to common stockholders}}{\text{Sales}}$$

$$= \frac{\$1{,}666}{\$25{,}265}$$

$$= 6.59\%$$

Return on Common Equity

- What It Measures: The rate of return on common stockholders' investment
- How You Compute: The ratio of net income after taxes to common equity

$$\text{Return on common equity} = \frac{\text{Net income available to common stockholders}}{\text{Average common equity}}$$

$$= \frac{\$1{,}666}{(\$5{,}308 + \$2{,}321)/2}$$

$$= 43.68\%$$

Market Trend Analysis

A set of ratios that relate the firm's stock price to its earnings and book value per share

- P/E ratio
- Market/book ratio

Price/Earnings Ratio

- What It Measures: The dollar amount investors will pay for $1 of current earnings
- How You Compute: The ratio of the price per share to earnings per share

$$\text{P / E ratio} = \frac{\text{Price per share}}{\text{Earnings per share}}$$

$$= \frac{\$38.50}{\$0.61}$$

$$= 63.11$$

Market/Book Ratio

- What It Measures: Indicates how investors regard the company – a higher ratio indicates that investors are willing to bet a higher return on investment
- How You Compute: The ratio of a stock's market price to its book value

$$\text{Market / book ratio} = \frac{\text{Market price per share}}{\text{Book value per share}}$$

$$= \frac{\$38.50}{\$1.31}$$

$$= 29.39 \text{ times}$$

Limitations of Financial Ratios

- Ratio analysis is useful, but analysts should aware of ever-changing market conditions and make adjustments necessary.
- It is difficult to generalize about whether a particular ratio is good or bad.
- Ratio analysis based on any one year may not represent the true business condition.

Summary

The primary purposes of this chapter were (1) to describe the basic financial statements and (2) to present some background information on cash flows and corporate profitability, and (3) to discuss techniques used by investors and mangers to analyze them.

Chapter 3
Cost Concepts and Behaviors

- General Cost Terms
- Classifying Costs for Financial Statements
- Cost Classification for Predicating Cost Behaviors
- Cost Concepts Relevant to Decision-Making
- Thinking on the Margin: Fundamental Economic Decision-Making

Unit Price of an Ice Cream Cone

Items	Total Cost	Unit Price	% of Price
Ice cream (cream, sugar, milk and			
milk solids)	$120,250	$0.65	26%
Cone	9,250	0.05	2%
Rent	112,850	0.61	24%
Wages	46,250	0.25	10%
Payroll taxes	9,250	0.05	2%
Sales taxes	42,550	0.23	9%
Business taxes	14,800	0.08	3%
Debt service	42,550	0.23	9%
Supplies	16,650	0.09	4%
Utilities	14,800	0.08	3%
Other expenses (insurance,			
advertising, fees)	9,250	0.05	2%
Profit	24,050	0.13	5%
Total	**$462,500**	**$2.50**	**100%**

General Cost Terms

- Manufacturing Costs
  - Direct materials
  - Direct labor
  - Mfg. Overhead
- Non-manufacturing Costs
  - Overhead
  - Marketing
  - Administrative

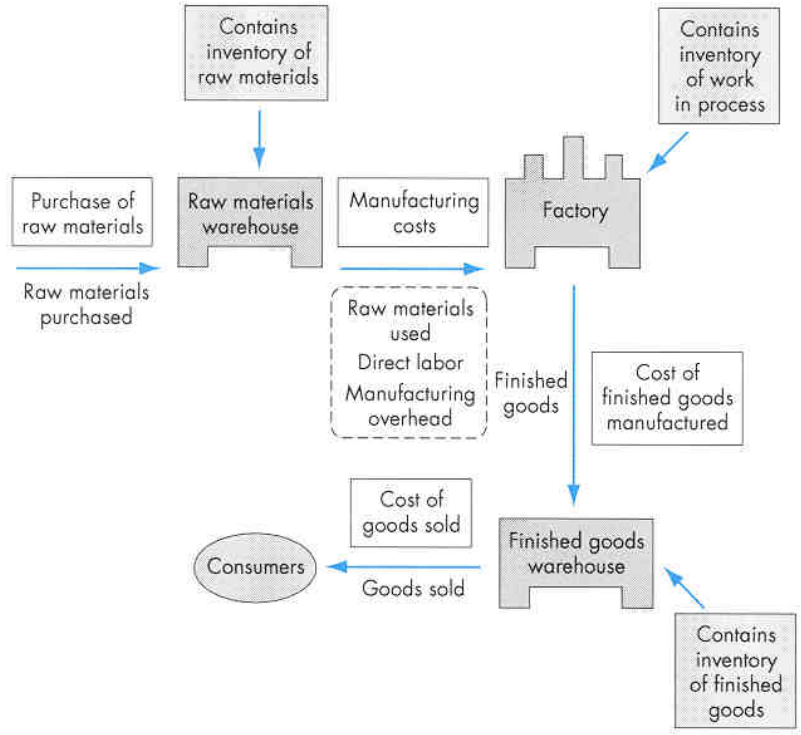


Figure 3.1 Various types of manufacturing costs incurred by a manufacturer

Classifying Costs for Financial Statements

- Matching Concept: The costs incurred to generate particular revenue should be recognized as expenses in the same period that the revenue is recognized.
- Period costs: Those costs that are matched against revenues on a time period basis
- Product costs:Those costs that are matched against revenues on a product basis.

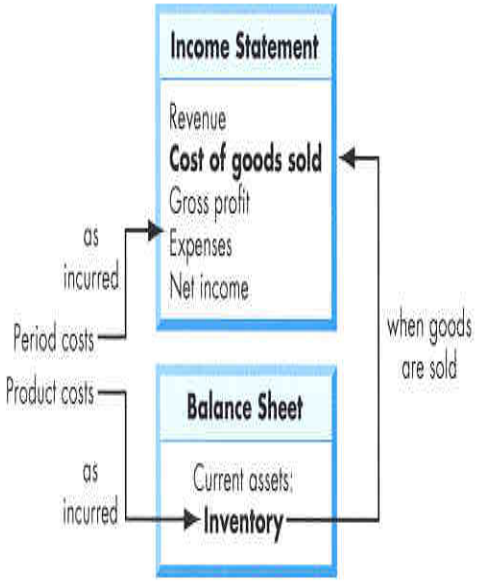
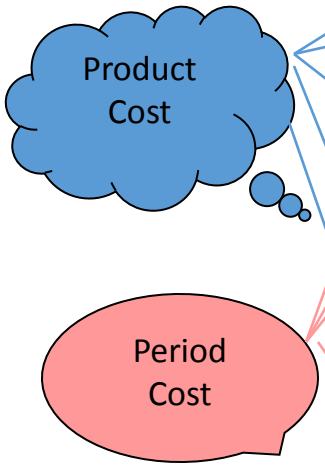


Figure 3.2 How the period costs and product costs flow through financial statements from manufacturing floor to sales

Classifying Costs for Uptown Ice Cream Shop



Unit Price of an Ice Cream	
Ice cream (cream, sugar, milk, and milk solids)	$0.65
Cone	0.05
Rent	0.61
Wages	0.25
Payroll taxes	0.25
Sales taxes	0.23
Business taxes	0.08
Debt service	0.23
Supplies	0.09
Utilities	0.08
Other (insurance, advertising,professional fees)	0.05
Profit	0.13
	$2.50

Cost Flows and Classifications in a Mfg. Co.

Cost of revenue = Cost of goods sold

- Raw materials inventory
- Work-in-process inventory
- Finished goods inventory

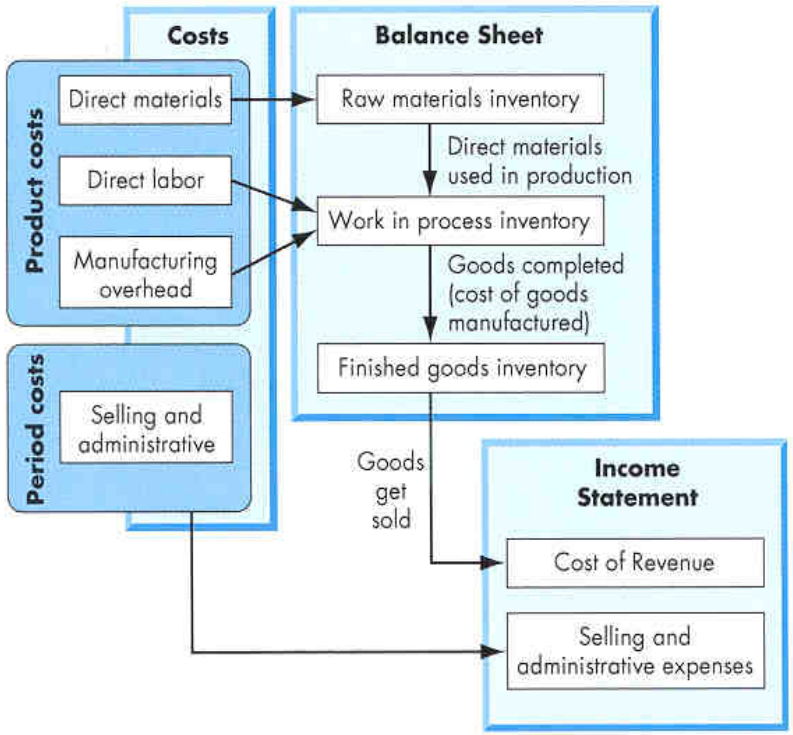


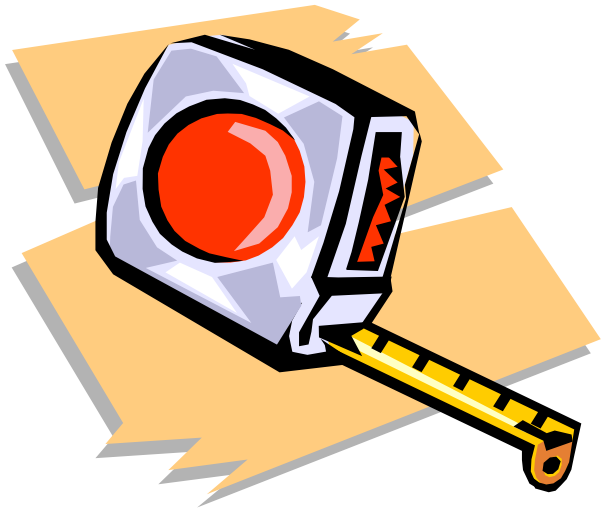
Figure 3.3 Cost flows and classifications in a manufacturing company

Cost Classification for Predicting Cost Behavior

- Volume index
- Cost Behaviors
  - Fixed costs
  - Variable costs
  - Mixed costs
- Average unit costs

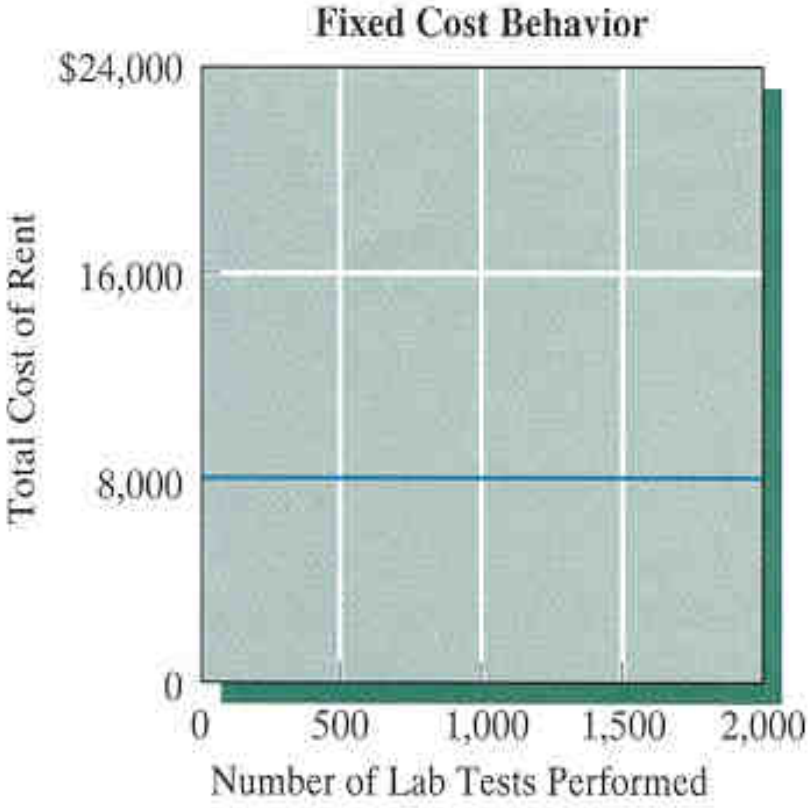
Volume Index

- Def: The unit measure used to define "volume"
- Examples:
  - Automobile – "miles" driven
  - Generating plant – "kWh" produced
  - Stamping machine – "parts" stamped



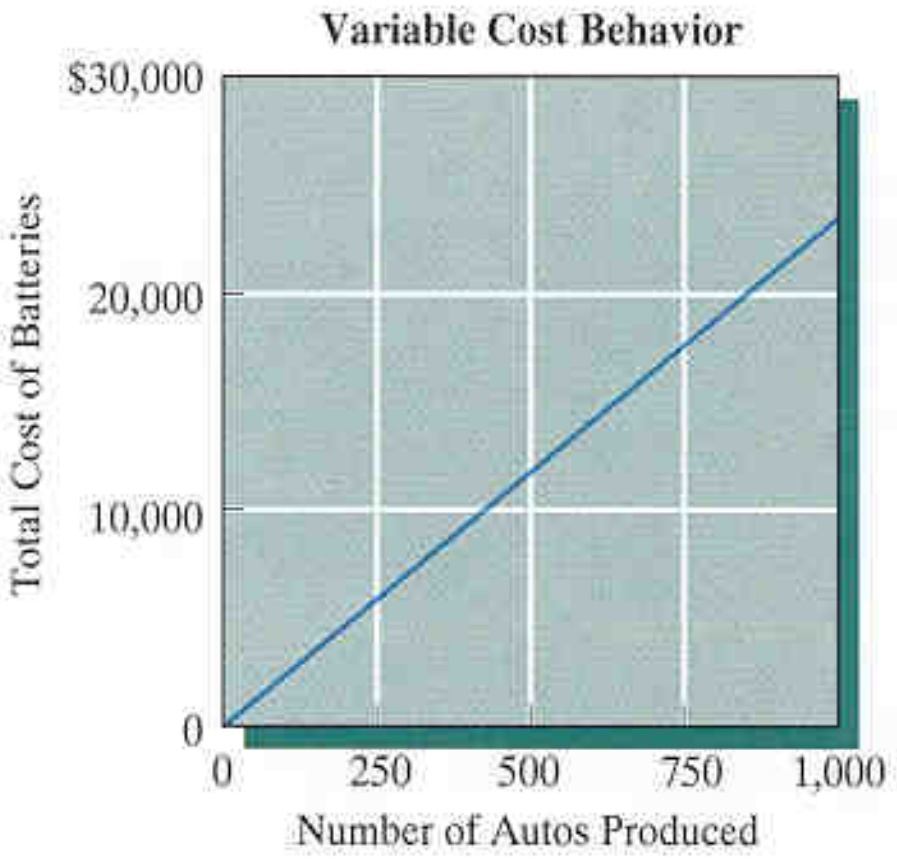
Fixed Costs

- Def: The costs of providing a company's basic operating capacity
- Cost behavior: Remain constant over the relevant range



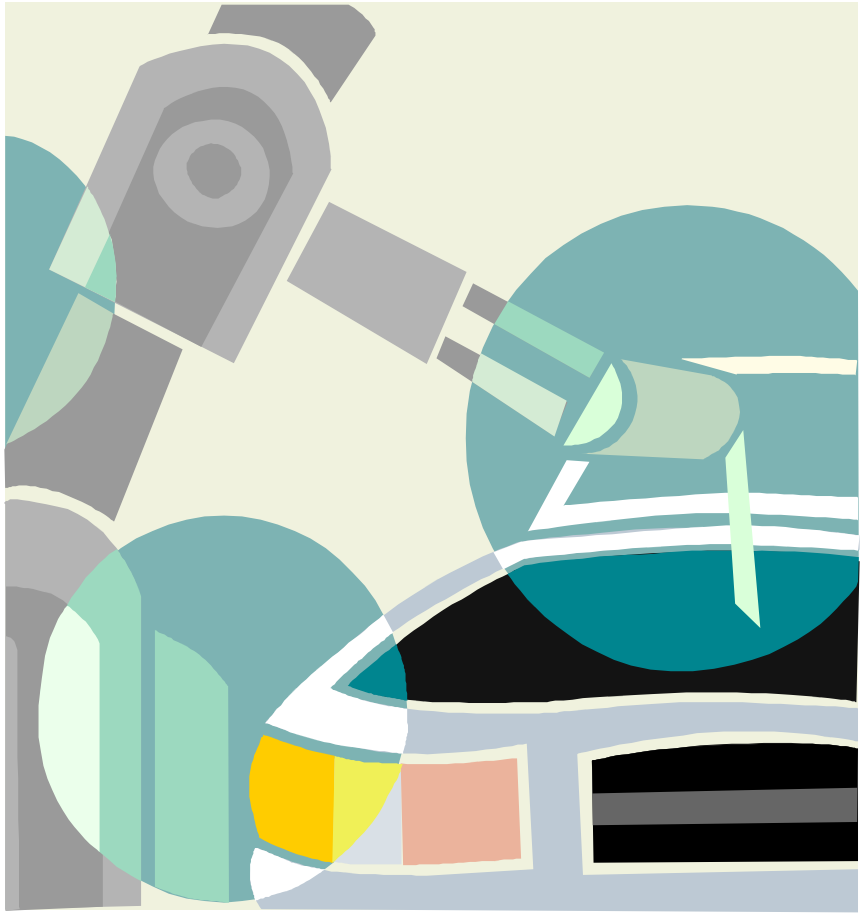
Variable Costs

- Def: Costs that vary depending on the level of production or sales
- Cost behavior: Increase or decrease proportionally according to the level of volume



Average Unit Cost

- Def: activity cost per unit basis
- Cost Behaviors:
  - Fixed cost per unit varies with changes in volume.
  - Variable cost per unit of volume is a constant.



Cost Classification of Owning and Operating a Passenger Car

Cost Classification	References	Cost
Variable Costs:		
Standard miles per gallon	20 miles/ gallon	
Average fuel price per gallon	$1.34/ gallon	
Fuel and oil per mile		$0.0689
Maintenance per mile		$0.0360
Tires per mile		$0.0141
Annual Fixed Costs:		
Insurance:		
Comprehensive	$250 Deductible	$90
Collision	$500 Deductible	$147
Body injury & Property damage		$460
License & Registration		$95
Property tax		$272
Mixed Costs: Depreciation		
Fixed portion per year		$3,106
Variable portion per mile		$0.04

Cost-Volume Relationship

Volume Index (miles)	5,000	10,000	15,000	20,000
Variable costs ($0.1190/mile)	$595	$1,190	$1,785	$2,380
Mixed costs:				
Variable portion	200	400	600	800
Fixed portion	3,106	3,106	3,106	3,106
Fixed costs:	1,064	1,064	1,064	1,064
Total variable cost	795	1,590	2,385	3,180
Total fixed cost	4,170	4,170	4,170	4,170
Total costs	$4,965	$5,760	$6,555	$7,350
Cost per mile	$0.9930	$0.5760	$0.4370	$0.3675

Cost-Volume Relationship

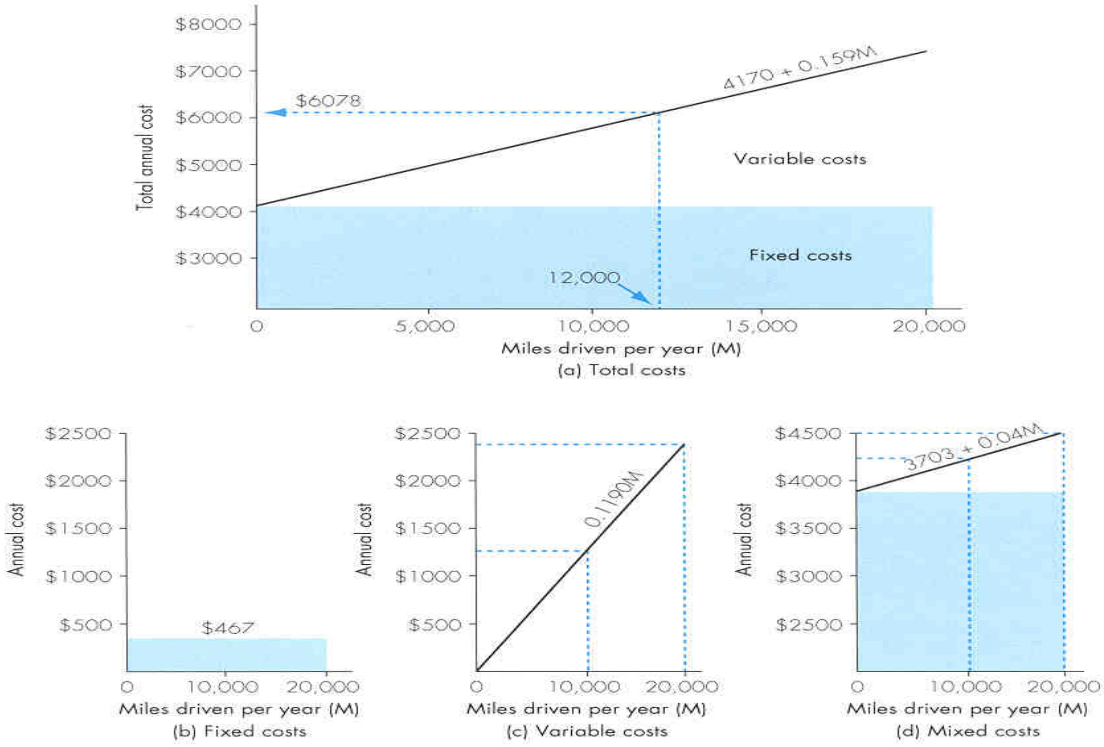


Figure 3.4 Cost-volume relationships of annual automobile costs (Example 3.2)

Average Cost per Mile

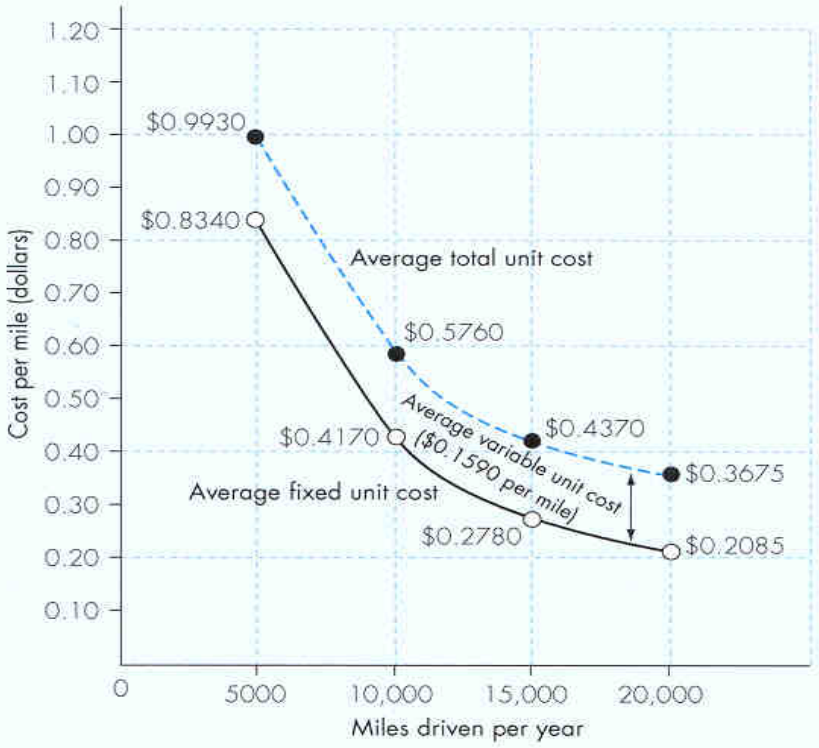
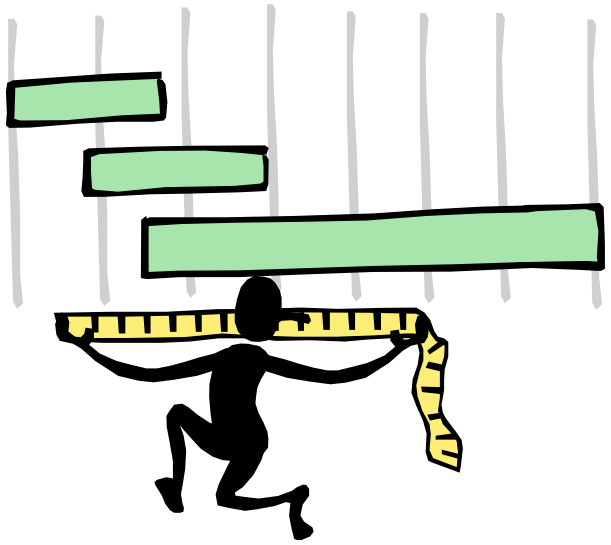


Figure 3.5 Average cost per mile for owning and operating a car (Example 3.2)

Differential (Incremental) Costs

- Def: Costs that represent the differences in total costs, which results from selecting one alternative instead of other



Example 3.3: Differential Cost Associated with Adopting a New Production Method

	Current Dies	Better Dies	Differential Cost
Variable costs:			
Materials	$150,000	$170,000	$20,000
Machining labor	85,000	64,000	-21,000
Electricity	73,000	66,000	-7,000
Fixed costs:			
Supervision	25,000	25,000	0
Taxes	16,000	16,000	0
Depreciation	40,000	43,000	3,000
Total	$392,000	$387,000	-$5,000

Example 3.4 Break-Even Volume Analysis

- Option 1: Adding overtime or Saturday operations: 36Q
- Option 2: Second-shift operation: $13,500 + 31.50Q
- Break-even volume:

36Q = $13,500 + 31.50Q

Q = 3,000 units

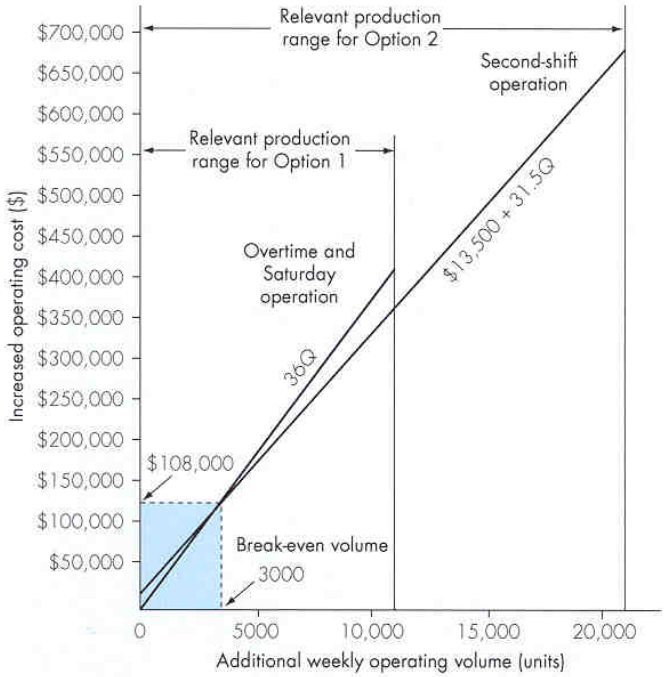


Figure 3.6 Cost-volume relationships of operating overtime and a Saturday operation versus second-shift operation beyond 24,000 units (Example 3.4)

Example 3.5 -Make or Buy

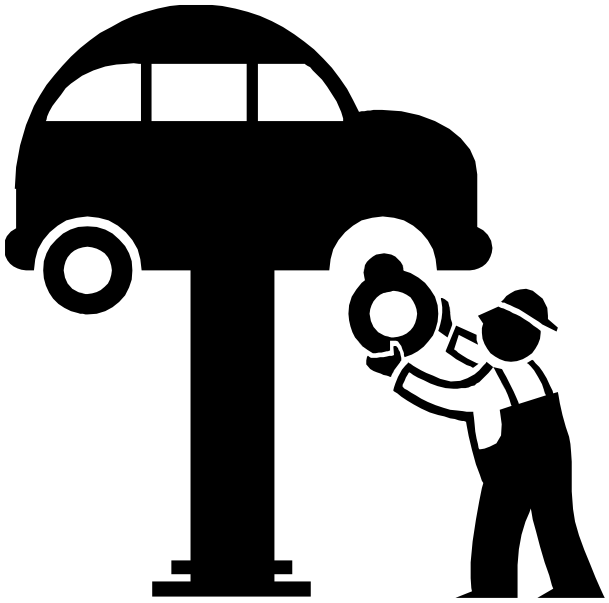
Example 3.5 - Make or Buy Decision			
	Make Option	Buy Option	Differential Cost
Variable cost			
Direct materials	$100,000		-$100,000
Direct labor	190,000		-190,000
Power and water	35,000		-35,000
Gas filter		340,000	340,000
Fixed costs			
Heating light	20,000	20,000	0
Depreciation	100,000	100,000	0
Rental income		-35,000	-35,000
Total cost	$445,000	$425,000	-$20,000
Unit cost	$22.25	$21.25	-$1.00

Opportunity Costs

- Def: The potential benefit that is given up as you seek an alternative course of action
- Example: When you decide to pursue a college degree, your opportunity cost would include the 4-year's potential earnings foregone.

Sunk Costs

- Def:Cost that has already been incurred by past actions
- Economic Implications: Not relevant to future decisions
- Example: $500 spent to replace tires last year—not relevant in making selling decision in the future



Marginal Costs

- Def: Added costs that result from increasing rates of outputs, usually by single unit
- Example: Cost of electricity—decreasing marginal rate

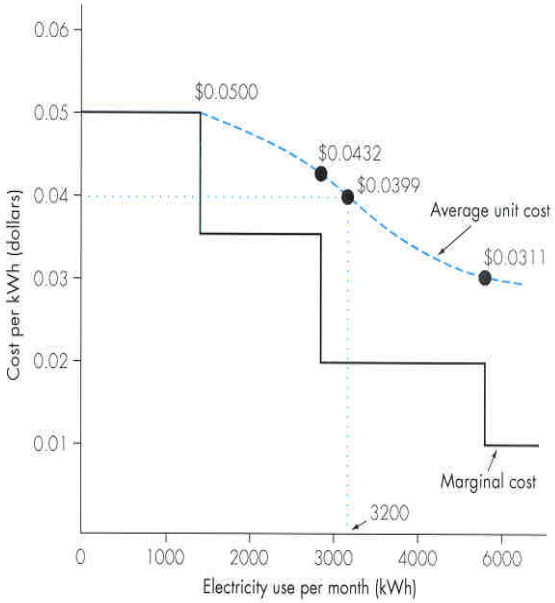


Figure 3.7 Marginal versus average cost per kWh (Example 3.6)

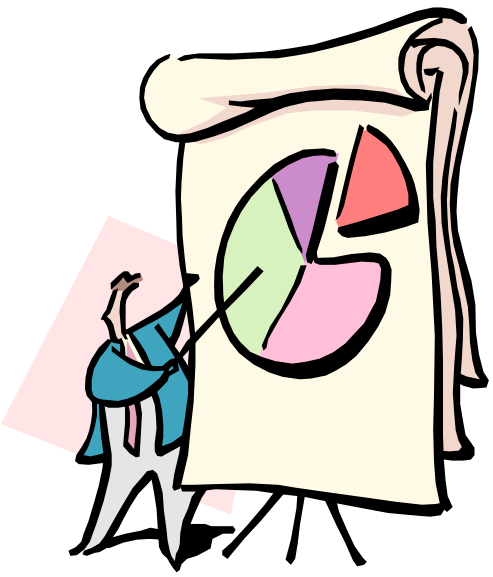
Unit Marginal Contribution

- Def: Difference between the unit sales price and the unit variable cost

  MC = Sales price – Variable cost

- Application: Break-even volume analysis:

$$\text{Break - even volume} = \frac{\text{Fixed costs}}{\text{MC}}$$



Marginal Analysis

- Principle: “Is it worthwhile?”
- Decision rule: To justify any course of action,

Marginal revenue > Marginal cost

	Product A
Marginal Revenue	$12/unit
Marginal Cost	$8/unit
Profit margin	$4/unit

Example 3.7 Profit Maximization Problem

	Branded	Generic
Marginal Revenue	$30/case	$10/case
Marginal Cost	$7/case	$7/case
Profit margin	$23/case	$3/case
	Sunday Operation	
Marginal Revenue	$10/case	
Marginal Cost	$12/case	
Profit margin	($2) /case	(loss)

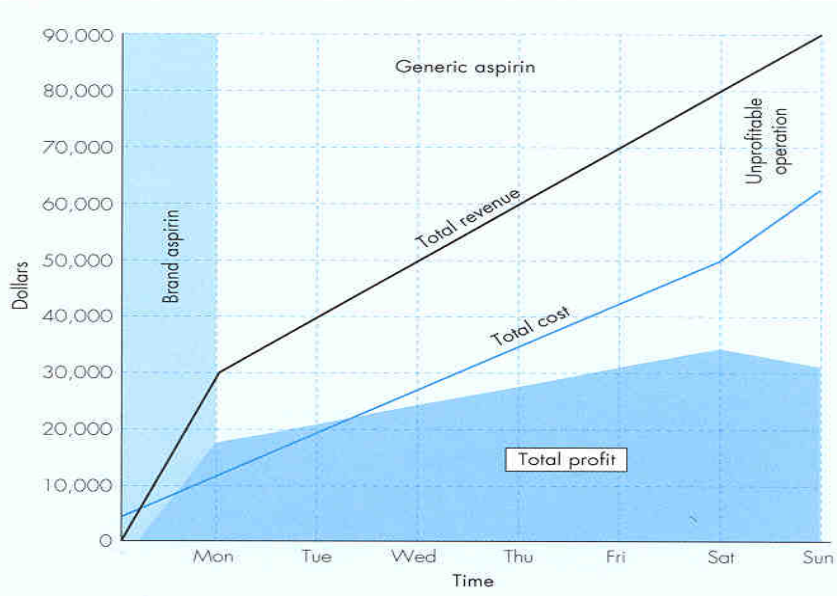


Figure 3.8 Weekly profits as a function of time. Sunday operation becomes unprofitable as the marginal revenue stays at $10 per case whereas the marginal cost increases to $12 per case (Example 3.7)

Summary

- General Cost Terms used in manufacturing:
  - Manufacturing costs
    - Direct materials
    - Direct labor
    - Manufacturing overhead
  - Nonmanufacturing costs
    - Administrative expenses
    - Marketing
    - Nonmanufacturing overhead

- Classifying Costs for Financial Statements:
  - Period costs
  - Product costs
- Cost Classification for Predicating Cost Behaviors:
  - Fixed costs
  - Variable costs
  - Mixed costs

- Cost Concepts Relevant to Decision-Making
  - Differential cost and revenue
  - Opportunity costs
  - Sunk costs
  - Marginal costs
- Thinking on the Margin: Fundamental Economic Decision-Making:
  - The basic question to any economic decision: Is it worthwhile?
  - Marginal revenues must exceed marginal costs.

End of Lecture 2