CHAPTER 5
Managerial Accounting Basics, Cost Behavior, and Profit Analysis

- Introduction to managerial accounting
- Cost classifications
- Profit analysis
  - Fee-for-service
  - Capitation
- Impact of cost structure on risk
Managerial Accounting

- **Financial accounting:**
  - Uses organizational (aggregate) data
  - Designed for use by external parties
  - Primarily historical
  - Must adhere to external standards (GAAP)

- **Managerial accounting:**
  - Uses organizational and subunit data.
  - Designed for use by managers.
  - Primarily forward looking.
  - Does not adhere to external standards.
Cost measurement is a critical part of managerial accounting.

- In fact, there is an entire field of accounting called cost accounting.
- Unfortunately, there is no single definition of the term cost. Different costs are used for different purposes.

Costs are classified in two major ways. In this chapter, we focus on the relationship of costs to volume.
Is there a difference between a *cost* and an *expense*?
The relationship between costs and the volume of services provided is called cost behavior or underlying cost structure.

If the underlying cost structure is known, managers can forecast costs at different levels of patient volume.

In this context, costs may be:
- **Fixed**, which are independent of volume
- **Variable**, which depend on volume
- **Semi-fixed**, which partially depend on volume
In the *long run*, all costs are variable, and hence these cost classifications hold only in the *short run*, say, for one year.

Also, no costs are fixed throughout an infinite range of volumes. Thus, the concept of cost classifications according to volume must be applied within some *relevant range* of patient volume.
What are some examples of fixed and variable costs, say, for a hospital’s clinical laboratory?
## Cost Structure Example: Walk-In Clinic

<table>
<thead>
<tr>
<th>Variable Costs Per Visit</th>
<th>Fixed Costs Per Year</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Clinical supplies</strong></td>
<td>Facilities</td>
</tr>
<tr>
<td>$20</td>
<td>$30,000</td>
</tr>
<tr>
<td><strong>Other supplies</strong></td>
<td>Salaries</td>
</tr>
<tr>
<td>$5</td>
<td>190,000</td>
</tr>
<tr>
<td><strong>Variable cost rate</strong></td>
<td>Overhead</td>
</tr>
<tr>
<td>$25</td>
<td>80,000</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
</tr>
<tr>
<td></td>
<td>$300,000</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Volume</th>
<th>Fixed Costs</th>
<th>Variable Costs</th>
<th>Total Costs</th>
<th>Average Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$300,000</td>
<td>$25</td>
<td>$300,025</td>
<td>$300,025</td>
</tr>
<tr>
<td>100</td>
<td>300,000</td>
<td>2,500</td>
<td>302,500</td>
<td>3,025</td>
</tr>
<tr>
<td>200</td>
<td>300,000</td>
<td>5,000</td>
<td>305,000</td>
<td>1,525</td>
</tr>
<tr>
<td>1,000</td>
<td>300,000</td>
<td>25,000</td>
<td>325,000</td>
<td>325</td>
</tr>
<tr>
<td>5,000</td>
<td>300,000</td>
<td>125,000</td>
<td>425,000</td>
<td>85</td>
</tr>
<tr>
<td>10,000</td>
<td>300,000</td>
<td>250,000</td>
<td>550,000</td>
<td>55</td>
</tr>
<tr>
<td>25,000</td>
<td>300,000</td>
<td>625,000</td>
<td>925,000</td>
<td>37</td>
</tr>
</tbody>
</table>

Note: The relevant range is this example is unrealistic.
Cost Structure Example (Cont.)

- Consider a volume of 5,000:
  - Fixed costs = $300,000.
  - Variable cost rate = $25.
  - Total variable costs = $125,000.
  - Total costs = $425,000.
  - Average cost per visit = $85.

- Now consider a volume of 10,000:
  - Fixed costs = $300,000.
  - Variable cost rate = $25.
  - Total variable costs = $250,000.
  - Total costs = $550,000.
  - Average cost per visit = $55.
Graphical Cost Structure

What is the slope of the total variable costs line?
What is the relationship between total costs and total variable costs?
Profit analysis, also called cost-volume-profit (CVP) analysis, is a technique used to assess the effects of alternative volume assumptions on costs and profits.

Why is such information valuable to health services managers?
Atlanta Clinic has forecasted the following cost data on the basis of 75,000 expected visits:

Fixed costs $4,967,462
Total variable costs 2,113,500
Total costs $7,080,962
What is the variable cost rate?

\[
\text{Variable cost rate} = \frac{\text{Total variable costs}}{\text{Volume}}
\]

\[
= \frac{\$2,113,500}{75,000}
\]

\[
= \$28.18 \text{ per visit.}
\]
What is Atlanta’s cost behavior model?

Total costs = Fixed costs + Total variable costs
= $4,967,462 + ($28.18 x Volume).

For example, at 70,000 visits:

Total costs = $4,967,462 + ($28.18 x 70,000)
= $4,967,462 + $1,972,600
= $6,940,062.
Cost/Volume Summary:

**Volume = 70,000**
TC = $4,967,462 + $1,972,600 = $6,940,062.

**Volume = 75,000 (Base Case)**
TC = $4,967,462 + $2,113,500 = $7,080,962.

**Volume = 80,000**
TC = $4,967,462 + $2,254,400 = $7,221,862.
What do Atlanta’s managers learn from the data on the previous slide?

Now, suppose that the average revenue per visit is expected to be $100. What does the clinic’s cost and revenue structure look like graphically?
Graphical Profit Analysis

- Where are profits and losses?
- Where is the breakeven volume?
- Where is 75,000 visits?
The *projected* P&L statement uses cost structure information along with the revenue forecast and projected volume to forecast profitability.

Although it looks like an income statement, it does not have to follow GAAP.

Because it is a *forecast*, it can be influenced by managerial actions.
Base Case P&L Statement

Total revenues ($100 x 75,000) $7,500,000
Total VC ($28.18 x 75,000) 2,113,500
Total CM ($71.82 x 75,000) $5,386,500
Fixed costs 4,967,462
Profit $ 419,038

VC = Variable costs.
CM = Contribution margin.
Note that *base case* total costs equal fixed costs plus total variable costs or $4,967,462 + $2,113,500 = $7,080,962.

Thus, Atlanta’s *average per visit cost* is $7,080,962 / 75,000 = $94.41.

What happens to the average cost per visit as volume increases?

Why?
The contribution margin is defined as the difference between per visit (unit) revenue and the variable cost rate.

It is the amount of each visit’s revenue that is available to:
- First cover fixed costs.
- Flow to profit when fixed costs are covered.

In this illustration, the contribution margin is $100 - $28.18 = $71.82.

What is the total contribution margin?
Breakeven Analysis

Breakeven analysis is performed in many different finance contexts.

Here, it is used to determine the **breakeven volume**, defined as that volume needed for an organization (or service or program) to be financially self-sufficient.

There are two types of breakeven:
- Accounting breakeven (zero profit)
- Economic breakeven (with profit)
Breakeven Analysis (Cont.)

What is the *accounting breakeven* for Atlanta Clinic? There are two approaches to answer this question:
- Projected P&L approach
- Graphical approach

**P&L Approach**

Total revenues - Total VC - FC = Profit

\[
\text{($100 \times V) - ($28.18 \times V) - $4,967,462 = $0}
\]

\[
$71.82 \times V = $4,967,462
\]

\[
V = $4,967,462 / $71.82 = 69,165 \text{ visits.}
\]
Breakeven Analysis (Cont.)

Note that the P&L approach can be recast in a contribution margin format.

**P&L Approach (Contribution Margin Format)**

\[ \text{CM} \times V = \text{Fixed costs} \]
\[ \$71.82 \times V = \$4,967,462 \]
\[ V = \frac{\$4,967,462}{\$71.82} = 69,165 \text{ visits.} \]
Graphical Breakeven Analysis

Revenues and Costs ($)

Total Revenues

Total Costs

Fixed Costs

Volume (Number of Visits)

69,165
Breakeven Analysis (Cont.)

What is the *economic breakeven* if the desired profit level is $100,000?

\[ CM \times V = \text{Fixed costs} + \text{Profit} \]
\[ $71.82 \times V = $5,067,462 \]
\[ V = \frac{$5,067,462}{71.82} = 70,558 \text{ visits.} \]

Note that the accounting breakeven is 69,165 visits. The additional number of visits needed is 1,393.
\[ 1,393 \times CM = 1,393 \times $71.82 = $100,000. \]
Operating Leverage

- **Operating leverage** is the use of fixed costs: the higher the proportion of fixed costs in the cost structure, the greater the operating leverage.

- Operating leverage is measured by the degree of operating leverage (DOL), which is defined as:

  \[
  \text{DOL} = \frac{\text{Total CM}}{\text{EBIT}}, \text{ where}
  \]

  \[
  \text{EBIT} = \text{Earnings before interest and taxes.}
  \]
The DOL changes as volume changes, so a single value is valid for only one volume.

What is the DOL at 75,000 visits?

DOL = Total CM / EBIT

= $5,386,500 / $419,038

= 12.85.

What does the DOL tell Atlanta’s managers?
Operating Leverage (Cont.)

Using DOL:

Visits
-10%
 67,500
+10%
 75,000
 82,500

Profit
-10%
 -$119,612
+10%
 419,038
 957,688

-128.5%
+128.5%

? What does a high DOL mean?
Profit Analysis Under Discounted FFS

- Suppose Atlanta Clinic is confronted with a situation in which a payer contributing 5,000 visits wants a 40 percent discount.

- Atlanta’s managers might want to drop the contract because a $60 per visit payment is less than the $94.41 average per visit cost.

- But further analysis is required.
P&L Statement with 70,000 Visits

Total revenues ($100 x 70,000) $7,000,000
Total VC ($28.18 x 70,000) 1,973,600
Total CM ($71.82 x 70,000) $5,027,400
Fixed costs 4,967,462
Profit $ 39,938
## P&L Statement with Discount Visits

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Undiscounted revenue ($100 x 70,000)</td>
<td>$7,000,000</td>
</tr>
<tr>
<td>Discounted revenue ($60 x 5,000)</td>
<td>$300,000</td>
</tr>
<tr>
<td><strong>Total revenues ($97.33 x 75,000)</strong></td>
<td><strong>$7,300,000</strong></td>
</tr>
<tr>
<td>Total VC ($28.18 x 75,000)</td>
<td>$2,113,500</td>
</tr>
<tr>
<td>Total CM ($69.15 x 75,000)</td>
<td>$5,186,500</td>
</tr>
<tr>
<td>Fixed costs</td>
<td>$4,967,462</td>
</tr>
<tr>
<td><strong>Profit</strong></td>
<td><strong>$219,038</strong></td>
</tr>
</tbody>
</table>
Graphical Profit Analysis

Revenues and Costs ($)

Old Total Revenues

New Total Revenues

Total Costs

Fixed Costs

Volume (Number of Visits)

69,165 71,836
Marginal (Incremental) Analysis

Suppose Atlanta Clinic is approached by a new insurer.

- This payer is expected to contribute 5,000 additional visits.
- However, it wants a 40 percent discount, resulting in a revenue of $60 per visit.

At a volume of 80,000, the clinic’s average cost per visit is $7,221,862 / 80,000 = $90.27, so again Atlanta’s managers might be tempted to say “no.”
## Base Case P&L Statement

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total revenues ($100 \times 75,000)</td>
<td>$7,500,000</td>
</tr>
<tr>
<td>Total VC ($28.18 \times 75,000)</td>
<td>2,113,500</td>
</tr>
<tr>
<td>Total CM ($71.82 \times 75,000)</td>
<td>$5,386,500</td>
</tr>
<tr>
<td>Fixed costs</td>
<td>4,967,462</td>
</tr>
<tr>
<td>Profit</td>
<td>$419,038</td>
</tr>
</tbody>
</table>

VC = Variable costs.
CM = Contribution margin.
### P&L Statement With Added Volume

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Undiscounted revenue ($100 x 75,000)</td>
<td>$7,500,000</td>
</tr>
<tr>
<td>Discounted revenue ($60 x 5,000)</td>
<td>$300,000</td>
</tr>
<tr>
<td>Total revenues ($97.50 x 80,000)</td>
<td>$7,800,000</td>
</tr>
<tr>
<td>Total VC ($28.18 x 80,000)</td>
<td>$2,254,400</td>
</tr>
<tr>
<td>Total CM ($69.32 x 80,000)</td>
<td>$5,545,600</td>
</tr>
<tr>
<td>Fixed costs</td>
<td>$4,967,462</td>
</tr>
<tr>
<td>Profit</td>
<td>$578,138</td>
</tr>
</tbody>
</table>
Graphical Profit Analysis

Revenues and Costs ($)

Old Total Revenues

New Total Revenues

Total Costs

Fixed Costs

Volume (Number of Visits)

69,165

84,928

69,165 84,928
Marginal (Incremental) Analysis (Cont.)

- The **marginal cost** of each visit is the **variable cost rate** of $28.18 per visit.

- The marginal revenue on the new contract is $60 per visit, so the **contribution margin** is $60 - $28.18 = $31.82.

- Thus, **5,000** incremental visits would add 5,000 x $31.82 = $159,100 to the bottom line: $419,038 + $159,100 = $578,138.
At this point, the numerical analysis indicates that the offer should be accepted. Considering all the factors relevant to the decision, what should Atlanta Clinic’s managers do?
Profit Analysis Under Capitation

- **Capitation** changes the way in which profit analysis is conducted.

- Perhaps the best way to see the effects of capitation is by *graphical analysis*.

- We will examine two approaches to graphical analysis:
  - In terms of utilization (number of visits).
  - In terms of membership (covered lives).
### Analysis Based on Visits

<table>
<thead>
<tr>
<th>Volume (Number of Visits)</th>
<th>Total Revenues</th>
<th>Fixed Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Costs</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Graph:
- **Y-axis**: Revenues and Costs ($)
- **X-axis**: Volume (Number of Visits)
On this graph, the profit and loss areas are *reversed* from the fee-for-service graph.

This “perverse” result occurs because the contribution margin on a per visit basis is negative.

- Each additional visit increases costs with no increase in revenues.
Graphical Analysis Based on Members

Note: Average utilization is assumed regardless of volume.
Analysis Based on Members (Cont.)

Now, the profit and loss areas are the same as on the fee-for-service graph.

On a per member basis, the contribution margin is positive.

- Each additional member contributes positively to profits.
- If per member annual revenue is $400 per member and variable costs (based on 4 visits) is 4 x $28.18 = $112.72 per year, the contribution margin is $400 - $112.72 = $287.28.
Discussion Items

What do the graphs tell managers about the importance of *utilization management*:
- Under FFS reimbursement?
- Under capitation?

What do the graphs tell about the importance of the *number of members* under capitation?
The Impact of Cost Structure on Risk

- If reimbursement is tied exclusively to volume (FFS), then the provider’s financial risk is minimized if all costs are variable.

- If reimbursement is exclusively capitated, then the provider’s financial risk is minimized if all costs are fixed.
Graphical Analysis under FFS

Revenues and Costs ($)

Volume (Number of Visits)

Total Revenues

Total VCs = Total Costs
Graphical Analysis Under Capitation

Revenues and Costs ($)

Total Revenues

Fixed Costs = Total Costs

Volume (Number of Visits)
What are the implications of the previous two slides for managerial decision making?
This concludes our discussion of *Chapter 5* (Managerial Accounting Basics, Cost Behavior, and Profit Analysis).

Although not all concepts were discussed in class, you are responsible for all of the material in the text.

Do you have any questions?