

# **Conducting a Cost-Volume-Profit Analysis for Maximum Result**

**Advanced Cost Accounting Techniques  
Conference**

**New Orleans, LA  
February 7, 1997**

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# Outline

- I. Cost Behavior
- II. Breakeven Analysis
- III. Case-Based Budgeting

# Importance of Understanding the Cost-Volume-Profit Relationship

- Managed Care
- Contribution Margin Analysis
- Product Line Profitability Reporting
- Modeling Changes in Volume
- Modeling a New Service
- Flexible Budgeting
- Productivity Monitoring
- Case-Based Budgeting

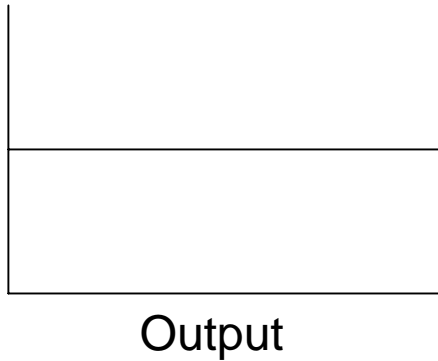
# Cost Behavior

- An important element in the cost-volume-profit relationship is that of cost behavior.
- It is essential that costs be analyzed by type:
  - Fixed
  - Variable
  - Semi-variable
  - Semi-fixed

# Cost Behavior

## Fixed Cost

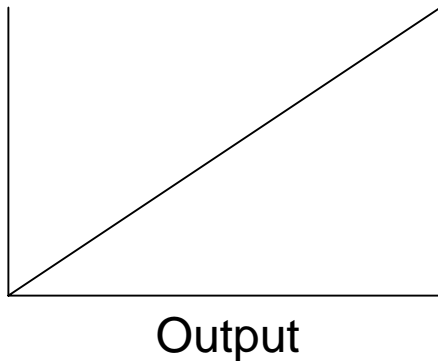
Mgt &  
Supv  
Salaries



Fixed Costs are costs which remain constant over a given period of time despite fluctuations in output.

## Variable Cost

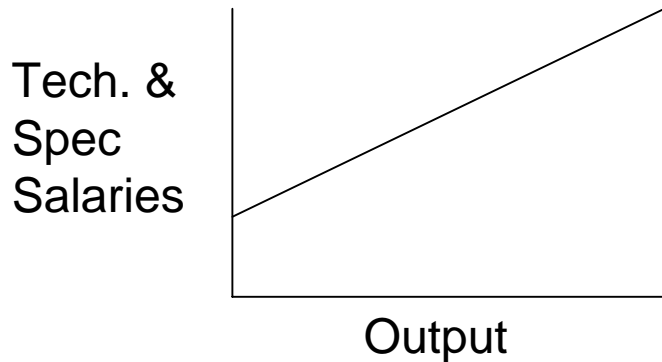
Supplies



Variable costs are costs which fluctuate directly in proportion to changes in volume.

# Cost Behavior (Cont)

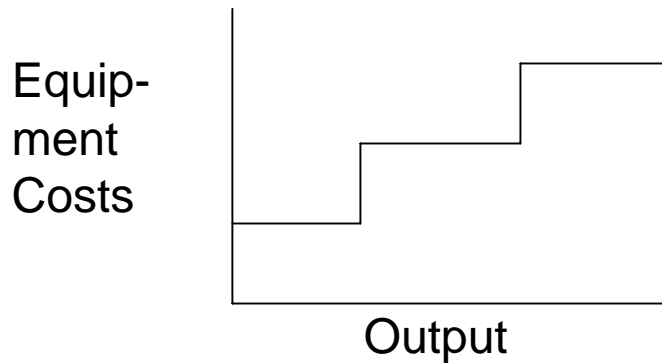
## Semi-Variable Cost



Semi-Variable costs are costs which contain attributes of both fixed and variable costs. For a certain level of output a fixed amount of cost will be incurred and for subsequent increases in volume levels cost will fluctuate in proportion to those changes.

# Cost Behavior (Cont)

## Semi-Fixed Cost



Semi-Fixed ,or step-function costs, are fixed over a given range of volume, and vary at certain volume increments.

# Methods of Determining Fixed/Variable Assumptions

- Use general guidelines accepted in the industry.
- Define each account as 100% fixed or 100% variable (no splits).
- Compile breakouts from department managers, based on their knowledge of cost behavior and their classification of positions.
- Employ regression and/or graphing techniques.
- Work with department managers to build detail of fixed hours by jobcode (fixed hours worksheet).

# Regression Example

## Nursing Fixed/Variable Analysis (RN and LPN hours paid, as a function of total patient days)

<u>Year</u>	<u>Month</u>	<u>RN/LPN Hours</u>	<u>Total Pat Days</u>	<u>Regression Output</u>	
FY94	JUL	56,279	4,599	Constant	28,531
FY94	AUG	54,916	4,348	Std Err of Y Est	1,987
FY94	SEP	51,936	4,139	R Squared	0.618453
FY94	OCT	53,162	4,372	No. of Observations	36
FY94	NOV	53,395	4,659	Degrees of Freedom	34
FY94	DEC	51,936	4,570		
	•			X Coefficient(s)	5.422113
	•			Std Err of Coef.	0.730381
	•				
FY96	JAN	46,507	3,620	<u>Based on 36 months</u>	
FY96	FEB	44,278	3,612	Monthly fixed hours (per regression)	<u>28,531</u>
FY96	MAR	46,388	3,579		
FY96	APR	43,473	3,128	Average monthly hours	50,243
FY96	MAY	45,837	3,249	% Fixed	<u>56.79%</u>
FY96	JUN	44,924	3,221		
	3 yr average	50,243	4,004		



# Validation of Fixed/Variable Breakouts

A method of validating the fixed/variable assumptions involves the following steps:

1. Apply actual volumes to the cost accounting standards to develop variable hours and \$.

<u>Procedure</u>	<u>Tech Min</u>	<u>Volume</u>	<u>Total Min</u>
Chest single view	15	500	7,500
Ankle	12	200	2,400
Spine entire AP+	40	250	10,000
•			
•			
•			
Total Minutes			600,000
Total Hours			10,000

2. Apply fixed/variable assumptions to actual hours/\$ to develop variable hours/\$.

Actual Rad Tech Hours	13,000
- Variable Hours	11,000
- Fixed Hours	2,000

# Validation of Fixed/Variable Breakouts (Cont)

3. Compare the variable hours/\$ from step 1 to those developed in step 2, and analyze the percentage variance.

Tech hours per standards	10,000
Actual variable hours	11,000
Variance	1,000
% Variance	10%

Note: This method is also used to validate the cost accounting standards

# Breakeven Analysis

- Breakeven analysis is a useful tool in analyzing new services as well as existing services.

- The breakeven point is the point at which revenues are equal to costs.

- More specifically, break-even is defined as:

$$\text{Net revenue} = \text{Fixed costs} + \text{Total variable costs}$$

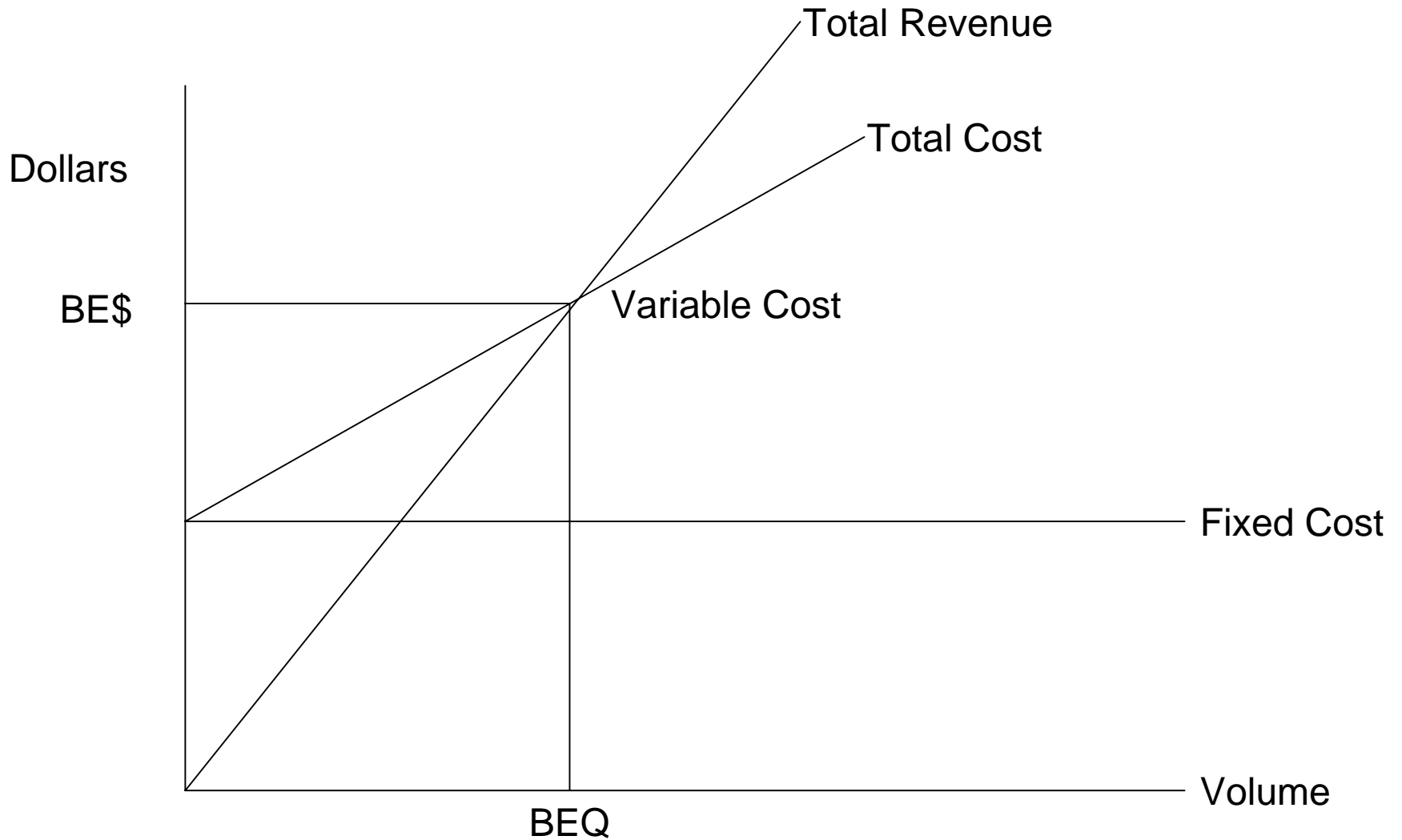
- Translating this equation:

$$\text{Net revenue per unit} \times \text{Units} = \text{Fixed costs} + (\text{Variable cost/unit} \times \text{Units})$$

- Thus, the breakeven point can be calculated using the following equation:

$$\frac{\text{Fixed costs}}{(\text{Net revenue per unit}) - (\text{Variable cost per unit})}$$

# Breakeven Point



The breakeven point is the volume level at which revenues are equal to costs. (Source: "Hospital Cost Management and Accounting", Vol. 1, No.8, p.2, Aspen Publishers, Inc., 1989)

# Break-even Analysis: New vs. Existing Services

- Adding a service: Fixed costs should include only the incremental fixed costs for that service (program-specific fixed costs).
- Analyzing an existing service: Fixed costs should include those organizational fixed costs that the service is currently covering.
- Hence, it is important to look at the purpose of the break-even analysis.
- The bottom line: Different decisions require different calculations

# Breakeven Analysis for Multiple Services and Multiple Payors

- When multiple types of patients are involved in the analysis (DRG's, product lines, types of physician visits), the net revenue per case and variable cost per case should be **WEIGHTED**:

$$VC/CASE = \frac{\text{Total variable costs}}{\text{Cases}}$$

$$NR/Case = \frac{\text{Total net revenue}}{\text{Cases}}$$

- Similarly, when the scenario involves multiple payors with varying reimbursement methods, weighted averages should be calculated.

# Breakeven Analysis: Considerations

- In a breakeven analysis, several factors are assumed to be CONSTANT over a range of volume:
  - Fixed costs
  - Variable cost/unit
  - Productivity/efficiency
  - Mix of case-types
  - Payor mix
- In other words, these factors may be valid for the *relevant range* only.
- “Breakeven analysis is a very static model in a very dynamic world” (Steven Finkler, “Cost Accounting for Health Care Organizations”, Aspen Publishers, 1994, p.214).
- Solution: Conduct sensitivity analysis (consider range of possible values - calculate a worst case and best case).

# Breakeven Analysis and Step-Function Costs

- The challenge of breakeven analysis with step-function costs is that the factors of fixed costs and variable costs per unit will vary at different volume levels.
- Approach with step function costs: first calculate at the lowest feasible volume level, then recalculate at various volume levels.
- Example:
  - Net revenue per case is \$3,000.
  - Variable cost per unit is \$1,000.
  - At a volume level of 50-75 cases, fixed costs are \$160,000.
  - At a volume level of 76-100 cases, fixed costs are \$200,000.

1. Calculate at volume level A:

$$\begin{aligned}\text{Breakeven} &= \text{Fixed costs}/(\text{Net rev per case} - \text{Var cost per case}) \\ &= \$160,000/ (3,000-1,000) \\ &= 80 \text{ cases (which is volume level B)}\end{aligned}$$

2. Next, calculate at volume level B:

$$\begin{aligned}\text{Breakeven} &= \text{Fixed costs}/ (\text{Net rev per case} - \text{Var cost per case}) \\ &= \$200,000/ \$3,000-1,000) \\ &= 100 \text{ cases}\end{aligned}$$

Because the breakeven point is at this volume level (B), it is not necessary to continue for other volume levels.

# Contribution Margin Analysis

- Contribution margin is defined as net revenue less variable costs.
- In addition to looking at the total contribution margin amount for a service, it is also important to consider constraining factors.
- For example, if the total number of cases is limited, calculate contribution margin on a *per case* basis.

# An Application of Cost-Volume Relationships: Case-Based Budgeting

- What is it? A method of budgeting that develops budget staffing and expenses based on forecasted volumes by product line.
- How is it different than traditional budgeting methods? The budget is driven from the product level vs. the department level (although it does result in a departmental budget).
- Who's doing it? More widespread on the West Coast, although more and more hospitals are producing case-based budgets, even if on a macro level, or if parallel with a traditional budgeting process.
- What does it require? Fixed/variable assumptions, and cost accounting standards (variable cost per unit).

# Benefits of Case-Based Budgeting

- Expands the analysis of variance: volume variance can now be broken into case variance and utilization variance.
- Improves forecasting capabilities.
- Incorporates product-mix into the budget.
- Can be run in parallel with a traditional budgeting approach, and used to provide an initial target for department managers.
- If parallel with a traditional budget, can be used to validate the budget coming in from department managers.

# Case-Based Budgeting: Steps

1. Determine how product will be defined (e.g. individual DRG's, DRG groupings, ICD-9-CM codes).
2. Determine outpatient products (e.g. ASC categories, Clinics, ER, Recurring, Other)
3. Develop forecasted cases by product.
4. Develop treatment protocol by product, from historical data.
5. Apply treatment protocol to forecasted cases, to develop budget volumes by charge code.
6. Apply cost standards to budgeted volume, to develop variable portion of budget.
7. Add fixed costs to produce departmental budgets.

# Case-Based Budgeting Model

