

Topic Overview	
Topic	BAFS Elective Part – Accounting Module – Cost Accounting A10: Cost-Volume-Profit Analysis
Level	S5 / S6
Duration	2 lessons (40 minutes per lesson)

Learning Objectives:

1. To identify variable and fixed costs;
2. To understand the uses and assumptions of Cost-Volume-Profit (CVP) analysis;
3. To apply the CVP analysis formulae;
4. To calculate unit contributions, break-even point, sales volume required to break-even or to earn a target profit, and margin of safety; and
5. To apply the CVP analysis in decision making and estimation under different scenarios.

Prior Knowledge:

Students should be familiar with Cost-Volume-Profit Analysis and calculating the Rate of Return.

Overview of Contents:

Lesson 1 Cost-Volume-Profit Analysis (i)
Lesson 2 Cost-Volume-Profit Analysis (ii)

Resources:

- Topic Overview, Teaching Plan and Answers to Student Worksheet
- PowerPoint Presentation
- Student Worksheet

Suggested activities:

- Case study
- Group discussion

Lesson 1	
Theme	Cost-Volume-Profit Analysis (i)
Duration	40 minutes

Expected Learning Outcomes:

Upon completion of this lesson, students will be able to:

1. Apply the CVP analysis formulae to calculate unit contributions, break-even point, sales volume required to break-even or to earn a target profit, and margin of safety; and
2. Apply the CVP analysis in decision making and estimation under different scenarios.

Teaching Sequence and Time Allocations:

Activities	Reference	Time Allocation
Part I: Introduction		
<ul style="list-style-type: none"> ◇ Teacher begins lesson by asking students product profit is affected by cost, selling price and sales volume to bring out the lesson theme. 	PPT #1-5	3 minutes
Part II : Content		
<ul style="list-style-type: none"> ◇ Activity 1 : Case Study (Part I) <ul style="list-style-type: none"> ■ Students review Case Study – Part I and calculate the business annual profit and rate of return; ■ Students divide into groups of 4 or 5 to complete the activities. ■ Teacher invites students to present findings before distributing the suggested answers to them. 	Student Worksheet pp.1-2 PPT #6-8	5 minutes
<ul style="list-style-type: none"> ◇ Teacher distributes the suggested answers and highlights key points learned in Part I. 		3 minutes
<ul style="list-style-type: none"> ◇ Activity 2 : Case Study (Part II) <ul style="list-style-type: none"> ■ Teacher reviews the break-even concept. ■ Students are asked to study Part II and calculate the break-even point and margin of safety of the existing business. Students then have to make a recommendation. 	Student Worksheet pp.3-4 PPT #9-11	5 minutes

<ul style="list-style-type: none"> ◇ Teacher distributes suggested answers and highlights the key points learned in Part II. 	PPT #12-13	3 minutes
<ul style="list-style-type: none"> ◇ Activity 3 : Case Study – Part III <ul style="list-style-type: none"> ■ Students are asked to study Part III of the case; ■ Students calculate the relevant figures and make recommendations to Eric. 	Student Worksheet pp.5-6 PPT #14-15	6 minutes
<ul style="list-style-type: none"> ◇ Teacher distributes the suggested answers and highlights the key points learned in Part III 	PPT #16-17	2 minutes
<ul style="list-style-type: none"> ◇ Activity 4 : Acceptance of a proposal <ul style="list-style-type: none"> ■ Students are asked to study a proposal to determine what is wrong with Eric’s calculation; ■ Students calculate the unit contribution, fixed cost, break-even point and margin of safety under the new circumstance; ■ Students then have to make a recommendation. 	Student Worksheet pp.7-8 PPT #18-19	6 minutes
<ul style="list-style-type: none"> ◇ Teacher distributes suggested answers and highlights the key points learned in Activity 4. 	PPT #20-22	2 minutes
Part III: Conclusion		
<ul style="list-style-type: none"> ◇ Teacher concludes lesson and highlights key points; ◇ Teacher asks students to bring questions and answers to next lesson. 	PPT #23	5 minutes

Preparation for the next lesson:

Students are asked to study the questions and answers and ask the teacher questions on unclear areas.

Lesson 2	
Theme	Cost-Volume-Profit Analysis (ii)
Duration	40 minutes

Expected Learning Outcomes:

Upon completion of this lesson, students will be able to:

1. Calculate volume of sales required to earn a target profit; and
2. Understand the importance of qualitative factors in decision making.

Teaching Sequence and Time Allocation:

Activities	Reference	Time Allocation
Part I : Introduction		
<ul style="list-style-type: none"> ◇ Teacher reviews the case from lesson 1. ◇ Teacher tells students to ignore the proposal in Activity 4 when answering the questions in this lesson. 	PPT #24	2 minutes
Part II : Content		
<ul style="list-style-type: none"> ◇ Activity 5 : Solving Business Problems <ul style="list-style-type: none"> ■ Continuing from the case in lesson 1, students will answer the questions raised by Eric. This serves as a warm-up exercise. 	Student Worksheet pp.9-11 PPT #25-26	5 minutes
<ul style="list-style-type: none"> ◇ Teacher distributes the suggested answers and highlights the key points. 		2 minutes
<ul style="list-style-type: none"> ◇ Activity 6 : Adding chocolate on the cake <ul style="list-style-type: none"> ■ Students are asked to study Eric's business development plan. ■ Students are asked to calculate the unit contribution, break-even point, margin of safety, profit and the rate of return if this plan is implemented. ■ Students are asked to advise whether Eric should implement the plan. 	Student Worksheet pp.12-14 PPT #27-28	10 minutes

◇ Teacher distributes suggested answers and highlights the key points.		2 minutes
◇ Activity 7 : Boost Sales <ul style="list-style-type: none"> ■ Students are asked to study Eric’s plan to boost sales and calculate the sales volume required to achieve the target profit. 	Student Worksheet p.15 PPT #29	3 minutes
◇ Teacher distributes suggested answers and highlights the key points.		2 minutes
◇ Activity 8 : Qualitative Factors <ul style="list-style-type: none"> ■ Students are divided into groups of four or five to discuss the factors to consider when making the final recommendation on whether to implement the 2 plans stated in Activity 6 and Activity 7. ■ Teacher invites students to present their answers. 	Student Worksheet p.15 PPT #30-31	7 minutes
◇ Teacher distributes the suggested answers and highlights key points.	PPT #32-33	2 minutes
Part III: Conclusion		
◇ Teacher concludes the lesson and highlights key points.	PPT #34-35	5 minutes

Suggested answers
Activity 1 : Profit and Rate of Return of Cake Shop
Step 1:

$$\begin{aligned} \text{Unit contribution} &= \text{Unit selling price} - \text{Unit variable costs} \\ &= \$10 - \$6 = \underline{\$4} \end{aligned}$$

Unit contribution is the revenue remaining after deducting variable costs. Unit contribution measures the contribution made by each unit of product sold to cover the fixed costs and generate profit.

Step 2:
Fixed Cost per month

$$\begin{aligned} \text{Rent} &= \$10,000 \\ \text{Wages } (\$8,000 \times 2) &= \$16,000 \\ \text{Operating expenses} &= \underline{\$4,000} \\ &= \underline{\$30,000} \end{aligned}$$

Step 3:

$$\begin{aligned} \text{Profit for each month} &= \text{Sales} - \text{Variable costs} - \text{Fixed costs} \\ &= \text{Contribution} - \text{Fixed costs} \\ &= \text{Units of sales} \times \text{unit contribution} - \text{Fixed costs} \\ &= 10,000 \text{ units} \times \$4 - \$30,000 \\ &= \underline{\$10,000} \end{aligned}$$

$$\text{Profit for each year} = \$10,000 \times 12 \text{ months} = \underline{\$120,000}$$

Step 4:

$$\text{Rate of return per annum} = \$120,000 / \$600,000 = \underline{20\%}$$

Suggested answers

Activity 2 : Breakeven Point and Margin of Safety

Step 1:

$$\text{Break - even point(in units)} = \frac{\text{Fixed Costs}}{\text{Unit Contribution}}$$

$$\begin{aligned} \text{Break-even point (units)} &= \frac{\$30,000}{\$4} \\ \text{for each month} &= \underline{7,500} \text{ units} \end{aligned}$$

At the break-even point, there is no profit or loss. The break-even point in units is calculated by dividing total fixed costs by the contribution per unit.

Step 2:

Margin of safety

$$\begin{aligned} \text{Margin of safety} &= \text{Sales volume} - \text{break-even volume} \\ \text{(in units) for each month} &= 10,000 \text{ units} - 7,500 \text{ units} \\ &= \underline{2,500 \text{ units}} \\ \text{(in \%)} &= 2,500 \text{ units} / 10,000 \text{ units} \\ &= \underline{25\%} \end{aligned}$$

The company has a margin of safety of 25%, which means the business will incur a loss if the sales volume is decreased by 25% or worse than that. As Mary says there are many loyal customers, there is no much chance that the sales volume will drop by this substantial amount and the margin is comfortable.

Recommendation

As the risk investment is low and the rate of return is high, it is recommended that Eric acquire the business.

Suggested answers
Activity 3 :Case Study - Part III
1. Step 1:

$$\begin{aligned} \text{Unit contribution} &= \text{Unit selling price} - \text{Unit variable cost} \\ &= \$11 - \$7.5 = \underline{\underline{\$3.5}} \end{aligned}$$

Step 2:

$$\begin{aligned} \text{Profit for each month} &= \text{Contribution} - \text{Fixed costs} \\ &= 10,000 \text{ units} \times \$3.5 - \$30,000 \\ &= \underline{\underline{\$5,000}} \end{aligned}$$

$$\text{Profit for each year} = \$5,000 \times 12 \text{ months} = \underline{\underline{\$60,000}}$$

$$\text{Rate of return per annum} = \$60,000 / \$600,000 = \underline{\underline{10\%}}$$

Step 3:

$$\begin{aligned} \text{Break-even point for each month} &= \frac{\$30,000}{\$3.5} \\ &= \underline{\underline{8,571 \text{ units}}} \end{aligned}$$

The fixed costs of \$30,000 per month remain unchanged.

$$\begin{aligned} \text{Margin of safety} &= \text{Sales volume} - \text{break-even volume} \\ \text{(in units) for each month} &= 10,000 \text{ units} - 8,571 \text{ units} \\ &= \underline{\underline{1,429 \text{ units}}} \\ \text{(in \%)} &= 1,429 \text{ units} / 10,000 \text{ units} \\ &= \underline{\underline{14.29\%}} \end{aligned}$$

2.

The company has a margin of safety of 14.29%, which means the business will incur a loss if the sales volume is decreased by 14.29% or worse than that. As Mary says all are loyal customers, there is low possibility that the sales volume will drop by this amount and the margin is still comfortable even when the unit contribution is decreased.

3.

When the unit contribution is decreased by \$0.5, the rate of return for this investment is 10% which is still a reasonable return.

4.
Recommendation

There is an 80% chance that the annual profit is \$120,000 and the rate of return is 20%, and a 20% chance that the annual profit is \$60,000 and the rate of return is 10%. Even in the second situation, the investment is sound as the return is reasonable and the risk is low, therefore, it is recommended that Eric acquires the business.

Suggested answers**Activity 4 : Acceptance of a proposal****Eric mixes up variable costs with fixed costs and draws an incorrect conclusion.**

A variable cost is a cost that varies with some measure of output or activity, whereas a **fixed cost is a cost that, in total, remains constant for a specified time period. The fixed cost \$30,000 per month will not increase even if the sales volume is increased by 10,000 units.**

Correct approach

The relevant cost is the variable cost which will increase as the sales volume increases. The correct approach is to compare the increase in contribution with the additional expenditure.

$$\text{Additional contribution} = 10,000 \text{ units} * \$4 = \$40,000$$

$$= \underline{\$40,000}$$

$$\text{Additional expenditure} = \underline{\$10,000}$$

$$\text{Incremental profit} = \text{Additional contribution} - \text{Additional expenditure}$$

$$= \$40,000 - \$10,000$$

$$= \underline{\$30,000}$$

Conclusion

As there is an increase of \$30,000 in the profit, the proposal should be implemented.

Suggested Answers

Activity 5: Solving Business Problem

Step 1:

$$\text{Increase in fixed cost per month} = \$10,000 * 20\% = \$2,000$$

$$\begin{aligned} \text{New fixed cost per month} &= \$30,000 + \$2,000 \\ &= \underline{\underline{\$32,000}} \end{aligned}$$

Step 2:

$$\begin{aligned} \text{Profit for each month} &= \text{Contribution} - \text{Fixed costs} \\ &= 10,000 \text{ units} \times \$4 - \$32,000 \\ &= \underline{\underline{\$8,000}} \end{aligned}$$

$$\text{Profit for each year} = \$8,000 \times 12 \text{ months} = \underline{\underline{\$96,000}}$$

$$\text{Rate of return per annum} = \$96,000 / \$600,000 = \underline{\underline{16\%}}$$

Step 3:

$$\begin{aligned} \text{Break-even point (units)} &= \frac{\$32,000}{\$4} \\ \text{for each month} &= \underline{\underline{8,000}} \text{ units} \end{aligned}$$

$$\text{Margin of safety} = \text{Sales volume} - \text{break-even volume}$$

$$\begin{aligned} \text{(in units) for each month} &= 10,000 \text{ units} - 8,000 \text{ units} \\ &= \underline{\underline{2,000}} \text{ units} \end{aligned}$$

$$\begin{aligned} \text{(in \%)} &= 2,000 \text{ units} / 10,000 \text{ units} \\ &= \underline{\underline{20\%}} \end{aligned}$$

Recommendation

The company has a 20% margin of safety which means the business will incur a loss if the sales volume is decreased by 20% or worse than that. As Mary says there are many loyal customers, there is a low possibility that the sales volume will drop by this amount and the margin is comfortable.

An 20% increase in fixed costs will reduce the rate of return by 4 percent to 16% resulting in a safety margin by 5 percentage points to 20%. The margin of safety is comfortable and the return is reasonable, so Eric should continue his business under the new situation.

Suggested answers
Activity 6: Adding chocolate mix topping on the cake
Step 1:

New unit variable cost	=	$\$6 \times 0.95 + \$0.5 = \$6.2$
New unit selling price	=	$\$10 + \$1 = \$11$
New Unit contribution	=	New unit selling price – New unit variable cost
	=	$\$11 - \$6.2 = \underline{\$4.8}$
New fixed costs per month		
Rent (\$10,000 x 120%)	=	\$12,000
Salaries – shopkeepers	=	\$16,000
Salaries - baker	=	\$9,500
Operating expenses	=	\$4,000
Flyers 5,000 x \$0.5	=	<u>\$2,500</u>
	=	<u>\$44,000</u>

Step 2:

New Break-even point (units) for each month	=	$\frac{\$44,000}{\$4.8}$
	=	<u>9,167 units</u>
New Margin of safety (in units) for each month	=	Sales volume – break-even volume
	=	$11,000 \text{ units} - 9,167 \text{ units}$
	=	<u>1,833 units</u>
(in %)	=	$1,833 \text{ units} / 11,000 \text{ units}$
	=	<u>16.7%</u>
New Profit for each month	=	Sales – Variable costs – Fixed costs
	=	Contribution – Fixed costs
	=	$11,000 \text{ units} * \$4.8 - \$44,000$
	=	<u>\$8,800</u>
Profit for each year	=	$\$8,800 * 12 \text{ months} = \underline{\$105,600}$
Annual rate of return	=	$\$105,600 / \$600,000 = \underline{17.6\%}$

Recommendation

The annual profit is \$9,600 (\$105,600 - \$96,000) higher if the plan is implemented. However, the margin of safety is 3.3% lower in percent points (20% - 16.7%). The 16.6% margin of safety is still a comfortable margin and it is recommended that Eric implement his plan.

Suggested answers**Activity 7: Boost Sales**

$$\begin{aligned} \text{Required sales units to maintain} &= \frac{\text{Fixed Costs} + \text{Target Profit}}{\text{Unit Contribution}} \\ \text{the annual profit of \$120,000} &= \frac{(\$44,000 \times 12) + \$120,000}{\$4.8} \\ &= \frac{\$648,000}{\$4.8} \\ &= \underline{135,000 \text{ units}} \end{aligned}$$

Activity 8: Qualitative factors to be considered.

1. Does the change require additional working capital?
2. What is the opportunity cost to Eric in promoting the new product?
3. Is it absolutely certain that the fixed operating costs will not change? There is one additional staff and there are more operations and sales costs.
4. How accurate are the forecasts?
5. Are supplier discounts sustainable in the foreseeable future? It seems that the supplier is very generous in providing discounts.
6. Is it possible to cut the advertising expenditures after the new product has been launched?

BAFS Elective Part Accounting Module – Cost Accounting

Topic A10: Cost-Volume-Profit Analysis

Technology Education Section
Curriculum Development Institute
Education Bureau, HKSARG
April 2009



Lesson One

Cost-Volume-Profit Analysis (i)

Topic A10
CVP Analysis

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BAFS Elective Part
Learning and Teaching Example

Introduction

This session will explore the relationship between costs, revenue, output levels and the resulting profit on situations where the changes in the activity level is relatively small and short run. Students are asked to calculate the sales volumes and profits earned under different scenarios.

Duration

Two 40-minute lessons

Content

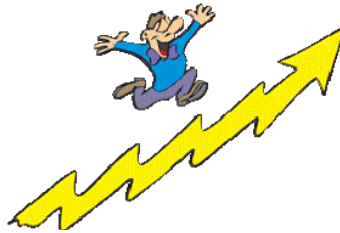
Lesson 1 – Cost-Volume-Profit Analysis (i)

Lesson 2 – Cost-Volume-Profit Analysis (ii)

Lesson 1

Teacher begins lesson by reviewing the CVP analysis. Teacher informs students that a case study about the acquisition of a cake shop will be reviewed to gain a thorough understanding to analyse situations and make decisions.

CVP Analysis



Topic A10
CVP Analysis

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BAFS Elective Part
Learning and Teaching Example

The CVP analysis is a key in decision making, including choice of product lines, pricing of products, marketing strategies and utilisation of production facilities.

The CVP analysis is sometimes referred to as a break-even analysis. A break-even analysis shows the relationship among costs, volume, contribution and profits at various levels of activity. The sales volume which equates total revenue with related costs and results in neither profit nor loss is called the break-even point (BEP).

The CVP analysis uses the principles of marginal costing and is best suited for short run issues. It explores the relationship among costs, revenue, output levels and resulting profits and is more relevant where the proposed changes in the levels of activity are relatively small.

Terms commonly used in CVP Analysis

- Variable costs
- Fixed costs
- Selling price
- Contributions
- Profit
- Rates of return
- Break-even point
- Margins of safety
- Volume for a target profit



Topic A10
CVP Analysis

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BAFS Elective Part
Learning and Teaching Example

Teacher briefly introduces the terms commonly used in CVP analysis and explains their relationships, for example,

1. Sales – Variable costs – Fixed costs = Profit
2. Contribution = Sales – Variable costs
3. Contribution – Fixed costs = Profit
4. Contribution = Fixed costs + Profit
5. Unit contribution = Unit selling price – Unit variable costs
6. Sales volume * Unit contribution = Fixed costs + Profit
7. Volume to earn a target profit = (Fixed costs + Profit) / Unit contribution
8. Break-even sales volume would result in neither a profit nor loss, i.e. Profit = 0
9. Break-even point = Fixed costs / Unit contribution
10. Margin of safety = Existing sales volume – Break-even sales volume
11. Rate of return = Profit / Investment

Basic Assumptions



- Within a relevant volume range and in a short run
 1. The costs can be accurately divided into variable and fixed elements.
 2. The unit selling price and unit variable costs remain constant throughout the whole range.
 3. Fixed costs are costs, that in total, remain constant for a specified time period.

Topic A10
CVP Analysis

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BAFS Elective Part
Learning and Teaching Example

It is important to emphasise the basic assumptions as the analysis would be meaningless if the basic assumptions are not sustained.

Case Study



- Should Eric buy the cake shop ?
- Activity 1 : Please help Eric to figure out the annual profit and rate of return of the cake shop.



Topic A10
CVP Analysis

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BAFS Elective Part
Learning and Teaching Example

Brief description of the case:

Your friend Eric Chan has been approached by his best friend Mary Wong, and asked whether he is interested in buying her cake shop. It is a small cake shop selling one very special cake imported from Japan.

Mary is asking for \$600,000 and she says that the annual profit and the rate of return on this investment are \$120,000 and 20% respectively. Eric considers that the profit and the rate of return very attractive but he is weak in accounting. He asks you to show him how the figures of profit and rate of return are arrived at.

This is a typical case in which CVP analysis can be applied. Teacher asks students to follow the steps on the next slide in answering the questions from Eric.

Activity 1 – Profit and Rate of Return of the Cake Shop



1. Calculate the contribution per unit of cake.
2. Identify the fixed costs and calculate the total fixed costs per month.
3. Calculate monthly profit and annual profit.
4. Calculate the investment rate of return.

Topic A10
CVP Analysis

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BAFS Elective Part
Learning and Teaching Example

Students can refer to student worksheets pp.1-2 for details and divide into groups to complete the case study

Unit contribution is the revenue remaining after deducting variable costs. Unit contribution measures the contribution made by each product unit sold to cover the fixed costs and generate business profits. Calculating unit contributions is the first step in most CVP analyses.

Usually, we use the contribution approach in calculating profit.

Refer to the footnote in slide #4 for the formulae in calculating the above figures.

Activity I – Key Points Learned



1. Profit calculation
2. Rate of return calculation

Topic A10
CVP Analysis

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BAFS Elective Part
Learning and Teaching Example

One important factor to be considered in making an investment is its rate of return. But before calculating the rate of return, we have to calculate the profit and the amount of investment.

Rate of return = Profit / Investment

Break-even Point

- At the break-even point, there is no profit nor loss.
- It is the point where
 - Sales revenue = Total costs
 - Contribution = Fixed costs



Topic A10
CVP Analysis

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BAFS Elective Part
Learning and Teaching Example

Teacher explains the concept of break-even again before proceeding to Activity 2.

Break-even point is when total revenue equals total costs incurred. It identifies activities required to cover costs but not generating any profits. The break-even point in units is calculated by dividing total fixed costs by the contribution per unit.

Case Study

- Should Eric buy the cake shop ?
- Activity 2 : Please advise Eric whether he should buy the cake shop based on the rate of return and the margin of safety.



Topic A10
CVP Analysis

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BAFS Elective Part
Learning and Teaching Example

Teacher tells students that besides the rate of return, another important factor that must be considered is the investment risk.

Margin of safety tells us the “cushion” of losing sales before incurring a loss if the expected sales fails to materialise. If the Margin of safety is low, say below 10%, Eric should not buy the business as the business will incur a loss when there is a drop of sales volume by 10% or more, which is quite risky.

Activity 2 – Breakeven Point and Margin of Safety



1. Calculate units of cakes to be sold per month to break even.
2. Calculate the margin of safety.
3. Recommendation.

Topic A10
CVP Analysis

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BAFS Elective Part
Learning and Teaching Example

Students stay with their groups and finish student worksheets p.2-3.

Margin of safety indicates by how much sales may decrease before a loss occurs. It represents the difference between the level of sales and the break-even point. It can be expressed in units, sales revenue and percentages. It is the “cushion” before incurring a loss if the expected sales fails to materialise.

Break-even point = Fixed costs / Unit contribution

Margin of safety = Expected sales volume – Break-even sales volume (in units)

Margin of safety = (Expected sales volume – Break-even sales volume) / Expected sales volume (in %)

Activity 2 - Recommendation



- Margin of safety
 - The investment is not risky.
- Rate of return
 - High.
- Recommendation
 - Acquire the business.



Topic A10
CVP Analysis

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BAFS Elective Part
Learning and Teaching Example

In this case, The company has a margin of safety of 25%, which means the business will incur a loss if the sales volume decrease by 25% or more. As Mary states there are many loyal customers, there is a low possibility that the sales volume will drop by this substantial amount and the margin is comfortable.

As the risk of this investment is low and the rate of return is high, students should suggest Eric to acquire the business.

Activity 2 – Key Points Learned



- Break-even point
- Margin of safety as a measure of the risk of incurring a loss.



Topic A10
CVP Analysis

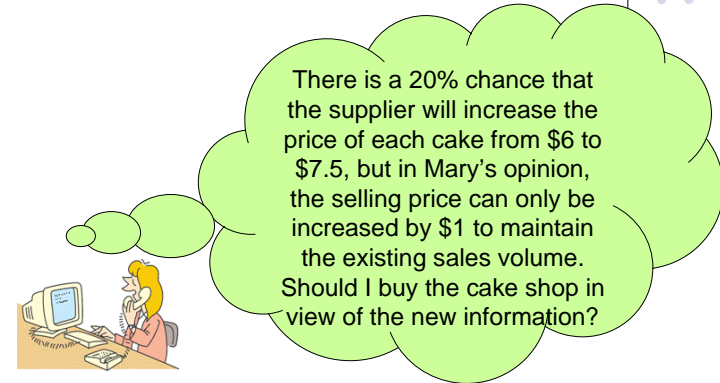
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BAFS Elective Part
Learning and Teaching Example

Return and risk are two important factors in making any investment decisions.

If the return is high but the corresponding risk is very high, most people will not make such an investment. Most investors would like to invest in a business of reasonable return and acceptable risk. There are many risk factors and one important factor is the decrease in sales. Margin of safety measures the risk in this aspect.

Activity 3 – Another Situation



There is a 20% chance that the supplier will increase the price of each cake from \$6 to \$7.5, but in Mary's opinion, the selling price can only be increased by \$1 to maintain the existing sales volume. Should I buy the cake shop in view of the new information?

Topic A10
CVP Analysis

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BAFS Elective Part
Learning and Teaching Example

Eric is now thinking of another situation. Students are required to follow the similar approach used in Activity 1 and 2 to make recommendations to Eric whether he should buy the cake shop or not.

There are changes in variable costs and the selling price, which leads to a change in unit contribution. Change in unit contribution will then lead to change in break-even point, monthly profit, margin of safety and the rate of return. Students are required to make recommendation based on the figures arrived at in student worksheets p.5-6.

Steps for Activity 3



1. Calculate revised unit contribution.
2. Calculate revised monthly break-even point.
3. Calculate revised margin of safety in units & in %.
4. Calculate revised annual profit.
5. Calculate revised annual rate of return.
6. Determine the risk of the business and the reasonableness of the return in the new situation.
7. Make your recommendation.

Topic A10
CVP Analysis

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BAFS Elective Part
Learning and Teaching Example

Teacher asks students to follow the steps on this slide in their calculations.

Activity 3 - Recommendation



- An 80% chance the rate of return is 20% and the margin of safety is 25%.
- A 20% chance the rate of return is 10%. Even in the situation, this is still a good investment as the return is reasonable and the risk involved is acceptable with 14% on margin of safety.
- Recommendation
 - Acquire the business.



Topic A10
CVP Analysis

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BAFS Elective Part
Learning and Teaching Example

If the supplier does not increase the price, which is high at an 80% chance, the rate of return and the margin of safety is 20% and 25% respectively. This is a very good investment with high rate of return and the risk involved is low.

Even if the supplier does increase the price, which is low at a 20% chance, the rate of return and the margin of safety is 10% and 14.29% respectively. This is still a good investment as the return is reasonable and the risk involved is acceptable with 14% on margin of safety.

Activity 3 – Key Points Learned

CVP Analysis when there is a change in selling price and variable cost.

Topic A10
CVP Analysis

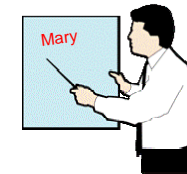
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BAFS Elective Part
Learning and Teaching Example

This part shows how selling price and variable cost changes affect the unit contribution, break-even point, profit, rate of return and margin of safety. This is the fundamental knowledge that students must know in performing a CVP analysis.

Activity 4 – Acceptance of a proposal

Eric receives a proposal from Mary and you are required to analyse the proposal to determine whether to accept it or not.



Topic A10
CVP Analysis

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BAFS Elective Part
Learning and Teaching Example

Teacher introduces some information in this case for students to discuss. Students can refer to student worksheets p.7-8 for details.

Activity 4 – The Proposal



- The company spends \$10,000 per month in advertising the cake, the monthly sales volume would be increased by 10,000 units.
- Should the proposal be implemented ?

Students are required to read the details in student worksheets p.7-8 to see what Eric did.

They determine problems with Eric's calculation and help him decide whether he should implement the proposal or not.

Activity 4 - Eric's wrong concept



- Mixes up variable costs with fixed costs and draws a wrong conclusion.
- A variable cost is a cost that varies with some measure of output or activity.
- A fixed cost is a cost that, in total, remains constant for a specified time period.

This is a common mistake made by students.

The relevant cost is the variable cost which will increase as the sales volume increases. Fixed costs are period costs and will not increase when sales volume increases.

Activity 4 - Correct approach

- The fixed cost \$30,000 per month will not increase even if the sales volume is increased by 10,000 units.
- Correct approach
 - compare the additional contribution with the additional expenditure.
- Incremental profit
 - = Additional contribution – Additional expenditure
 - = 10,000 units * \$4 - \$10,000 = \$30,000
- Recommendation : Implement the proposal



A fixed cost is a cost, that in total, remains constant for a specified time period and will not be affected by the change in sales volume. Here the shopkeepers' salary, the monthly rental and other fixed costs will remain the same when the sales volume increases by 10,000 units.

The relevant cost is the variable costs which varies linearly with the change in sales volume. The correct approach is to compare the incremental contribution with incremental expenditure to determine whether there is incremental profit or not.

Activity 4 – Key Points Learned

- Different behavior of Variable costs and Fixed costs.
- Comparing additional contributions with additional expenditures in making a decision.

Students should be aware that only the variable costs, but not fixed costs, are the relevant costs for decision making in this case.

Most of the time, as the variable cost varies with the change in sales volume, we should compare incremental contributions with incremental expenditures in order to determine the profit or loss for decision making.

Conclusion

- Profit and rate of return calculations
- Break-even point and margin of safety - calculation and interpretation
- Cost behavior of variable costs and fixed costs
- CVP analysis used when there are changes in the selling price and variable costs

Topic A10
CVP Analysis

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BAFS Elective Part
Learning and Teaching Example



Teacher concludes the lesson by reviewing the key points learned.

Key points learned include:

1. CVP analysis concerns with analysis within a relevant range and for short run.
2. Costs can be divided into variable and fixed elements.
3. The unit selling price and unit variable cost remain constant.
4. A fixed cost is a cost, that in total, remains constant for a specified time period.
5. The different cost behavior of variable cost and fixed cost.
6. The formulae in calculating profit and break-even point.

To prepare for the next lesson, students must study the questions and answers distributed in this lesson and ask the teacher to clarify areas they do not understand. The case in lesson 1 will continue in lesson 2 and the thorough understanding of the materials in lesson 1 is vital for them to answer questions in lesson 2.

End of Lesson 1

Lesson Two

Cost-Volume-Profit Analysis (ii)

Topic A10
CVP Analysis

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BAFS Elective Part
Learning and Teaching Example



Lesson 2

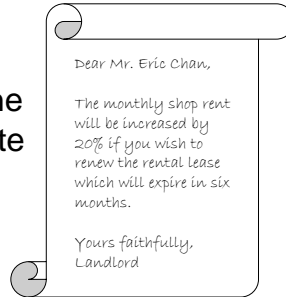
Teacher starts the lesson by telling students that following the case in Lesson 1, they are continued to help Eric in solving his business problems. Inform students to ignore the proposal in Activity 4.

Activity 5 – Solving Business Problem



- Eric receives a letter from the landlord informing him that the monthly rent will increase by 20%.

Activity 5 :
Advise Eric how it affects the company's annual profit, rate of return and the risk of this investment.



Topic A10
CVP Analysis

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Steps for Activity 5



1. Calculate revised fixed cost
2. Calculate revised monthly break-even point
3. Calculate revised margin of safety in units & %
4. Calculate revised annual profit
5. Calculate revised annual rate of return
6. Determine the risk of the business and the reasonableness of the return in the new situation
7. Make your recommendation

Topic A10
CVP Analysis

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BAFS Elective Part
Learning and Teaching Example

This is a very straight forward question and it serves as a warm up exercise for students.

Teacher should encourage students to complete these questions to evaluate how much they have learned in lesson one.

Fixed cost is changed which leads to a change in break-even point, margin of safety, contribution, profit earned and rate of return.

Activity 6 – Adding chocolate mix topping on the cake



- Eric has a plan to develop his business by selling a new style cake with chocolate topping.
- Selling price, unit variable costs, monthly fixed costs and sales volume will be changed.
- Advise Eric whether he should carry out his plan.



Topic A10
CVP Analysis

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BAFS Elective Part
Learning and Teaching Example

This is a complicated CVP analysis with changes in all the elements, i.e. selling price, sales volume, unit variable costs and monthly fixed costs. Teacher asks students to follow the steps on the next slide in solving this business problem. Students can also refer to student worksheets p.12-14 for details.

Steps for Activity 6



1. Calculate the new variable cost and monthly fixed cost for the new product if it is launched.
2. Calculate the break-even point, margin of safety in units and in percent, annual profit and rate of return if the new product is launched.
3. Compare results to results arrived at in Activity 5.
4. Make recommendations to Eric.

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CVP Analysis

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BAFS Elective Part
Learning and Teaching Example

For Step 1

Teacher asks students to think whether the chocolate mix, baker's salary and the cost of flyers are variable costs or fixed costs, and then calculate the unit contribution and the monthly fixed costs.

For Step 3

Teacher asks students that annual profit, rate of return and margin of safety should be compared.

Activity 7 - Boost Sales



- Eric phones you one day and says that he would like to earn the same amount of profit as last year's (\$120,000) and plans to boost sales more by staying in the cake shop on weekends.
- Advise Eric



Students can refer to student worksheet p.15 for details.

In this situation, to determine the required sales units to maintain a certain profit, students should add the target profits with the fixed costs to determine the total amount. Then, they divide this amount by the unit contribution to find out the sales units.

Activity 8 - Qualitative Factors



- Eric wants you to advise him what other factors he should consider before implementing his 2 plans as stated in Activity 6 and Activity 7.
- Form groups of four or five and discuss the qualitative factors to be considered before making the decision.

This is an open-ended question and there are many possible answers. Students have to think critically and discuss among themselves whether the points they raise are appropriate or not.

Students are required to present their points in front of the class.

Group discussion and Presentation

Present the qualitative factors drawn by your group to the class.



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BAFS Elective Part
Learning and Teaching Example

Presentation to the class will lead to more discussions and arguments and students will know more limitations of CVP analysis in making decisions.

Qualitative Factors I

1. Does the change require additional working capital?
2. What is the opportunity cost to Eric in promoting the new product?
3. Is it absolutely certain that fixed operating costs will not change? One more staff is added in the shop and there are more operations and sales. Will the shop keepers ask for a raise of wages in view of the increase in workload?

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CVP Analysis

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BAFS Elective Part
Learning and Teaching Example

Students may have other answers and give them credit if their answers are reasonable.

Qualitative Factors II



4. How accurate are the forecasts?
5. Are the supplier discounts be sustainable in the foreseeable future? It seems that the supplier is very generous in allowing the discounts in this case.
6. Is it possible to cut the advertising expenditures after the new product has been launched?

Conclusion



- CVP analysis when there are changes in the selling price, variable costs and fixed costs.
- Sales volume required to earn a target profit.
- Qualitative factors to be considered before making decisions.

Teacher concludes this lesson by reviewing the key points.

Teacher should emphasise that the CVP analysis uses the principles of marginal costing and is best suited to short run problems; it explores the relationship which exists among costs, revenue, output levels and resulting profit and is more relevant where the proposed changes in the levels of activity are relatively small.



The End

End of Lesson 2.

BAFS Elective Part – Accounting Module – Cost Accounting
Topic A10: Cost-Volume-Profit Analysis

Activity 1 - Case Study - Part I

Read the following case and answer the questions asked.



Purchase price per cake \$6
 Selling price per cake \$10

Your friend Eric Chan has been approached by his best friend Mary Wong, and asked whether he is interested in buying her cake shop. It is a small cake shop selling one very special cake imported from Japan.

Here are the operating costs:

Two shopkeepers' salary: \$8,000 per shopkeeper per month

Shop rental: \$10,000 per month

Other expenses (do not vary with sales volume): \$4,000 per month



Mary

- ✧ Monthly sales volume: 10,000 cakes
- ✧ Loyal customers
- ✧ \$600,000 in selling the business
- ✧ Annual profit: \$120,000
- ✧ Return on investment: 20% p.a.

Eric considers that the profit and the rate of return are very attractive but he is weak in accounting. He asks you to show how the profit and rate of return are calculated.

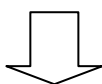
How can you help Eric?

Step 1: Calculate the contribution per unit of cake.

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Step 2: Identify the fixed costs and find the total fixed costs per month.

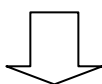
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Step 3: Calculate profit earned in each month and annual profit.

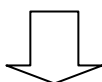
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Step 4: Calculate the rate of return per annum.

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Activity 2 - Case Study - Part II

Read the following paragraph and make recommendations to Eric.



Eric is risk-averse and has concerns about business losses. He asks you how risky the business is in relation to the decrease in sales volume, and whether he should acquire the business.

Should Eric acquire the cake shop?

Step 1: Calculate units of cakes to be sold per month to break even.

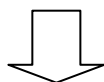
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Step 2: Calculate the margin of safety to determine the "cushion" before incurring a loss if the expected sales fail to materialise. Express this measure in percentage and think whether the risk as indicated by this measure is acceptable.

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Eric

Is the risk as indicated by this measure acceptable?

Make recommendations to Eric based on the rate of return and margin of safety results.

Handwriting practice lines consisting of 12 horizontal dashed lines for writing a response.



You

Activity 3 - Case Study - Part III

There is a 20% chance that the supplier will increase the price of each cake from \$6 to \$7.5, but in Mary's opinion the selling price could only be increased by \$1 to maintain the existing sales volume.

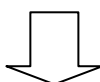
1. What is the impact on the annual profit, rate of return and the risk of the investment if this new situation occurs?

Step 1: Calculate the new unit contribution.

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Step 2: Calculate the new annual profit and rate of return.

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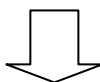
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Step 3: Calculate the new margin of safety.

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2. Comments on the new margin of safety.

3. Provide comments on the new rate of return.

4. What is your recommendations to Eric?

5. Conclusion:
Should Eric acquire the business under this new situation? Yes/No

Activity 4 - Acceptance of a proposal

Eric receives a proposal from Mary after he acquired the cake shop. You are now required to help Eric to analyse the proposals and determine whether to accept it or not.

Mary's Proposal

If the company spends \$10,000 per month in advertising, the monthly sales volume will increase by 10,000 units.

Eric performs a calculation and finds that the unit cost will increase from \$9 to \$10 and concludes that profit will remain unchanged if the proposal is implemented.

Eric's calculation

Total fixed cost per month	=	\$30,000
Fixed cost per unit	=	\$30,000 / 10,000 units
	=	\$3
Variable cost per unit	=	\$6
Total cost per unit	=	\$3 + \$6 = \$9
Additional expenditure	=	\$10,000
Additional cost per unit	=	\$10,000 / 10,000 units
	=	\$1
Cost per unit	=	\$9 + \$1
(on additional sales)	=	<u>\$10</u>
Profit per unit	=	Selling price - unit cost
	=	\$10 - \$10
	=	<u>Nil</u>

Activity 5 - Solving Business Problem

One year after Eric acquired the cake shop business



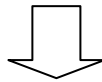
Without implementing the proposal made by Mary in Activity 4, the profit for the first year of operation is \$120,000 as expected. After receiving the letter, Eric asks you how this change will affect the company's annual profit, rate of return, and the investment risk.

Advise Eric on this issue.

(Hint: What is the change to fixed costs? How does it affect the annual profit, rate of return and margin of safety?)

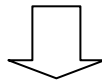
Step 1: Calculate the new fixed costs.

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Step 2: Calculate the new annual profit and new rate of return per annum.

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Step 3: Calculate the new break-even point in units and margin of safety (in units and in percentage) for each month.

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Your advice to Eric:

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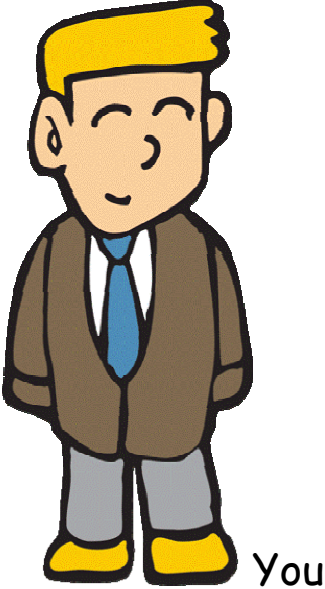
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Activity 6 - Adding chocolate mix topping on the cake

Eric has a plan to develop his business. His wife has a special chocolate mix recipe. He plans to add chocolate topping on the cake, using his wife's special recipe.



Special recipe on the cake:
Add chocolate topping on the cake.

Eric expects the new product unit selling price to increase by \$1 and the monthly sales volume to increase to 11,000 units. The supplier of the cake will give Eric a 5 % discount on 11,000 units per month.

Extra costs:

- Baker's salary to prepare the chocolate mix: \$9,500 per month
- Cost of chocolate mix: \$0.5 per unit
- To publicise the new product, 5,000 flyers are distributed in order to achieve the target sales volume. \$0.5 per flyer

Advice Eric whether he should carry out the plan.

Step 1: Please help Eric calculate the new variable costs and monthly fixed costs for the new product.

(Hint: What is the new unit purchase price if the discount is taken? Think whether the chocolate mix, baker's salary and the cost of flyers are variable or fixed costs.)

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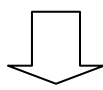
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Step 2: Please help Eric calculate the break-even point, margin of safety in units and in percentage, annual profit and rate of return if the new product is launched.

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Step 2 (cont'd):

What is your recommendation to Eric?

Recommendation:



