Chapter 7

Cost-Volume-Profit (CVP) Relationships

CVP analysis helps management understand the interrelationship between cost, volume and profit in an organization.

It focuses on interactions between the following five elements:

1. Prices of products
2. Volume or level of activity
3. Per unit variable costs
4. Total fixed costs
5. Mix of products sold

THE BASICS OF COST-VOLUME-PROFIT ANALYSIS

ACOUSTICS CONCEPTS, INC.
Contribution Income Statement
For the Month of June

	Total	Per Unit
Sales (400 speakers)	$100'000	$250
Less variable expenses	60'000	150
Contribution margin	40'000	$100
Less fixed expenses	35'000	
Net Income	$5'000	

This is with what we start CVP analysis

Contribution Margin?

What does it mean?

CM is the amount available to cover fixed expenses and then to provide profits for the period.

Have you noted the sequence?

If a contribution margin is not sufficient to cover fixed expenses, then a loss occurs for the period.

Ex: Assume that Acoustic Concepts has been able to sell only one speaker, at that point, the company's contribution income statement would appear as follows:

ACOUSTICS CONCEPTS, INC.
Contribution Income Statement
For the Month Any

	Total	Per Unit
Sales (1 speaker)	$250	$250
Less variable expenses	150	150
Contribution margin	100	$100
Less fixed expenses	35'000	
Net Income	(34'900)	

ACOUSTICS CONCEPTS, INC.
Contribution Income Statement
For the Month Any

	Total	Per Unit
Sales (1 speaker)	$250	$250
Less variable expenses	150	150
Contribution margin	100	$100
Less fixed expenses	35'000	
Net Income	$(34'900)	

For each additional speaker that the company is able to sell during the month, $100 more in CM will become available to help cover the fixed expenses.

If a second speaker is sold, for example, what will be the total CM to cover fixed expenses?

ACOUSTICS CONCEPTS, INC.
Contribution Income Statement
For the Month Any

	Total	Per Unit
Sales (2 speakers)	$500	$250
Less variable expenses	300	150
Contribution margin	200	$100
Less fixed expenses	35'000	
Net Income	$(34'800)	

If enough speakers can be sold to generate$35’000 in CM, then all of the fixed costs will be covered and the company will have managed to at least **break even** for the month – that is, to show neither profit nor loss, but just cover fixed costs for the month.

Break Even Point – the point where total sales revenue equals total expenses, or – the point where total CM equals total fixed expenses.

So, how many speakers should we sell in order to reach the **Break Even Point**?

ACOUSTICS CONCEPTS, INC.
Contribution Income Statement
For the Month Any

	Total	Per Unit
Sales (X speakers)	$87’500	$250
Less variable expenses	52’500	150
Contribution margin	35’000	$100
Less fixed expenses	35’000	
Net Income	$ -0-	

Once the break-even point has been reached, net income will increase by the unit CM for each additional unit sold.

If 351 speakers are sold in a month, on how much will our income increase compared to break-even sales?

ACOUSTICS CONCEPTS, INC.
Contribution Income Statement
For the Month Any

	Total	Per Unit
Sales (351 speakers)	$87'750	$250
Less variable expenses	52'650	150
Contribution margin	35'100	$100
Less fixed expenses	35'000	
Net Income	$ 100	

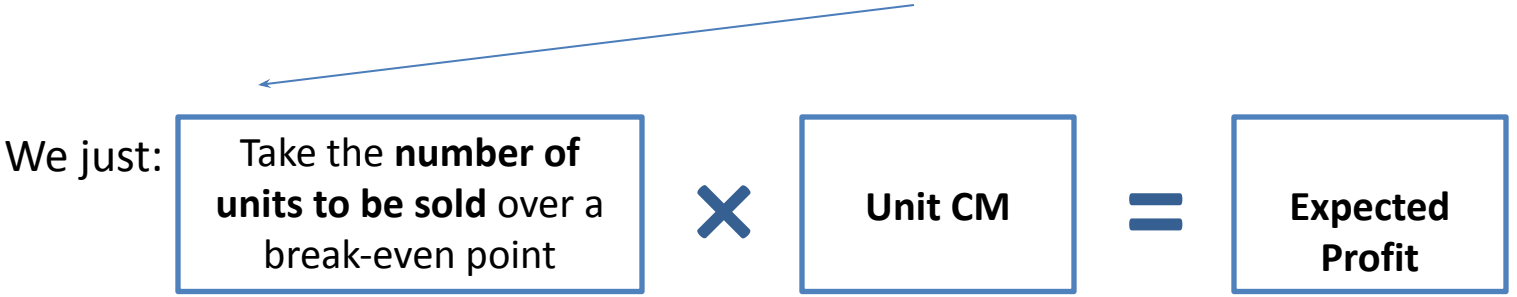
If 352 speakers are sold?

ACOUSTICS CONCEPTS, INC.
Contribution Income Statement
For the Month Any

	Total	Per Unit
Sales (352 speakers)	$88'000	$250
Less variable expenses	52'800	150
Contribution margin	35'200	$100
Less fixed expenses	35'000	
Net Income	$ 200	

So WHAT?

The CM concepts helps us know what the profits will be at various levels of activity without the need to prepare a whole series of income statements.



Ex: Assume that Acoustic Concepts is selling 400 speakers per month and plans to increase the sales to 425 speakers per month. What impact will be on profits of the company?

The CM concepts helps us know what the profits will be at various levels of activity without the need to prepare a whole series of income statements.

We just: Take the **number of units to be sold** over a break-even point × **Unit CM** = **Expected Profit**

Ex: Assume that Acoustic Concepts is selling 400 speakers per month and plans to increase the sales to 425 speakers per month. What impact will be on profits of the company?

Increased number of speakers to be sold….	25
CM per speaker……	× $100
Increase in net income…….	$2’500

These calculations can be verified as follows:

	Sales Volume		Difference	
	400 Speakers	425 Speakers	25 Speakers	Per Unit
Sales	$100,000	$106,250	$6,250	$250
Less variable expenses	60,000	63,750	3,750	150
Contribution margin	40,000	42,500	2,500	$100
Less fixed expenses	35,000	35,000	–0–	
Net income	$ 5,000	$ 7,500	$2,500	

Summary for CM:

1. If there were no sales, the company loss would be equal its fixed expenses.
2. Each unit that is sold, reduces the loss by the amount of the unit CM
3. Once the break-even point has been reached, each additional unit sold increases the company's profit by the amount of the unit CM.

	Sales Volume		Difference	
	400 Speakers	425 Speakers	25 Speakers	Per Unit
Sales	$100,000	$106,250	$6,250	$250
Less variable expenses	60,000	63,750	3,750	150
Contribution margin	40,000	42,500	2,500	$100
Less fixed expenses	35,000	35,000	–0–	
Net income	$ 5,000	$ 7,500	$2,500	

Contribution Margin Ratio (CM Ratio)

In addition to being expressed on a per unit basis, revenues, variable expenses, and CM for Acoustics Concepts can be expressed on a percentage basis:

	Total	Per Unit	Percent
Sales (400 speakers)	$100,000	$250	100
Less variable expenses	60,000	150	60
Contribution margin	40,000	$100	40
Less fixed expenses	35,000		
Net income	$ 5,000		

$$\frac{\text{Contribution Margin}}{\text{Sales}} = \text{CM ratio}$$

Using the CM RATIO, the impact on Net Income of any given dollar change in total sales can be computed in seconds by simply applying the CM ratio to the dollar change.

1. Calculate CM Ratio for Acoustic Concepts

	Total	Per Unit	Percent
Sales (400 speakers)	$100,000	$250	100
Less variable expenses	60,000	150	60
Contribution margin	40,000	$100	40
Less fixed expenses	35,000		
Net income	$ 5,000		

Computation:

2. What kind of information can you reveal from your computations?

3. What will be the increase in CM if Acoustic Concepts plans to increase sales in the next month by $30'000?

4. If fixed costs don't change during the coming months, what will be the change in NI?

1. Calculate CM Ratio for Acoustic Concepts

	Total	Per Unit	Percent
Sales (400 speakers)	$100,000	$250	100
Less variable expenses	60,000	150	60
Contribution margin	40,000	$100	40
Less fixed expenses	35,000		
Net income	$ 5,000		

Computation:

$$\frac{\text{Total contribution margin, \$40,000}}{\text{Total sales, \$100,000}} = 40\% \quad \text{or} \quad \frac{\text{Per unit contribution margin, \$100}}{\text{Per unit sales, \$250}} = 40\%$$

2. What kind of information can you reveal from your computations?

- For each dollar increase in sales, total CM will increase by 40 cents.
- If there is no change in fixed costs, then NI will also increase by 40 cents.

3. What will be the increase in CM if Acoustic Concepts plans to increase sales in the next month by $30'000?

$30'000 increased sales × CM Ratio of 40% = $12'000 increase in sales

4. If fixed costs don't change during the coming months, what will be the change in NI?

Net Income will also increase by $12'000

5. Verify your statements about the changes in NI and CM by constructing income statements

	Sales Volume			
	Present	**Expected**	**Increase**	**Percent**
Sales……	$100'000	……	……	……
…….		…….	…….	…….
Less variable expenses……	60'000	_____	_____	…… …….
Contribution margin……	40'000	…… …….	…… …...	…… …….
Less fixed expenses……	35'000	_____	_____	
Net Income…… …	$ 5'000	…… …….	…… …...	

5. Verify your statements about the changes in NI and CM by constructing income statements

	Sales Volume			
	Present	**Expected**	**Increase**	**Percent**
Sales……	$100’000	……	……	……
…….		…….	…….	…….
Less variable expenses……	60’000	_____	_____	…… …….
Contribution margin……	40’000	…… …….	…… …..	…… …….
Less fixed	35’000	_____	_____	

	Sales Volume			
	Present	**Expected**	**Increase**	**Percent**
Sales	$100,000	$130,000	$30,000	100
Less variable expenses	60,000	78,000*	18,000	60
Contribution margin	40,000	52,000	12,000	40
Less fixed expenses	35,000	35,000	–0–	
Net income	$ 5,000	$ 17,000	$12,000	

*$130,000 expected sales × 60% variable expense ratio = $78,000.

Some applications of CVP concepts

We will use the following and other data:

	Per Unit	Percent
Sales price	$250	100
Less variable expenses	150	60
Contribution margin	$100	40

Recall that F. exp. equal
$35’000

❖ ***Change in Fixed Costs and Sales Volume***

Acoustic Concepts is currently selling 400 speakers per month (monthly sales of $100’000). The sales manager feels that a $10’000 increase in monthly advertising budget would increase monthly sales by $30’000. Should the advertising budget be increased?

Some applications of CVP concepts

We will use the following and other data:

	Per Unit	Percent
Sales price	$250	100
Less variable expenses	150	60
Contribution margin	$100	40

Recall that F. exp. equal $35'000

❖ *Change in Fixed Costs and Sales Volume*

Acoustic Concepts is currently selling 400 speakers per month (monthly sales of $100'000). The sales manager feels that a $10'000 increase in monthly advertising budget would increase monthly sales by $30'000. Should the advertising budget be increased?

Expected total contribution margin:	
$130,000 × 40% CM ratio	$52,000
Present total contribution margin:	
$100,000 × 40% CM ratio	40,000
Incremental contribution margin	12,000
Change in fixed costs:	
Less incremental advertising expense	10,000
Increased net income	$ 2,000

If we don't know the previous sales, we could come to this solution like this:

Incremental contribution margin:	
$30,000 × 40% CM ratio	$12,000
Less incremental advertising expense	10,000
Increased net income	$ 2,000

Some applications of CVP concepts

We will use the following and other data:

	Per Unit	Percent
Sales price	$250	100
Less variable expenses	150	60
Contribution margin	$100	40

Recall that F. exp. equal $35'000

❖ *Change in Fixed Costs and Sales Volume*

Acoustic Concepts is currently selling 400 speakers per month (monthly sales of $100'000). The sales manager feels that a $10'000 increase in monthly advertising budget would increase monthly sales by $30'000. Should the advertising budget be increased?

Expected total contribution margin:	
$130,000 × 40% CM ratio	$52,000
Present total contribution margin:	
$100,000 × 40% CM ratio	40,000
Incremental contribution margin	12,000
Change in fixed costs:	
Less incremental advertising expense	10,000
Increased net income	$ 2,000

If we don't know the previous sales, we could come to this solution like this:

Incremental contribution margin:	
$30,000 × 40% CM ratio	$12,000
Less incremental advertising expense	10,000
Increased net income	$ 2,000

Yes, based on the information presented, and assuming that other factors in the company don't change, the advertising budget should be increased.

Here, we used an incremental analysis.

Incremental analysis considers only those items of revenue, cost, and volume that will change if the new program or project is implemented.

❖ ***Change in Variable Costs and Sales Volume***

Management has received an advice about higher-quality components, which, as the sales manager predicts, would increase sales to 480 speakers per month, however the use of these higher-quality components will increase variable costs (and thereby reduce CM) by $10 per speaker. Should the higher-quality components be used?

❖ ***Change in Variable Costs and Sales Volume***

Management has received an advice about higher-quality components, which, as the sales manager predicts, would increase sales to 480 speakers per month, however the use of these higher-quality components will increase variable costs (and thereby reduce CM) by $10 per speaker. Should the higher-quality components be used?

The $10 increase in variable costs will cause the unit contribution margin to decrease from $100 to $90.

Expected total contribution margin:	
480 speakers × $90	$43,200
Present total contribution margin:	
400 speakers × $100	40,000
Increase in total contribution margin	$ 3,200

Yes, based on the information above, the higher-quality components should be used.

❖ ***Change in Fixed Costs, Sales Price, and Sales Volume***

The sales manager would like to cut the selling price by $20 per speaker and increase the advertising budget by $15’000 per month. He argues that if these two steps are taken, unit sales will increase by 50%. Should the changes be made?

❖ *Change in Fixed Costs, Sales Price, and Sales Volume*

The sales manager would like to cut the selling price by $20 per speaker and increase the advertising budget by $15'000 per month. He argues that if these two steps are taken, unit sales will increase by 50%. Should the changes be made?

A decrease of $20 per speaker in the selling price will cause the unit contribution margin to decrease from $100 to $80.

Expected total contribution margin:	
400 speakers × 150% × $80	$48,000
Present total contribution margin:	
400 speakers × $100	40,000
Incremental contribution margin	8,000
Change in fixed costs:	
Less incremental advertising expense	15,000
Reduction in net income	$ (7,000)

No, based on the information above, the changes should not be made. The same solution can be obtained by preparing comparative income statements:

We would obtain the same conclusion if we have constructed income statements using contribution format.

	Present 400 Speakers per Month		Expected 600 Speakers per Month		
	Total	Per Unit	Total	Per Unit	Difference
Sales	$100,000	$250	$138,000	$230	$38,000
Less variable expenses	60,000	150	90,000	150	30,000
Contribution margin	40,000	$100	48,000	$ 80	8,000
Less fixed expenses	35,000		50,000*		15,000
Net income (loss)	$ 5,000		$ (2,000)		$(7,000)

*$35,000 + $15,000 = $50,000.

Notice that the answer is the same as that obtained by the incremental analysis above.

❖ ***Change in Variable Cost, Fixed Cost, and Sales Volume***

The sales manager would like to place the sales staff on a commission basis of $15 per speaker sold, rather than on flat salaries that now total $6’000 per month. He is confident, that the change will increase monthly sales by 15%. Should the change be made?

❖ *Change in Variable Cost, Fixed Cost, and Sales Volume*

The sales manager would like to place the sales staff on a commission basis of $15 per speaker sold, rather than on flat salaries that now total $6'000 per month. He is confident, that the change will increase monthly sales by 15%. Should the change be made?

Changing the sales staff from a salaried basis to a commission basis will affect both fixed and variable costs. Fixed costs will decrease by $6,000, from $35,000 to $29,000. Variable costs will increase by $15, from $150 to $165, and the unit contribution margin will decrease from $100 to $85.

Expected total contribution margin:	
400 speakers × 115% × $85	$39,100
Present total contribution margin:	
400 speakers × $100	40,000
Decrease in total contribution margin	(900)
Change in fixed costs:	
Add salaries avoided if a commission is paid	6,000
Increase in net income	$ 5,100

Yes, the changes should be made

We would obtain the same conclusion if we have constructed income statements using contribution format.

	Present 400 Speakers per Month		Expected 460 Speakers per Month		Difference: Increase or (Decrease) in Net Income
	Total	Per Unit	Total	Per Unit	
Sales	$100,000	$250	$115,000*	$250	$ 15,000
Less variable expenses	60,000	150	75,900	165	(15,900)
Contribution margin	40,000	$100	39,100	$ 85	(900)
Less fixed expenses	35,000		29,000		6,000
Net income	$ 5,000		$ 10,100		$ 5,100

*400 speakers × 115% = 460 speakers.
460 speakers × $250 = $115,000.

❖ ***Change in Regular Sales Price***

The company has an opportunity to make a bulk sale of 150 speakers to a wholesaler if an acceptable price can be worked out. This sale would not disturb the company's regular sales. What price per speaker should be quoted to the wholesaler if Acoustic Concepts wants to increase its monthly profits by $3'000?

❖ ***Change in Regular Sales Price***

The company has an opportunity to make a bulk sale of 150 speakers to a wholesaler if an acceptable price can be worked out. This sale would not disturb the company's regular sales. What price per speaker should be quoted to the wholesaler if Acoustic Concepts wants to increase its monthly profits by $3'000?

Variable cost per speaker	$150
Desired profit per speaker:	
$3,000 ÷ 150 speakers	20
Quoted price per speaker	$170

If Acoustic Concepts had been operating at a loss rather than at a profit, many managers would look at the situation somewhat differently. Instead of a modest profit of $3,000, many managers would attempt to reverse all or part of the company's overall loss by quoting a higher price. To illustrate this point, assume that Acoustic Concepts presently has a loss of $6,000 this month and that the company would like to make enough money on the bulk sale of speakers to turn this loss into a profit of $3,000. Under these circumstances, the quoted price on the 150 new speakers would be computed as shown below.

❖ ***Change in Regular Sales Price***

The company has an opportunity to make a bulk sale of 150 speakers to a wholesaler if an acceptable price can be worked out. This sale would not disturb the company's regular sales. What price per speaker should be quoted to the wholesaler if Acoustic Concepts wants to increase its monthly profits by $3'000?

Variable cost per speaker	$150
Desired profit per speaker:	
$3,000 ÷ 150 speakers	20
Quoted price per speaker	$170

If Acoustic Concepts had been operating at a loss rather than at a profit, many managers would look at the situation somewhat differently. Instead of a modest profit of $3,000, many managers would attempt to reverse all or part of the company's overall loss by quoting a higher price. To illustrate this point, assume that Acoustic Concepts presently has a loss of $6,000 this month and that the company would like to make enough money on the bulk sale of speakers to turn this loss into a profit of $3,000. Under these circumstances, the quoted price on the 150 new speakers would be computed as shown below.

Variable cost per speaker	$150
Present net loss:	
$6,000 ÷ 150 speakers	40
Desired profit:	
$3,000 ÷ 150 speakers	20
Quoted price per speaker	$210

The $210 price we have computed represents a substantial discount from the $250 regular selling price per speaker. Thus, both the wholesaler and the company would benefit from the bulk order at this price. This will not always happen, however. By attempting to cover all of the company's losses on one special order, a manager may quote such a high price that the order is lost. And any price greater than $150 will help to reduce the company's loss. A manager must always keep such market considerations in mind when deciding on prices.

Importance of CM

- CVP analysis seeks the most profitable combination of variable costs, fixed costs, selling price, and sales volume.

- In applying CVP analysis very often we see that the effect on the CM is a major consideration in deciding on the most profitable combination of these factors.

- The size of the unit CM figure (and the size of the CM ratio) will have a heavy influence on what steps a company is willing to take to improve profits.

  Ex: The greater the unit CM for a product, the greater is the amount that a company will be willing to spend in order to increase unit sales of the product by a given percentage.

BREAK-EVEN ANALYSIS

Answers a question: How far sales could drop before the company begins to lose money?

Two approaches to Break-Even analysis:

1. Equation Method
2. Contribution Margin Method

❖ ***Change in Regular Sales Price***

❖ *Margin of Safety*

Margin of safety is the excess of budgeted (or actual) sales over the break-even volume of sales. The amount by which sales can drop before losses begin to be incurred.

Formula for margin of safety:

Total Sales – Break-even Sales = Margin of Safety

Margin of safety can also be obtained in a percentage form:

$$\text{Margin of safety percentage} = \frac{\text{Margin of Safety in Dollars}}{\text{Total Sales}}$$

Ex: For Acoustic Concepts, whose sales in units are 400, BE sales are 350 speakers and per unit sales price is $250. Calculate the margin of safety in dollars and as a percentage of sales.

Sales (at the current volume of 400 speakers) (a)	$100'000
Break-even sales (at 350 speakers)	87'500
Margin of safety (in dollars) (b)	$12'500
Margin of safety as a percentage of sales	12.5%

This margin of safety means that at the current level of sales and with the company's current prices and cost structure, a reduction in sales of $12'500 or 12.5%, would result in just break even.

CVP CONSIDERATIONS IN CHOOSING A COST STRUTURE

Cost Structure is the relative proportion of fixed and variable costs in an organization.

❖ *Cost Structure and Profit Stability*

Which cost structure is better – high variable costs and low fixed costs, or the opposite?

Ex: Let's look at two blueberry farms:

Bogside Farm
- depends on migrant workers to pick its berries by hand
- has higher variable costs

Sterling Farm
- has invested in expensive berry-picking machines
- has higher fixed costs

	Bogside Farm		Sterling Farm	
	Amount	Percent	Amount	Percent
Sales	$100,000	100	$100,000	100
Less variable expenses	60,000	60	30,000	30
Contribution margin	40,000	40	70,000	70
Less fixed expenses	30,000		60,000	
Net income	$ 10,000		$ 10,000	

 assume that each farm experiences a 10% increase in sales. Which farm would earn more?

	Bogside Farm		Sterling Farm	
	Amount	Percent	Amount	Percent
Sales	$110,000	100	$110,000	100
Less variable expenses	66,000	60	33,000	30
Contribution margin	44,000	40	77,000	70
Less fixed expenses	30,000		60,000	
Net income	$ 14,000		$ 17,000	

We could have come to the **same result** by multiplying the increase in sales by the **CM ratio** for the companies:

Bogside (10000 × 0.4)	$4'000
Sterling (10000 × 0.7)	$7'000

As we would expect, for the same dollar increase in sales, **Sterling Farm** has experienced a **greater increase in NI** due to its **higher CM ratio**.

- What if sales can be expected to drop below $100’000 from time to time?
- What are the BEPs of the two farms?
- What are their margins of safety?

	Bogside Farm	Sterling Farm
Fixed expenses	$30,000	$60,000
Contribution margin ratio	÷40%	÷70%
Breakeven in total sales dollars	$75,000	$85,714
Total current sales (a)	$100,000	$100,000
Break-even sales	75,000	85,714
Margin of safety in sales dollars (b)	$ 25,000	$ 14,286
Margin of safety as a percentage of sales (a) ÷ (b)	25.0%	14.3%

This analysis makes it clear that Bogside Farm is less vulnerable to downturns than Sterling Farm, for two reasons:

1. Lower fixed expenses → lower BEP → higher margin of safety. It’s sales may drop more than for Sterling before this farm begins to lose money.
2. Lower CM ratio. When sales fall off, the Bogside will not lose CM as rapidly as Sterling.

Thus, **Bogside’s NI will be less volatile**, although this is a **drawback when sales increase**, it provides **more protection when sales drop**.

Summary for Cost Structure and Profitability:

1. Without knowing the future, it is not obvious which cost structure is better.

2. Both have advantages and disadvantages

3. A company with higher F.C. and lower V.C. will experience wider swings in NI due to changes in sales volume.

4. A company with lower F.C. and higher V.C. will enjoy greater stability in NI and will be more protected during bad years, but at the cost of lower NI in good years.

❖ *Operating Leverage*

Operating leverage is a measure of the extent to which fixed costs are being used in an organization.

- If a company has high operating leverage, then profits will be very sensitive to changes in sales.
- Just as in our example with blueberry farms, where the Sterling farm had a greater operating leverage as a result of the greater amount of F.C. in its structure.

Degree of operating leverage is a measure, ***at a given level of sales***, of how a percentage change in in sales volume will affect profits.

Formula for the Degree of Operating Leverage:

$$Degree\ of\ operating\ leverage = \frac{Total\ \$Contribution\ Margin}{Net\ Income}$$

Calculate the Degree of Operating Leverage for our farms:

$$Bogside\ Farm = \frac{\$40'000}{\$10'000} = 4X \qquad Sterling\ Farm = \frac{\$70'000}{\$10'000} = 7X$$

These figures tell us that for a given percentage change in sales we can expect a change four times as great in the NI for Bogside Farm and a change seven times as great in the NI of Sterling Farm.

	(1) Percent Increase in Sales	(2) Degree of Operating Leverage	(3) Percent Increase in Net Income (1) × (2)
Bogside Farm	10	4	40
Sterling Farm	10	7	70

Behavior:

The degree of operating leverage is greatest at sales levels near the BEP and decreases as sales and profits rise.

Ex: Degree of operating leverage for a Bogside Farm at various sales levels.

Sales	$75'000	$80'000	$100'000	$150'000	$225'000
Less: V.exp.	45'000	48'000	60'000	90'000	135'000
CM (a)	30'000	32'000	40'000	60'000	90'000
Less: F.exp.	30'000	30'000	30'000	30'000	30'000
NI (b)	$ -0-	$ 2'000	$ 10'000	$ 30'000	$ 60'000
Degree of operating leverage (a)÷(b)	∞	16X	4X	2X	1.5X

Thus, a 10% increase in sales would increase profits by only 15% (10% × 1.5X) if the company were operating at a $225'000 sales level, as compared to the 40% increase we computed earlier at the $100'000 sales level.

The degree of operating leverage will continue to decrease the farther the company moves from its BEP.

Summary for Operating leverage (don't write this):

1. A manager can use the degree of operating leverage to quickly estimate what impact various percentage changes in sales will have on profits, without the necessity of preparing income statements.

2. If a company is fairly near its BEP, then even small increases in sales can yield large increases in profits.

3. This explains why management sometimes work very hard for only a small increase in sales volume.

4. If the DOL is 5X, then a 6% increase in sales would translate into a 30% increase in profits.

Carnival Corporation owns and operates a fleet of cruise ships under the names Carnival Cruise Lines and Holland America Line. In its 1993 annual report, the company states that "fixed costs, including depreciation, fuel, insurance, port charges and crew costs represent more than one-third of the Company's operating expenses and do not significantly change in relation to changes in passenger loads and aggregate ticket revenue." Since the fixed costs are one-third of operating expenses, the variable expenses must be two-thirds.

Because of the company's fixed costs, increases and decreases in passenger loads have a disproportionate impact on net income. The company reported total operating expenses of $908 million and net income of $348 million on revenues of $1,557 million in 1993. Therefore, Carnival's operating leverage was about 2.73.

Carnival Corporation owns and operates a fleet of cruise ships under the names Carnival Cruise Lines and Holland America Line. In its 1993 annual report, the company states that "fixed costs, including depreciation, fuel, insurance, port charges and crew costs represent more than one-third of the Company's operating expenses and do not significantly change in relation to changes in passenger loads and aggregate ticket revenue." Since the fixed costs are one-third of operating expenses, the variable expenses must be two-thirds.

Because of the company's fixed costs, increases and decreases in passenger loads have a disproportionate impact on net income. The company reported total operating expenses of $908 million and net income of $348 million on revenues of $1,557 million in 1993. Therefore, Carnival's operating leverage was about 2.73.

$$DOL = \frac{CM}{NI} = \frac{\$1'557 - {}^{2}/_{3} \times \$908}{\$348} = 2.73$$

If the next year's revenues are expected be 115% of this year's sales, what percentage increase in NI we would expect for the company?

Carnival Corporation owns and operates a fleet of cruise ships under the names Carnival Cruise Lines and Holland America Line. In its 1993 annual report, the company states that "fixed costs, including depreciation, fuel, insurance, port charges and crew costs represent more than one-third of the Company's operating expenses and do not significantly change in relation to changes in passenger loads and aggregate ticket revenue." Since the fixed costs are one-third of operating expenses, the variable expenses must be two-thirds.

Because of the company's fixed costs, increases and decreases in passenger loads have a disproportionate impact on net income. The company reported total operating expenses of $908 million and net income of $348 million on revenues of $1,557 million in 1993. Therefore, Carnival's operating leverage was about 2.73.

$$DOL = \frac{CM}{NI} = \frac{\$1'557 - {}^{2}/_{3} \times \$908}{\$348} = 2.73$$

If the next year's revenues are expected be 115% of this year's sales, what percentage increase in NI we would expect for the company?

$$15\% \times 2.73 = 40.95\%$$

❖ ***Structuring sales commissions***

Pipeline Unlimited produces surfing equipment. Data for the company's two products appears below:

	Model	
	XR7	Turbo
Selling price	$100	150
Less V.Exp.	75	132
CM	**25**	**18**