

Finance - Self Study Guide for Staff of Micro Finance Institutions

LESSON 3

BREAK-EVEN ANALYSIS

Objectives: This session will provide the tools necessary to determine the break-even point for a borrower activity, for an income generating project, or for a micro-finance organization branch. Profitability can be forecast and managed when one knows: i) at what level of production a business will be able to cover all of its expenses; ii) what minimum product price is needed for the product to be viable at different levels of production; and iii) what happens if the financial estimate of costs and prices are changed.

You will learn how to calculate a break-even point for an income generating activity and for a branch. Topics covered include:

- Fixed costs
- Variable costs
- Contribution margin
- Required break-even volume/revenue
- Break-even portfolio size



Fixed Costs

The break-even point of a service or product is reached when total revenue equals total costs. Break-Even Analysis is the process of determining the rates at which resources generate revenue and expenses. It is important to calculate the break-even point to determine if the resources of an organization provide sufficient revenue to meet expenses. The goal is to exceed the break-even point so that additional income (or profit) results.

Consider the difference between fixed and variable costs. *Fixed costs are those incurred on an ongoing basis and are not dependent on the level of production.* [Note: fixed costs may increase with a significant increase in the level of production.] Fixed costs are costs which remain the same regardless of whether the operation makes one product or several hundred. They represent the minimum cost of operations. For example, to rear day-old chicks, an incubator is required. An incubator is a fixed asset and is a cost regardless of the volume of day-old chicks reared. Until a certain volume of production is reached, another incubator is not required.

Fixed costs can be capital costs such as the costs to purchase a fixed asset, or operating costs such as rent or utilities. Think of some examples of fixed costs of businesses to which micro-finance organizations might lend.

Examples are: rent, depreciation, maintenance and repair, salaries, insurance, utilities, fees, etc. Consider the differences between various businesses and the fixed costs associated with them.

Step Costs: Other fixed costs are those that are considered "step" costs or those that increase once specific volume levels are reached. An example would be the purchase of another incubator once a certain number of chicks were produced. Other businesses incur step costs when a new employee is hired as the business grows. In the long-run, all fixed costs are step costs.

Variable Costs

Variable costs are those that are directly related to production and vary depending on the volume produced. For example, to rear more chicks, more day-old chicks are required. The purchase of day-old chicks is a variable cost for the business, that is, it increases with the volume of activity.

What are some examples of variable costs of income generating activities? Examples are: raw materials, direct labour, commissions, etc. Place the sheet next to the fixed costs written out earlier. Consider the differences between various businesses and the variable costs associated with them.

Variable costs per unit are constant while fixed costs per unit change with the volume of production. For example, if the variable costs (such as fuel, labour, etc.) of irrigating one acre of land are P70, then P700 is required to irrigate ten acres. If the number of acres increases, the variable costs will also increase. However, the variable cost per acre of land remains the same (P70).

In contrast, fixed costs per acre of land decrease if the volume of land is increased. If one well supplies water to ten acres of land and the cost of the well is P100,000, then the fixed cost per acre is P10,000. If the volume of land to which the well supplies water is increased to 20 acres from 10, then the fixed cost per acre decreases to P5,000. Fixed costs do not decrease in total but decrease as a per acre cost as the volume of irrigated land increases.

Contribution Margin

To be profitable, all fixed and variable costs must be covered by revenue earned. To determine how much revenue is required per item (price to be charged) to cover all costs, the contribution margin is calculated. *The contribution margin is defined as revenue less variable costs per item.*

Refer to the example on the next page, "Break-Even Analysis I" and go through each of the fixed and variable costs. Continue with the example and calculate the contribution margin. This is the amount per chair that *contributes* to covering the fixed costs of the carpentry workshop.

Required Break-Even Volume/Revenue

Continuing with the example, calculate the required break-even volume. The resulting number of chairs is the minimum that must be produced *in the time period which the fixed costs are budgeted for* to break even. If fixed costs increase due to increased prices or if the cost structure changes then the break even volume will also change.

Break Even Analysis I

SAMPLE CARPENTRY BUSINESS

Fixed Costs (Monthly)		Rd
Depreciation of tools (Rd 15,000/year)		1,250
Rent		500
Utilities		220
Assistant's Salary		200
TOTAL		2,170
Variable Costs per Chair		Rd
Wood		150
Paint and others		50
TOTAL		200
Revenue per chair (market price)		300
Contribution Margin (Revenue – Variable Cost)		300 – 200
Contribution Margin per Chair		= 100
Required Break Even Volume		
Break Even Point	=	$\frac{\text{Total Fixed Costs}}{\text{Contribution Margin}}$
	=	$\frac{2,170}{100}$
Number of chairs required to break even	=	22 chairs per month
Required Break Even Revenue		
Break Even Point	=	(22 chairs x 200) + fixed costs
	=	4,400 + 2,170
Revenue required to break even	=	6,570 per month

Many businesses produce more than one item. “Break Even Analysis II” builds on the same information for fixed costs as “Break Even Analysis I” except there are now chairs, tables and cabinets being produced which provide different contribution margins.

The break-even volume can be calculated on each item produced only if the fixed costs can be split among items. For example, if an equal number of chairs, tables and cabinets are made and they take an equal amount of time to make, then the contribution margins can simply be added together and divided by three. If there are more chairs than tables and cabinets produced, then the number of chairs, tables and cabinets produced must be multiplied by the contribution margin for each.

Work through each of the contribution margins on the next page and then calculate the *weighted contribution margin* and *required break-even volume* as in the example.

Break Even Analysis II

SAMPLE CARPENTRY BUSINESS

Variable Costs per Chair (Monthly)	Rd
Wood	150
Paint and others	<u>50</u>
TOTAL	200
Revenue per chair	300
Contribution Margin (Revenue – Variable Cost)	300 – 200
Contribution Margin per Chair	= 100
Variable Costs per Table	Rd
Wood	250
Paint and others	<u>65</u>
TOTAL	315
Revenue per table	450
Contribution Margin (Revenue – Variable Cost)	450 – 315
Contribution Margin per Table	= 135
Variable Costs per Cabinet	Rd
Wood	450
Paint and others	<u>125</u>
TOTAL	575
Revenue per Cabinet	700
Contribution Margin (Revenue – Variable Cost)	700 – 575
Contribution Margin per Cabinet	= 125

Contribution margin of each product:	chairs	100
	tables	135
	cabinets	125

Example weighted contribution:

If the percentage of total products produced were as follows:

chairs	40%
tables	30%
cabinets	<u>30%</u>
	100%

and the Contribution Margins for each product were the same as listed above, then:

$$\begin{aligned}
 \text{(i) Weighted Contribution Margin} &= (40\% \times 100) + (30\% \times 135) + (30\% \times 125) \\
 &= \text{Rd } 118 \text{ per item per month}
 \end{aligned}$$

$$\begin{aligned}
 \text{(ii) Required Break-Even Volume} &= \frac{\text{Total Fixed Costs}}{\text{Weighted Contribution Margin}} \\
 &= \frac{2,170}{118}
 \end{aligned}$$

= 19 items per month produced in the same proportion as above

Break-Even Portfolio Size

Just as it is possible to determine the break-even point for a borrower's business, we can calculate the size of portfolio required for a branch or a micro-finance organization as a whole using break-even analysis.

First it is necessary to calculate the Variable Cost Rate:

$$\text{Variable Cost Rate} = \frac{\text{Total Costs} - \text{Fixed Costs}}{\text{Average Portfolio Outstanding}}$$

Using the effective cost calculation we covered in the last session, an estimation of the yield to the branch or organization can be calculated. This is referred to as the Portfolio Yield Rate and combines all interest and fees charged on the loan. Then we calculate the Contribution Margin (or Overhead Contribution Rate):

$$\text{Contribution Margin} = \text{Portfolio Yield Rate} - \text{Variable Cost Rate}$$

As in the previous examples, the Break-Even rate is simply Fixed Costs divided by the Contribution Margin. Go through the following example:

Break Even Analysis III

BRANCH

Fixed Costs (Annual)		Rd
Salaries and benefits		16,080
Rent		8,400
Utilities		1,440
Administration costs		3,600
Other costs		<u>2,400</u>
TOTAL		31,200
Variable Costs per Rd 1,000 Outstanding		
Financial Cost (%)		6.0
Transportation (%)		5.4
Loan loss provision (%)		<u>3.0</u>
TOTAL (%)		14.4
Revenue (yield) per Rd 1,000 outstanding (%)		36.0
Contribution Margin (Yield - Variable Cost Rate)		= 21.6
Contribution	= Contribution Margin x Portfolio Outstanding	
	= 21.6% x Rd 1,000 = 216	
Required Break Even Volume		
Break Even Point	=	$\frac{\text{Total Fixed Costs}}{\text{Contribution}}$
	=	$\frac{31,200}{216}$
	=	144
Volume of Rd 1,000 outstanding required to break even		
	=	144 x Rd 1,000 outstanding
	=	Rd 144,000 outstanding/year



Complete the following “Break-even” Exercises.

Break-Even Analysis
EXERCISES

1. What are fixed costs?

2. What are variable costs?

3. What is the break-even point?

4. Define the contribution margin.

5. Write down the formula for the break-even point.

6. Define the term “step cost”.

7. Selina runs a weaving business. She makes and sells hand woven cloth by the metre. She produces 12 metres of cloth per month which she sells at a stand in the market each Sunday. She borrowed Q2,500 @ 15% annual flat rate from the Finance Fund of Guatemala for 6 months with monthly payments. Other information on her business includes:

- i) She purchased a hand loom for Q2,000, which she is depreciating over 2 years at Q83 per month
- ii) The cost of coloured threads is Q250 per metre
- iii) Transportation costs are Q100 per month
- iv) Stall rental is Q60 per month
- v) Selling price of the cloth is Q350 per metre

Calculate the break-even point in metres and sales revenue per month.

8. The ABC Credit company incurs the following monthly expenses:

Salaries and benefits	3,400
Administration expenses	1,620
Rent and utilities	1,440
Other fixed expenses	800
Interest on debt @ 12% annual rate per 1,000	10
Interest paid on deposits @ 6% annual rate per 1,000	5
Travel and transportation per 1,000 loans outstanding	4.5

The ABC Credit company earns a 20% yield on their loans. Calculate the portfolio size required to break even in a month.