MSc in International Shipping, Finance and Management

Course: Financial and Management Accounting

Part B: Management Accounting

Initial details

- Personal details
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- This course is supported in the e-class environment
  - ✓All slides and additional material will be uploaded on the webpage.
- The recommended textbook is *Managerial Accounting*, Garrison, Noreen, & Brewer, 17th Edition, 2021, McGraw Hill Publications.
  - ✓However, the slides and the rest material covered in the class are sufficient to succeed in the course.
- Note that the course is interactive!

Course content

- This part of the course deals with “Management Accounting”. Management Accounting is one of the two major fields of accounting, with the other being “Financial Accounting”.
- The major difference of the two fields is that they provide information to different parties for different decision making.
- Concisely:
  - ✓Financial Accounting provided information to **outside** parties (mostly to investors and creditors) for decisions such as to provide capital (share capital or loans) to the firm.
  - ✓Management Accounting provides information to **inside** users (mostly to the management team) to facilitate managerial decisions.
- This distinction entails several different attributes for the two fields. The most important ones are presented on the next slide.

Major differences between Financial and Management Accounting

Attribute	Financial Accounting	Management Accounting
Target group	Outside parties	Inside parties
Accounting Standards	GAAPs, IFRS	No typical standards
Focus	The overall business	Specific departments, specific processes, overall business
Frequency of reporting	Usually, at the end of an annual period	Whenever it is necessary
Obligatory nature	Mandatory	Optional
Relation with other sciences	Mostly with Commercial Law and Taxation	Data analytics, Economics
Data for analysis	Mostly archival data	Archival and forecasted data

Course outline

- Note that the Management Accounting field is constantly growing and it's hard to cover all relevant topics in just four lectures. Therefore, this part of the course intends to present the most important parts of Management Accounting.
- The topics that will be discussed are the following:
  - ✓Cost estimation and costing approaches
  - ✓Differential analysis
  - ✓Budgeting and variance analysis
  - ✓Transfer pricing
  - ✓Evaluation of investment centers

Section 1

Cost concepts

Approaches to costing

Estimation of cost behavior

Cost-related terms

- There are some cost-related terms that need clarification before we proceed:
  - ✓Expenditure
  - ✓Cost
  - ✓Expense

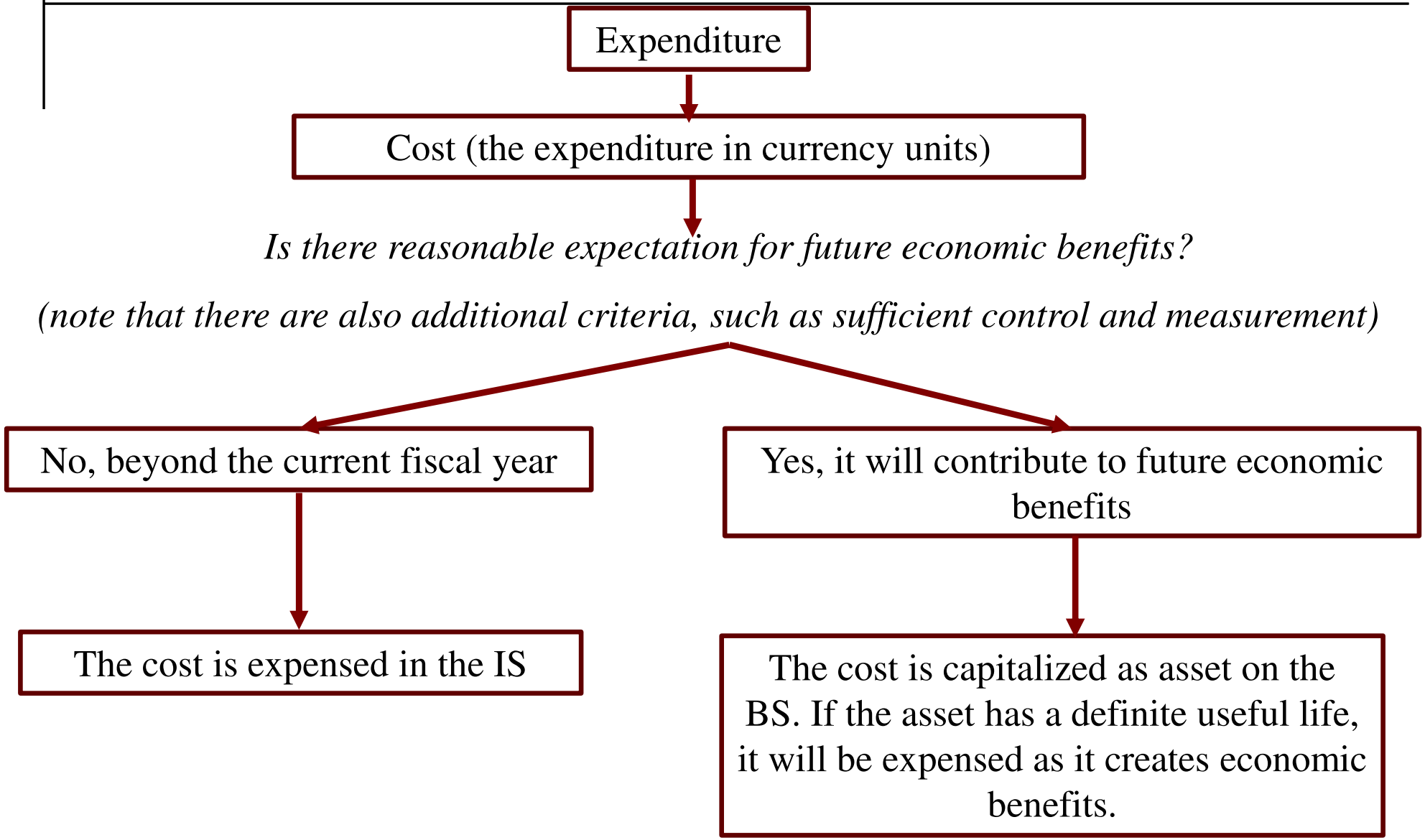
Often, these terms are interchangeably used in daily life, but for accounting purposes they are quite different.

- An **expenditure** occurs when a firm sacrifices some economic resources to achieve a goal. For example, the acquisition of a machine requires an expenditure.
- When we value the expenditure in monetary units, we use the term "**cost**". For example, the cost of the machine acquisition was €10,000. Note that many times the **accounting cost**, which includes only the **explicit opportunity cost**, is very different to the **economic cost,** which includes **both the explicit and the implicit opportunity cost**.
  - ✓ For example, assume that the risk-free rate is 5%. This means that €10,000 invested would yield a minimum return of €500. Thus, although the accounting cost is €10,000 (explicit opportunity cost), the economic cost increases to €10,500.

Cost-related terms

- Economic costs are very important to Management Accounting. For now, we will focus on accounting costs but later we will use economic costs.
- The **expense** is the part of the cost that reduces **the current year's** accounting results. Accounting expenses are presented in the Income Statement.
- This implies that the accounting costs may follow **two different paths**: the first one capitalizes the cost and presents it as an **asset** on the Balance Sheet (BS). The second one expenses the cost and presents it as an **expense** in the Income Statement (IS). Obviously, financial accounting is more reluctant to allow the first treatment and imposes strict conditions (the conservatism principle).
- The most important condition that must hold to follow the first path is that the firm reasonably expects future economic benefits (other conditions are the reasonable valuation of the asset and sufficient control of it). This is imposed by the "matching principle". For many cost-types, Financial Accounting dictates that they should be treated as expenses and vice-versa.
  - ✓For example, research expenditures are costs that are typically expensed in the IS. Conversely, the construction cost of a building is typically capitalized as asset on the BS.

Costs, the matching principle, and the two paths



Costs, products, and services

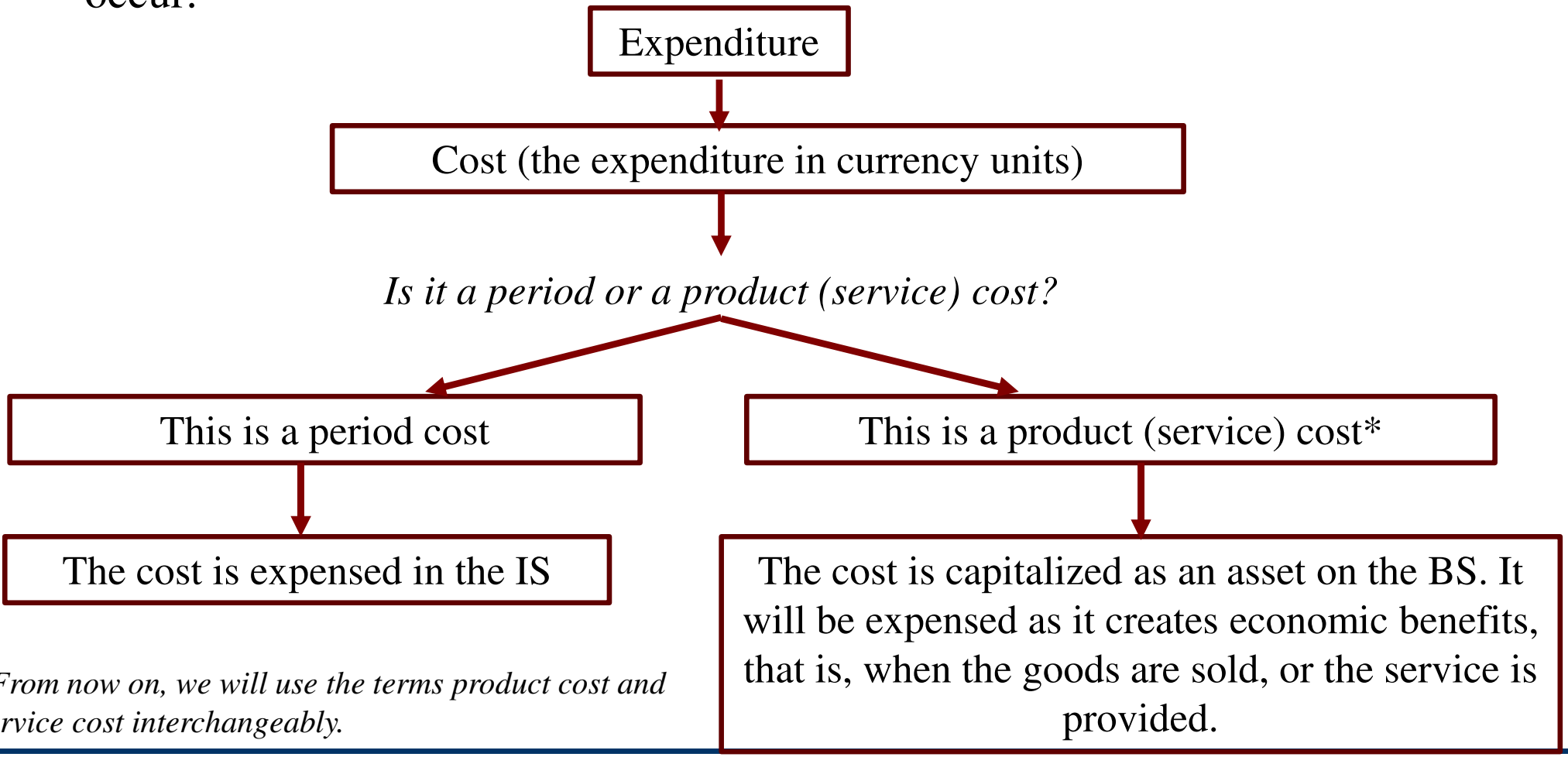
- These concepts apply to all the expenditures that a firm makes (consider for example, the simple journal entry for a land acquisition!).
- However, in the field of Management Accounting, we are mostly interested in their application to **products** and **services** that a firm provides.
- Recall, that for accounting purposes, we classify firms into three types:
  - ✓Merchandise firms
  - ✓Service providers
  - ✓Manufacturing firms
- Merchandise firms are the simplest type because they are just resellers. Conversely, service providers and manufacturers have a common attribute: They have a significant production process; the first produce services while the second produce products.

Product (service) cost vs. period cost

- Shipping firms are typical service providers. They acquire economic resources (e.g., vessels, crew services, fuels, lubricants, etc.) and produce shipping services. Other service providers are hotel businesses, aviation companies, education colleges, etc.
- A computer making firm is a manufacturing business. It acquires raw materials (e.g., plastics, steel, iron, glass, etc.), labor services, machines, electricity, etc. and produces goods (i.e., computers).
- The critical part for those firms is to decide which cost will be expensed in the fiscal year that the cost occurred (this is referenced as period cost) and which cost will be capitalized and expensed when the service will be provided, or the goods will be sold (this is referenced as service or product cost).
- This decision is not easy. For expositional purposes, I will focus on manufacturing firms because they are harder to study. Next, I will make the connection to service providers which are a little bit easier case (not always). The next figure summarizes the importance of the distinction between period and product costs.

Product (service) cost and period cost

- Product or service costs are capitalized until the product is sold or the service provided. On the contrary, period costs are expensed in the fiscal year that they occur.



**From now on, we will use the terms product cost and service cost interchangeably.*

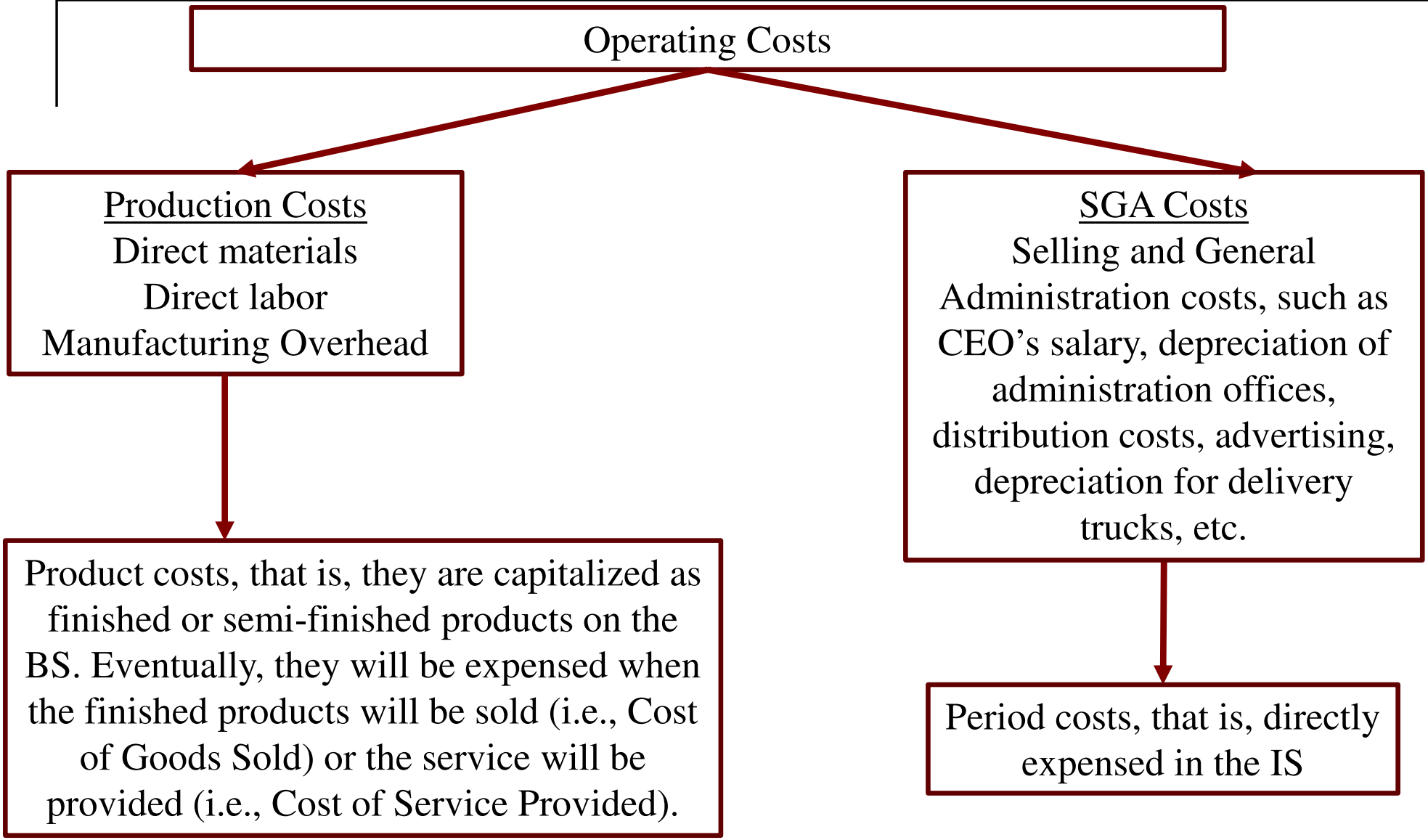
Product (service) cost and period cost

- According to the previous discussion, it is critical to decide which costs are "product costs" and which costs are "period costs" because they will have different treatments.
- We have 3 different approaches to deal with this:
  1. Full (Absorption) Costing
  2. Marginal (or Variable) Costing
  3. Activity Based Costing – ABC
- Full Absorption Costing is always our starting point. This is because Financial Accounting approves only this one, that is, Marginal Costing and ABC are not acceptable for financial accounting purposes (i.e., financial statements are prepared according to the Full Absorption Costing).
- However, for this course will also discuss Marginal costing because it is extremely useful for decision making (in many cases more useful than Absorption costing). I will also explain what ABC assumes, but we will not devote much time on this.

Full Absorption Costing

- We customarily classify costs to Production-related costs and Selling, General & Administrative (SGA) costs.
- Production costs include the consumption of raw materials (it is called as **direct materials**), **direct labor**, and **manufacturing overheads** (they include overheads that are necessary for the production process).
- For example, in a computer manufacturing firm:
  - ✓ the direct materials are the main raw materials for the computers,
  - ✓the direct labor is the cost of the workers that process the products, and
  - ✓overheads include electricity, depreciation of machines, etc.
- In a shipping firm, the direct materials include the fuel consumed, direct labor is the cost of the crew, and overheads include the depreciation of the vessel.
- SGA costs include costs for the overall operation of the firm that are not directly related to the production process. For example, the cost of the accounting department is an administrative cost, and the cost of the marketing department is a selling cost.
- Full Absorption Costing simply assumes that the production costs are product costs, whereas SGA costs are period costs.

Full Absorption Costing – an illustration



Full Absorption Costing – final remarks

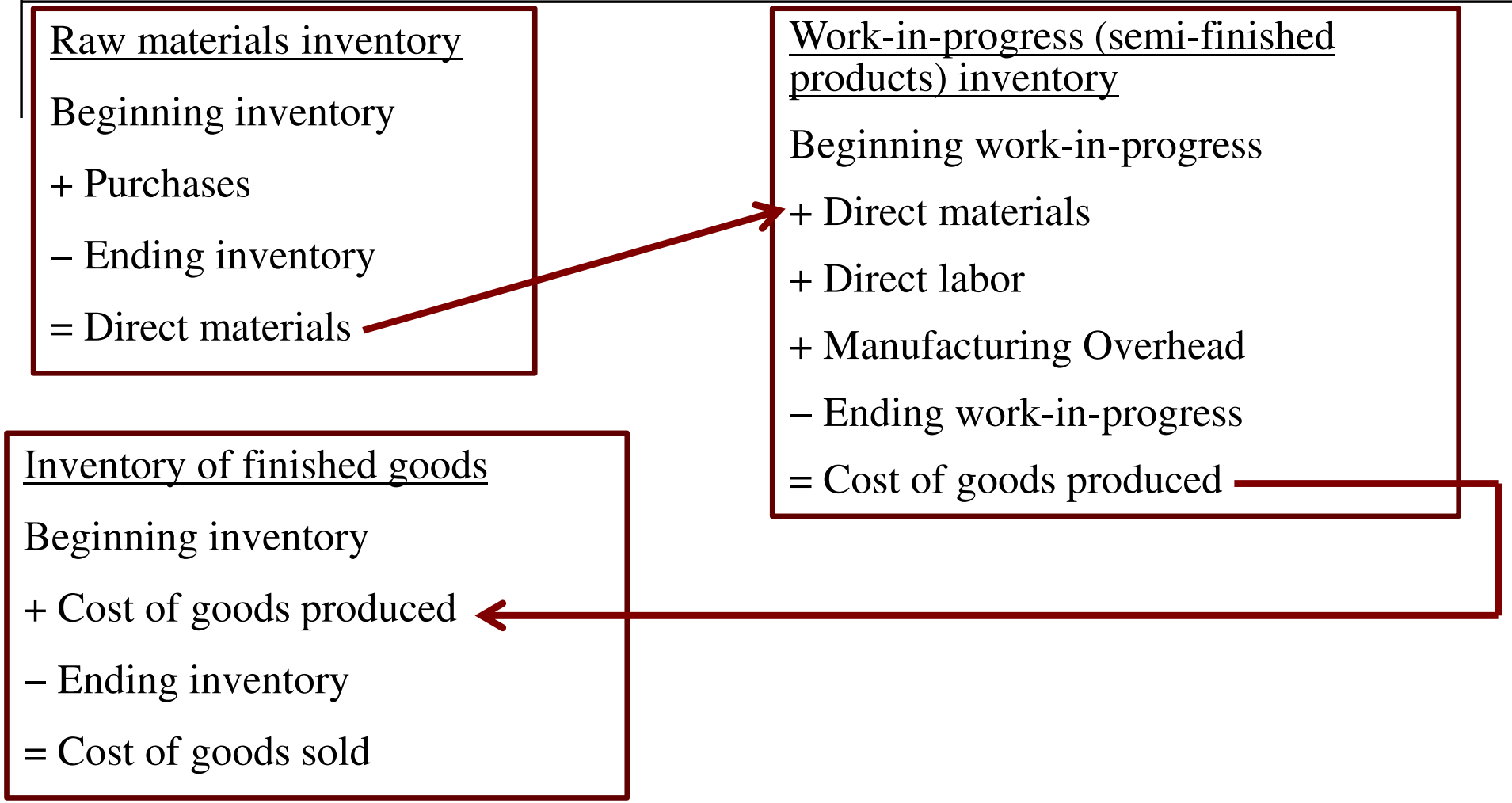
- Apparently, Full Absorption Costing requires a clear classification of costs regarding the activity that they related (i.e., production vs. SGA).
- Some costs are considered "clear-cut". For example, the direct materials and the direct labor of the production process are directly related to the production; and the salaries of the marketing department are clearly related to the selling activity.
- However, some overheads are not so clear-cut (they are indirect costs with respect to activities). For example, electricity cost may relate to the factory but also to the administration facilities. Such indirect costs need **allocation** with **allocation rates.**
- The cost allocation is a difficult task. We will return to this latter. For now, if we take the allocation rates for granted, we should allocate indirect costs before we prepare an income statement.
- Such allocation is normally made in an **allocation table**. The allocation table presents the allocation of operating costs to the activities (i.e., production and SGA activities). Note that the allocation table is not published.

-Exercise 1-

Cost flow in firms with production process

- Another important concept of firms with production process is the **cost flow process**.
- Recall that the Full Absorption Costing approach assumes that the production cost includes three elements:
  - ✓Direct material (raw materials consumed in the production process)
  - ✓Direct labor
  - ✓Manufacturing overhead (general production costs)
- Firms with a production process retain three kinds of inventories that are related each other:
  - ✓Raw materials inventory
  - ✓Inventory of work-in-progress goods (goods that are semi-finished)
  - ✓Inventory of finished goods
- The relationship of these 3 inventories and the cost-flow is presented in the next figure.

Cost flow in a firm with production process



-Exercise 2-

Fixed and variable costs

- So far, we have discussed the following cost classifications:

Classification A: Product Costs vs. Period Costs

Product costs are capitalized until the goods are sold or the service provided. Period costs are expensed. So, this classification has to do with the capitalization or the expense treatment.

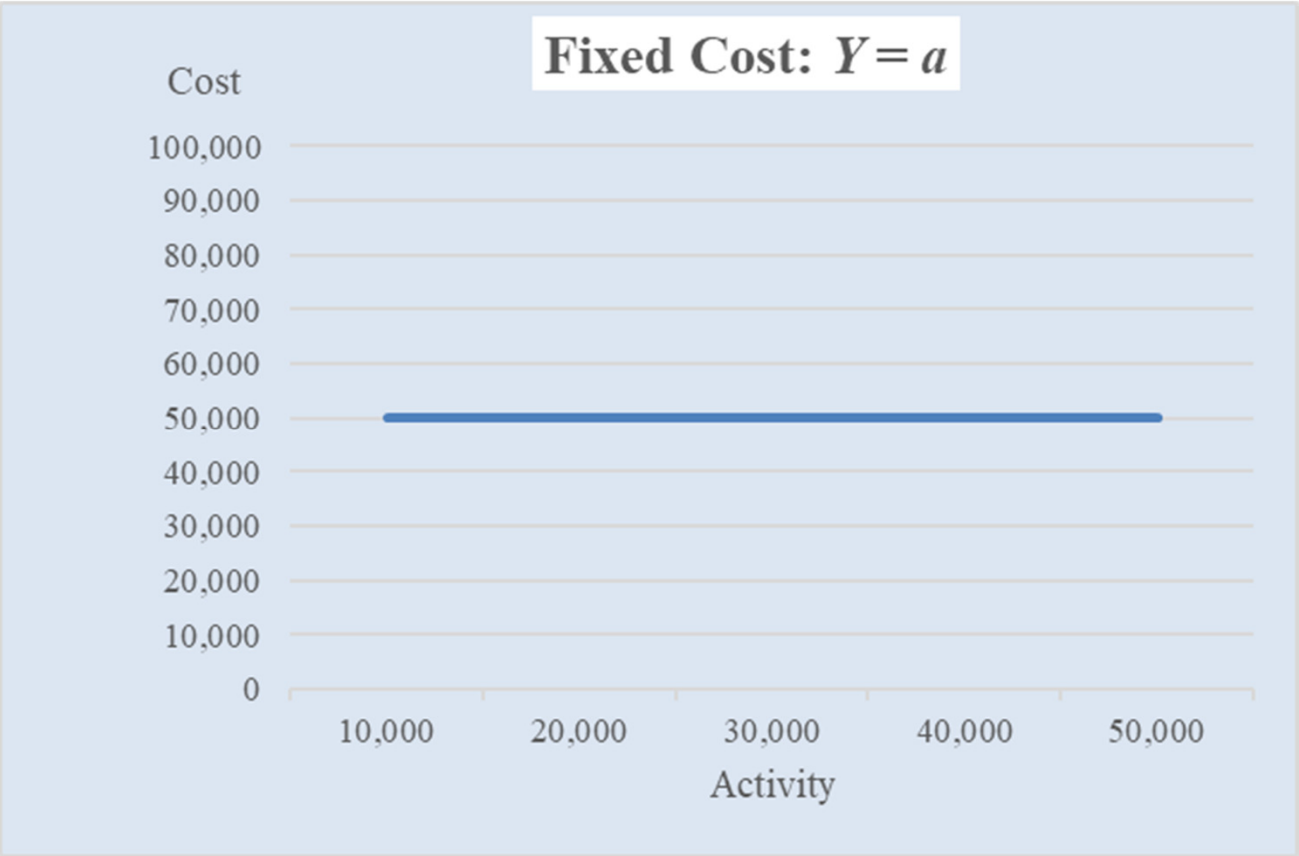
Classification B: Direct Costs vs. Indirect Costs

Direct costs relate directly to a product, a service, or an activity. Indirect costs relate to more than one products, services, or activities and need allocation. So, this classification has to do with the allocation treatment.

- In fact, there is another classification which has to do with the cost behavior regarding the activity level. According to this classification, we may distinguish between **fixed** and **variable** costs.

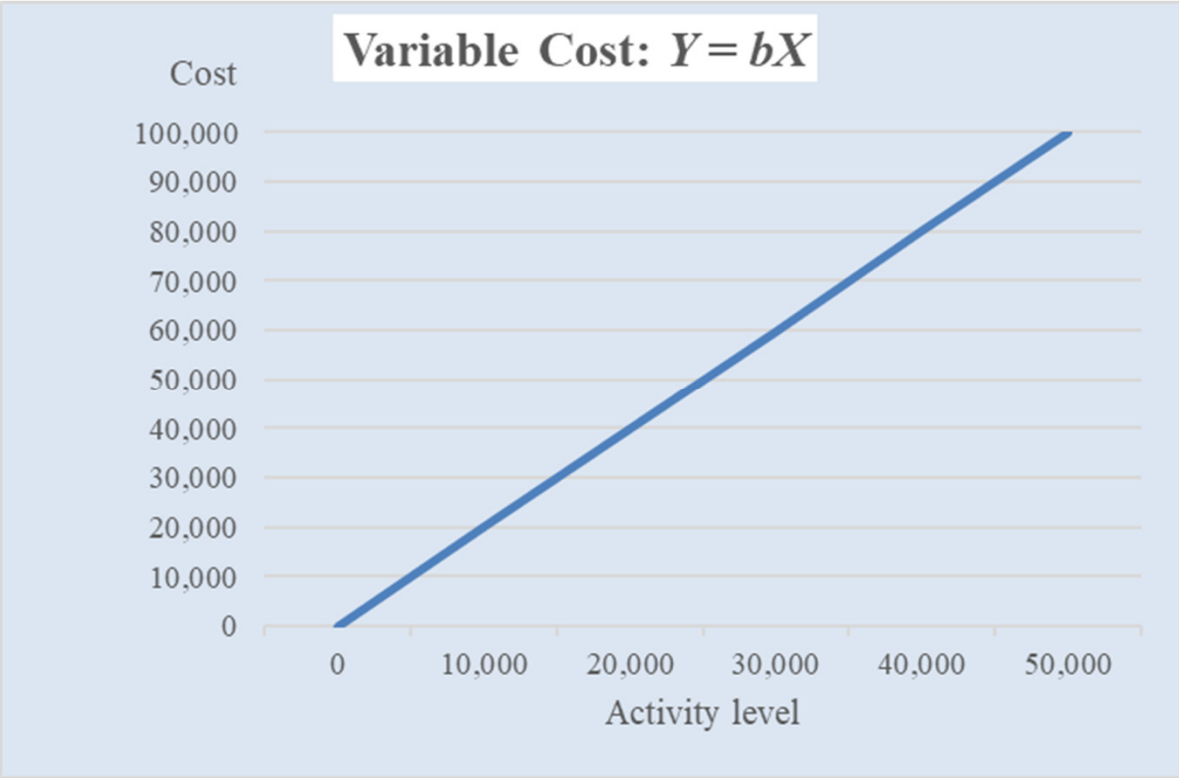
Fixed cost

- Fixed costs remain constant to different activity levels. Therefore, fixed cost has a function that is $Y=\alpha$, where Y is the total cost, and α is a constant. This refers to a relevant range of activity for a specific period of time. For example, rent cost of the production factory equals €50,000.



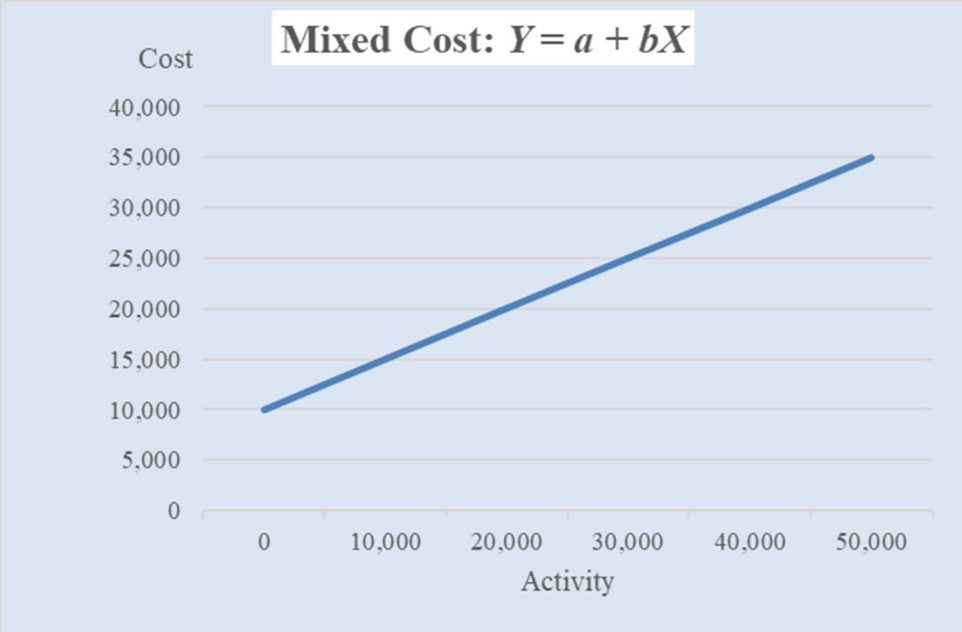
Variable cost

- Variable cost increases when the activity level increases. Classical theory assumes that variable cost has a *linear* relationship with the activity level. Therefore, the function of the variable cost is $Y = bX$, where Y is the total cost , b is the variable cost per unit, and X is the activity level. For example, assume that direct materials have a cost of €2 per unit.



Mixed Cost

- Many cost contain a fixed and a variable part. They are called as mixed (or semi-variable cost). For example, the electricity cost is normally a mixed cost. In other cases, mixed costs may occur when we aggregate different costs in a single cost pool for ease of analysis. For example, if we pool all overhead costs together, the overall cost will be probably a mixed cost.
- Therefore, the function for a mixed cost is $Y = \alpha + bX$
- For example, assume that a mixed cost is equals $Y=10{,}000+0.5X$



Estimation of cost behavior

- Estimating the cost behavior is a daunting task. Older approaches include the accounts method (the accountant decided for each cost account the cost behavior) and the engineering method (which is based on the relationship of physical input and outputs).
  - ✓Customarily, **Full Absorption Costing assumes that Direct Materials and Direct Labor are variable costs, whereas Overhead and SGA costs are mixed.**
- More recent approaches include the "high-low method" and the analytical procedures (e.g., regression analysis).
- Next, the high-low method and the regression analysis are presented, but some important points should be mentioned here:
  - ✓Both methods assume that the cost under scrutiny is mixed, that is, it has a fixed and a variable component.
  - ✓Both methods assume strict linearity of the cost behavior. However, the regression method may be used to estimate piece-wise or non-linear models (I will return to this point latter).
  - ✓Regardless the method we use, it is important to seek for causal relationships, that is, we use an independent variable that we assume that is the **cost driver**.

High-low method

- This method uses only two point of the cost function, that is the cost observations at the highest and the lowest point of the cost driver. It a simple method that estimates the variable component as follows:

$$Variable\ cost\ component = \frac{Difference\ between\ costs\ at\ the\ highest\ and\ the\ lowest\ obsrvations\ of\ the\ cost\ driver}{Difference\ between\ the\ highest\ and\ the\ lowest\ observation\ of\ the\ cost\ driver}$$

- Recall that the cost function is mixed:

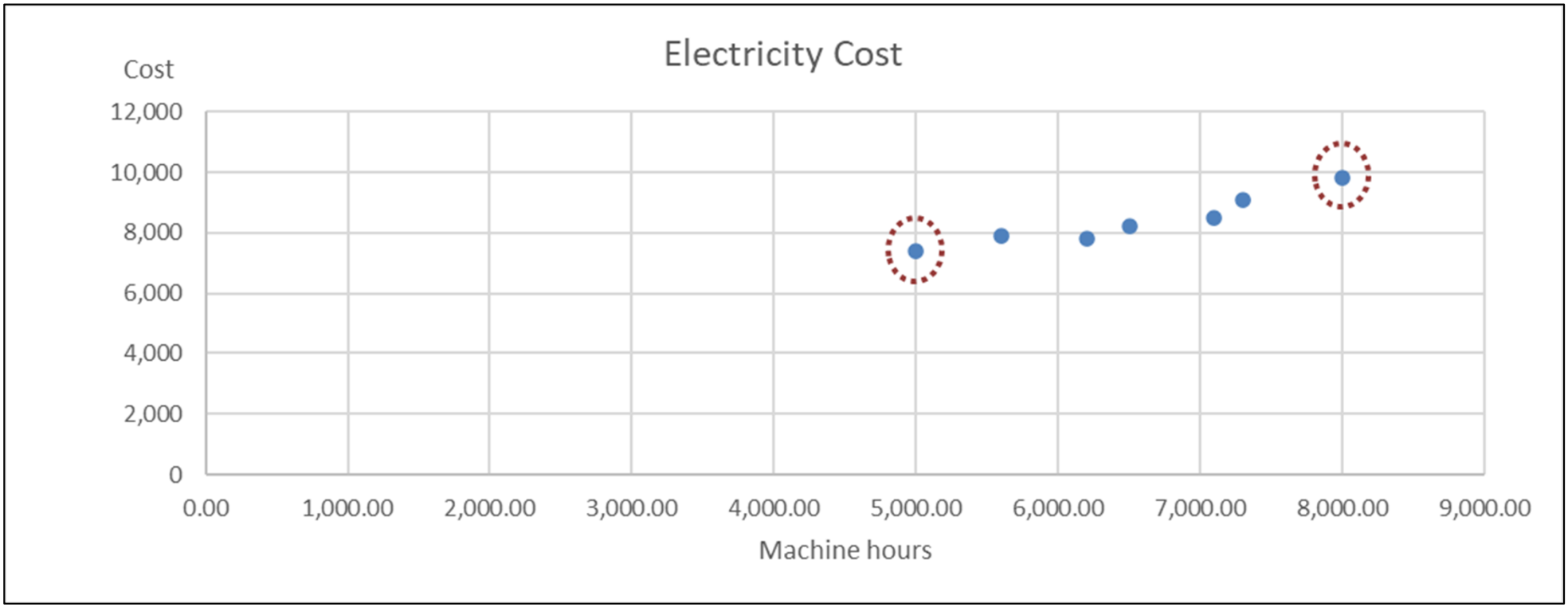
$$Y = a + bX$$

- The above equation yields the variable cost per unit, that is, coefficient b.
- Next, we calculate the constant term α with subtraction. Specifically, we use either the highest or the lowest observation of the cost driver, and we subtract the total variable cost from the total cost:

$$a = Y\ - bX$$

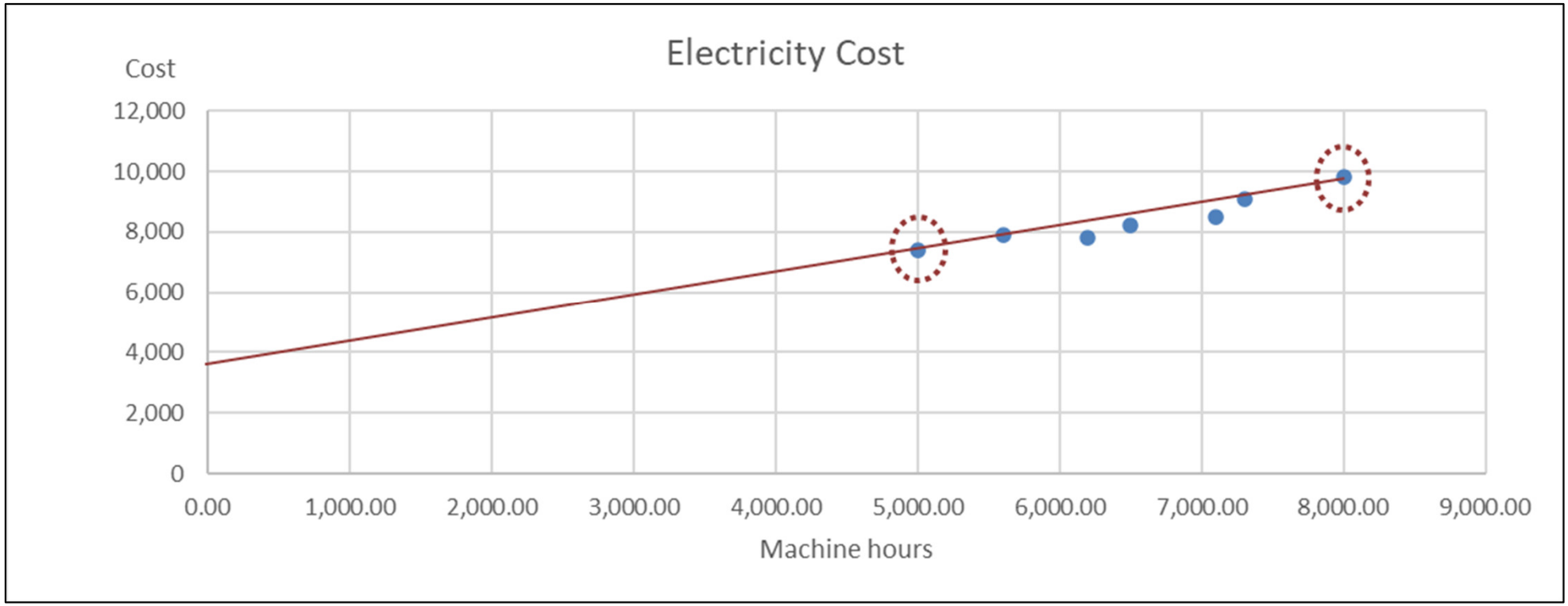
High-low method

- For example, assume that we try to estimate the cost behavior of electricity cost. We have concluded that the cost driver for the electricity cost is the machine hours. We plot the relevant data (a picture is worth a thousand words). The points that we will use are the circled ones.



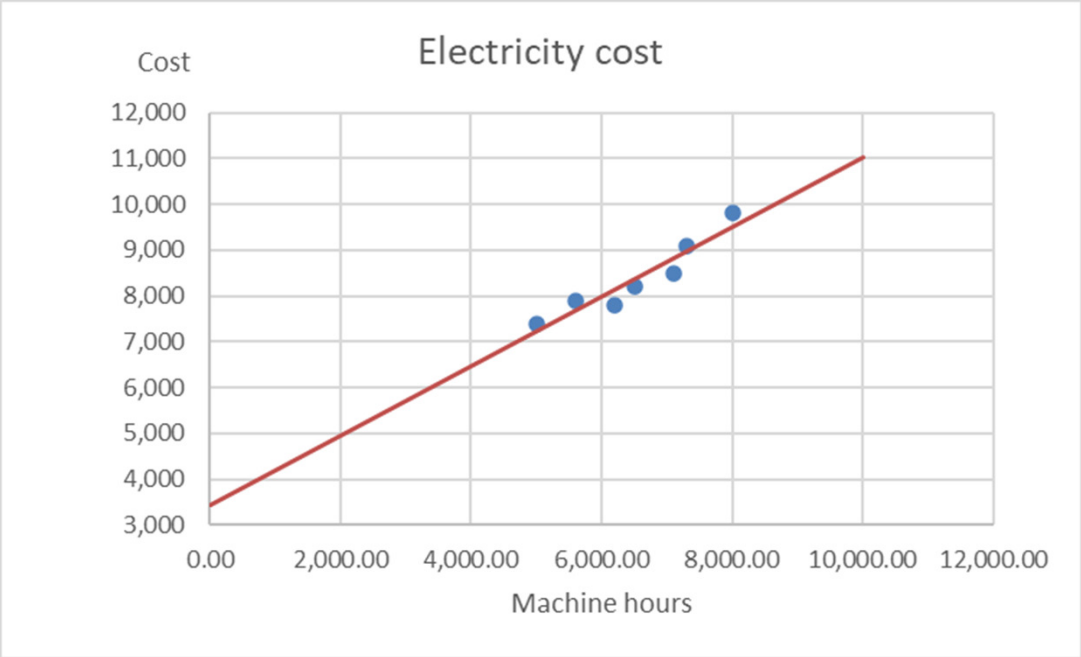
High-low method

- The high-low method will yield a linear relationship that connects the two points and intersects the *y* axis at the constant term.



Regression

- The regression method is normally accomplished with ordinary least squares. It yields a linear relationship using all the data – not just two points.
- This is a relatively simple method; we estimate a function line that passes as near as possible to the observations, that is, it minimizes the distance between the line and the observations. These distances are called “residuals”.
- For example, in the previous case, the regression method gives the following plot:



Regression method

- The OLS estimation uses the squared residuals. Simply stated, we try to minimize the sum of the residuals. However, residuals are positive and negative, so we use their squares.

Equation: $Y = a + bX + e$

Residual: $e = Y - a - bX$

Squared residual: $e^2 = (Y - a - bX)^2$

Sum of squared residuals (SSR): $\sum e^2 = \sum (Y - a - bX)^2$

Minimize SSR: min $[\sum e^2 = \sum (Y - a - bX)^2]$

- To minimize we use differential calculus (1st derivative criterion and the chain rule). Several software (e.g., Stata, Excel, Python, etc.) make this estimation for us. Nevertheless, if we want to make it by hand, we use the formulas that are derived from SSR minimization and are presented on the next slide.

Regression method – OLS formulas for the estimators

$$\hat{b} = \frac{n\sum xy - \sum x \sum y}{n\sum x^2 - (\sum x)^2}$$

$$\hat{a} = \bar{y} - \hat{b}\,\bar{x}$$

Where n the number of observations, Σ is the sum, $\bar{y}$ is the average value of the dependent variable, and $\bar{x}$ the average of the independent variable.

Moreover, we observe the R^2 which is a measure of the explanatory power of the model:

$$R^2 = 1 - \frac{\sum e^2}{\sum (y - \bar{y})^2}$$

-Exercise 3-

Estimating cost behavior - final remarks
Learning curves

- So far, we have assumed that the cost function is linear, that is, it varies proportionally to activity levels. However, this is barely true. In real life, we have several non-linearities. Prominent causes may be learning economies and cost-stickiness.
- Learning may affect the cost curve because the required time of production declines as the output increases. Learning models are of two kinds:
  - ✓The **cumulative average-time learning model (CLM)**. In this model the cumulative average time decreases by a specific percentage every time the cumulative output doubles. The mathematical relationship is the following:

$$k = pX^q$$

where k = cumulative average time per unit, p = the time required for the first unit, X is the cumulative number of units produced, and

q = rate of learning calculated as: $ln(\%learning)/ln2$

Therefore, total time = $kX = pX^{q+1}$

Estimating cost behavior - final remarks
Learning curves

✓The **incremental unit-time learning model (ILM)**. In this model, the time needed to produce the last unit declines by a constant percentage each time the cumulative output doubles. The mathematical relationship is the following:

$$m = pX^q$$

where m = time needed to produce the last single unit, p = the time required for the first unit, X is the cumulative number of units produced, and

q = rate of learning calculates as: $ln(\%learning)/ln2$

Therefore, $total\ time = m_1 + m_2 + \ldots + m_n$

- Obviously, these models are not linear. If we have indications that learning has an effect on the cost under scrutiny, we recast these models in a linear fashion:

✓ For the CLM we use a log-log model, that is, $ln(y) = ln(p) + (1+q)ln(X)$

✓ For the ILM we use a log-log model, but y is differenced, that is,

$ln(\Delta y) = lnp + q*ln(X)$

-Exercise 4-

Estimating cost behavior - final remarks
Sticky costs

- Sticky cost theory argues that variable costs may present non-linearities due to cost-stickiness.
- Cost-stickiness is a phenomenon where costs respond differently to decreases than to increases in activity. For example, a 20% increase in activity entails a 20% increase in costs, but a 20% decrease in activity entails 15% decrease in costs.
- These costs are sticky, that is, the under-respond to decreases in the output. Recent research finds that many cost categories are sticky, with the most typical one, the SGA costs.
- Sticky behavior has been attributed to several deliberate actions by managers, such as adjustment cost concerns and managerial opportunism.
- Estimation of sticky costs requires a piecewise linear model (most of the times it is in log-log form). Empirically, the output is measured in sales revenues (Sales):

$$\Delta lnCOST = \alpha + b_1 \Delta lnSales + b_2 DS * \Delta lnSales + e$$

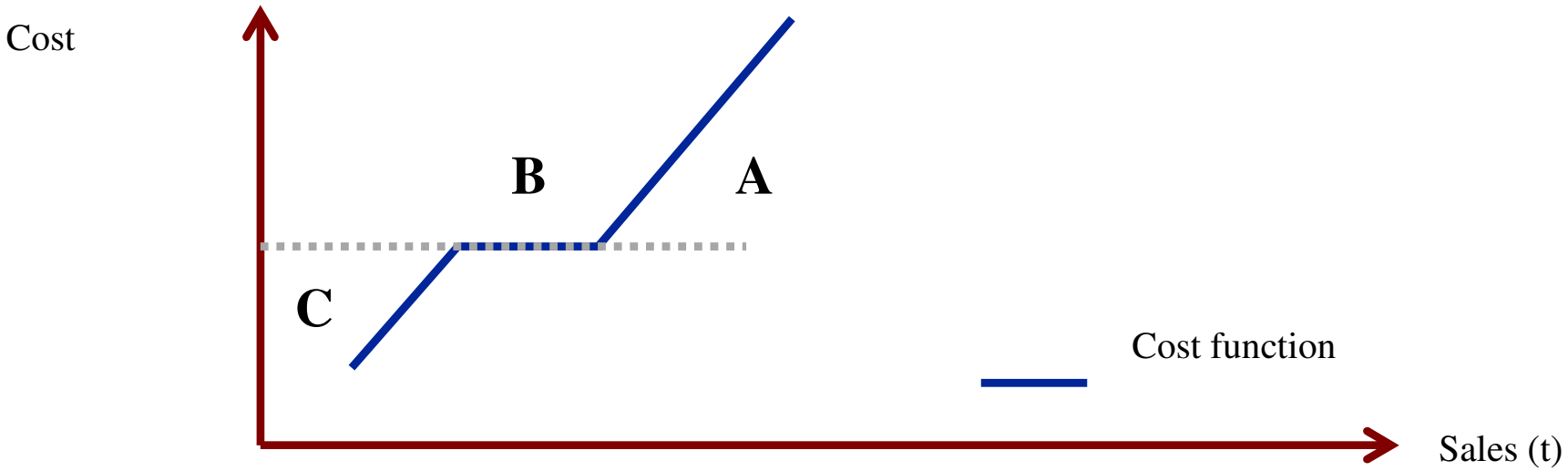
where *DS* is an indicator variable taking the value 1 if $\Delta Sales < 0$ and 0 otherwise

Estimating cost behavior - final remarks
Sticky costs

Scenario A: Change in sales is positive. Therefore, change in cost is linearly positive.

Scenario B: Change in sales is negative and costs under-respond. We have sticky behavior.

Scenario C: Change in sales is too negative and costs start to respond linearly negative.



-Exercise 5-

Section 2

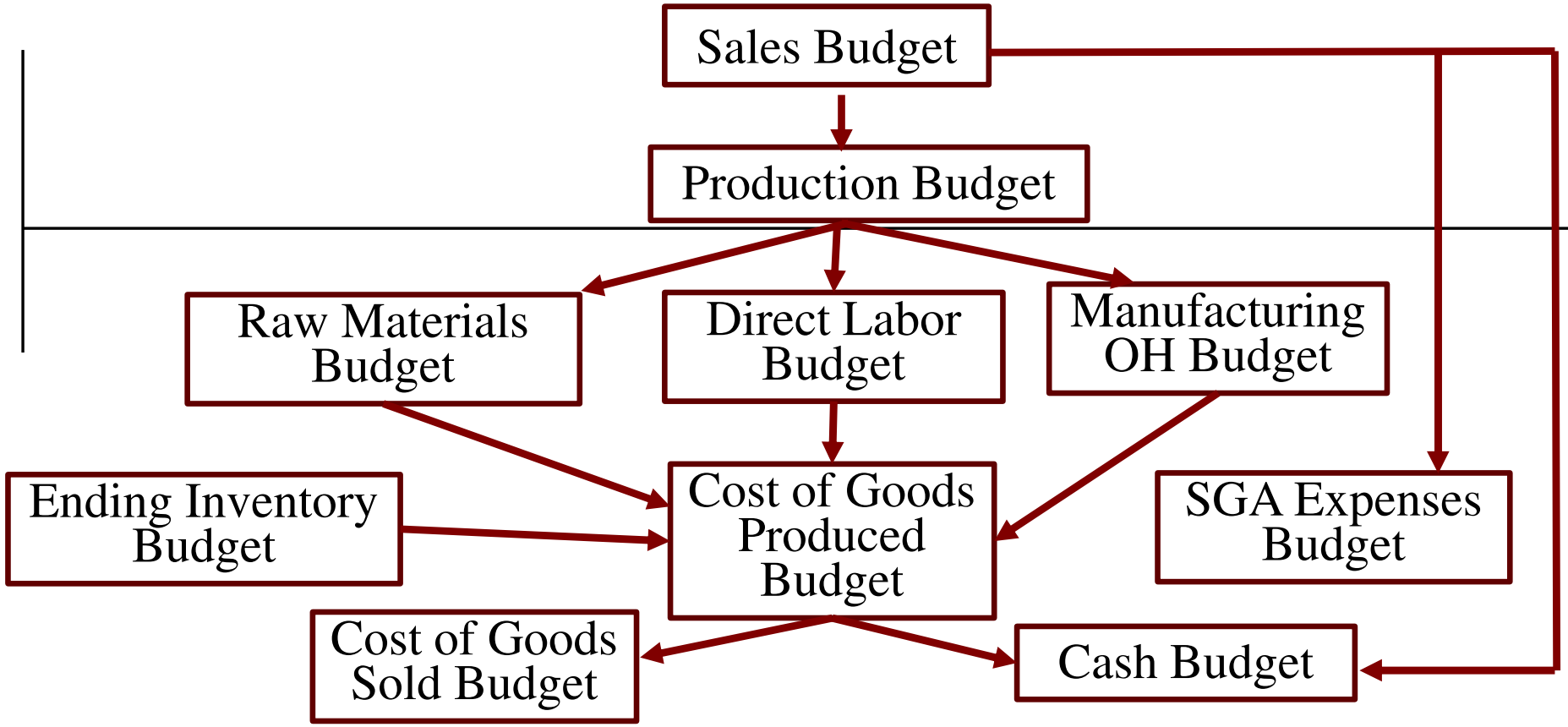
Master Budget

Static Budget vs Flexible Budget

The master budget

- Full Absorption Costing is extremely useful when we want to prepare a master budget, that is, a budget that forecasts the performance of a firm.
- The master budget consists of separate but interdependent budgets that formally lay out the company sales, production, and financial goals. It concludes with the cash budget and pro-forma financial statements.
- The major budgets that are included in the master budget are:
    1. The sales budget.
    2. The production budget and the related RM, DL, and MOH budgets.
    3. The ending inventory budget
    4. The cost of goods produced, and the cost of goods sold budget.
    5. The sales and administrative expense budget.
    6. The cash budget.
    7. Pro-forma financial statements

    Unsurprisingly, the budgetary process is more difficult for service providers and even more for manufacturing firms because they have production activity. I will present the budgetary process for a manufacturing firm, but these concepts are qualitatively similar for service providers.



Pro-forma Income Statement

Pro-forma Balance Sheet

Pro-forma Cash Flow Statement

Exhibit: The Master Budget Interrelationships

Preparing a budget: Technical steps
The sales budget

- The first step in the budgeting process is the preparation of the **sales budget**. The sales budget is a detailed schedule showing the expected sales for the budget period in units and in currency units. Apparently, the hardest task is to forecast the future sales! (if we are lucky, this is accomplished by the marketing department).

Budgeted unit sales	XXX
×Budgeted selling price	XXX
= Forecasted Sales Revenue	XXX

- An accurate sales budget is of key importance to the entire budgeting process as all other parts of the master budget depend on the sales budget.
- Sales budget is the primary source for the production budget. It is usually followed by a **cash receipts schedule** which will be used in the cash budget.

-Exercise 6-

Sales Budget

Preparing a budget: Technical steps
The production budget

- The next step is the preparation of the production budget. The production budget lists the number of units that must be produced to:
  - ✓Satisfy sales needs.
  - ✓Provide the desired ending inventory.
- The production budget is the necessary input for:
  - ✓The direct materials budget.
  - ✓The direct labor budget.
  - ✓The manufacturing overhead budget.
  - ✓The ending inventory budget

Preparing a budget: Technical steps
The production budget

- The production needs are determined by the following formula:

Budgeted unit sales (source: sales budget)	XXX
+ Desired ending inventory of finished goods	XXX
– Beginning inventory of finished goods	(XXX)
= Required production	XXX

-Exercise 6-

Production Budget

Preparing a budget: Technical steps
The direct materials budget

- The next step is the preparation of direct materials budget. The direct materials budget details the raw materials that must be purchased to fulfill the production budget and the desired inventories.
- The necessary information for the direct material budget is:
  - ✓The required production (source: production budget).
  - ✓The required raw materials per unit.
  - ✓Beginning and desired ending inventory.
  - ✓Unit cost of raw materials.

Preparing a budget: Technical steps
The direct materials budget

- The direct material budget is prepared under the following formula:

Required production (source: production budget)	XXX
× Required materials per unit	XXX
= Required raw materials in the production	XXX
+ Desired ending inventory of raw materials	XXX
– Beginning raw materials inventory	(XXX)
= Raw materials to be purchased	XXX
× Unit cost of raw materials	XXX
= Cost of raw materials to be purchased	XXX

Preparing a budget: Technical steps
The direct materials budget

- The direct materials budget is the source for the preparation of the schedule of expected cash disbursements for materials.
- The schedule of expected cash disbursement for raw materials details the cash outflows for raw materials purchases during each period.

-Exercise 6-

Direct Materials Budget

Preparing a budget: Technical steps
The direct labor budget

- The next step involves the preparation of the direct labor budget.
- The direct labor budget details the direct labor hours required to satisfy the production needs and the relevant cost.
- The direct labor budget permits the adjustment of labor force. Apparently, each firm's labor policy shall be also taken into account.
- The formula for direct labor budget is:

Required production (source: production budget)	XXX
× Required labor hours per unit	XXX
× Direct labor cost per hour	XXX
= Total direct labor cost	XXX

-Exercise 6-

Direct Labor Budget

Preparing a budget: Technical steps
The manufacturing overhead budget

- The manufacturing overhead budget lists all production costs other than direct materials and direct labor.
- Manufacturing overhead may include both variable and fixed costs. Variable costs shall be estimated each period.
- The variable manufacturing overhead budget is also used to estimate the predetermined overhead rate:

  Total budgeted overhead / Total units of the allocation basis (e.g., labor hours, machine hours, production volume)

-Exercise 6-

Manufacturing Overhead Budget

Preparing a budget: Technical steps
Ending inventories budget

- The next step is to prepare the ending inventory budget. Ending inventory is of three kinds:
  - ✓Raw materials
  - ✓Work-in-progress
  - ✓Finished goods
- Recall that finished goods (and work-in-progress to some extent) have absorbed: direct materials, direct labor and overheads. To prepare a budget of finished goods, one shall calculate first the cost per unit.

-Exercise 6-

Ending Inventories Budget

Preparing a budget: Technical steps
Cost of Goods Produced and Cost of Goods Sold Budgets

- All previous budgets are used to the cost of goods produced and the cost of goods sold budgets.
- Recall that Cost of goods produced is defined as:

  Beginning inventory of work-in-progress

  + Direct material cost

  + Direct labor cost

  + Overheads

  – Ending inventory of work-in-progress

  = Cost of goods produced

Preparing a budget: Technical steps
Cost of Goods Produced and Cost of Goods Sold Budgets

- The cost of goods sold is defined as:

  Beginning inventory of finished goods

  + Cost of goods produced

  – Ending inventory of finished goods

  = Cost of goods sold.

-Exercise 6-

Cost of Goods Produced Budget

Cost of Goods Sold Budget

Preparing a budget: Technical steps
Selling and Administrative Expenses Budget

- The final budget relating to costs is the selling and administrative budget. This budget is usually a compilation of many smaller budgets submitted by departments other than the manufacturing one.
- Usually, the S&A expenses consist of variable and fixed components. Variable components are often related to the number of units sold rather than the units produced.
- Recall that, according to the absorption cost approach, costs characterized as selling and administrative are treated as "period costs" and therefore are expensed in the period they occur.

-Exercise 6-

S&A Expenses Budget

Preparing a budget: Technical steps
Cash Budget

- The final operating budget is the cash budget. The cash budget is composed of four main sections:
  - ✓The receipts section.
  - ✓The disbursements section.
  - ✓The cash excess or deficiency section.
  - ✓The financing section.
- To deduce receipts and disbursements we use estimates from previous budgets. However, we have to adjust for:
  - ✓Revenues that are not collected directly in cash.
  - ✓Costs and expenses that are not paid in cash at the time they occur.

Preparing a budget: Technical steps
Cash Budget

- The cash budget:

  Beginning cash balance

  + Cash Receipts

  - Cash Payments (for direct materials, direct labor, overheads, S&A expenses, capital investments, dividends, etc).

  = Excess cash or Deficiency

  +Borrowings

  - Capital Repayments

  - Interest payments

  Ending cash balance

-Exercise 6-

Cash Budget

Preparing a budget: Technical steps
Pro-forma financial statements

- The final step is the preparation of pro-forma financial statements. Usually, of most interest is the budgeted income statement that provides a forecast for the net income.
- Recall that an income statement (in a simple form) states as:

Sales	XXX
Less: Cost of goods sold	(XXX)
Gross margin	XXX
Less: S&A expenses	(XXX)
Net operating income	XXX
Less: Interest expense	(XXX)
Net income	XXX

-Exercise 6-

Pro-forma Income Statement

Deficiencies of static budgets

- The budgets that were presented in previous slides are also called planning or static budgets.

A Static Budget is prepared at the beginning of the period.

A Flexible Budget is prepared at the end of the period (!).

- This is because they refer to an ex-ante planned level of activity and therefore, they are static budgets.
- However, it is quite unlikely that the planned and the actual level of activity will coincide. Alternative scenarios must also be considered.
- In case of different actual level of activity, a static budget is inappropriate for evaluation purposes.

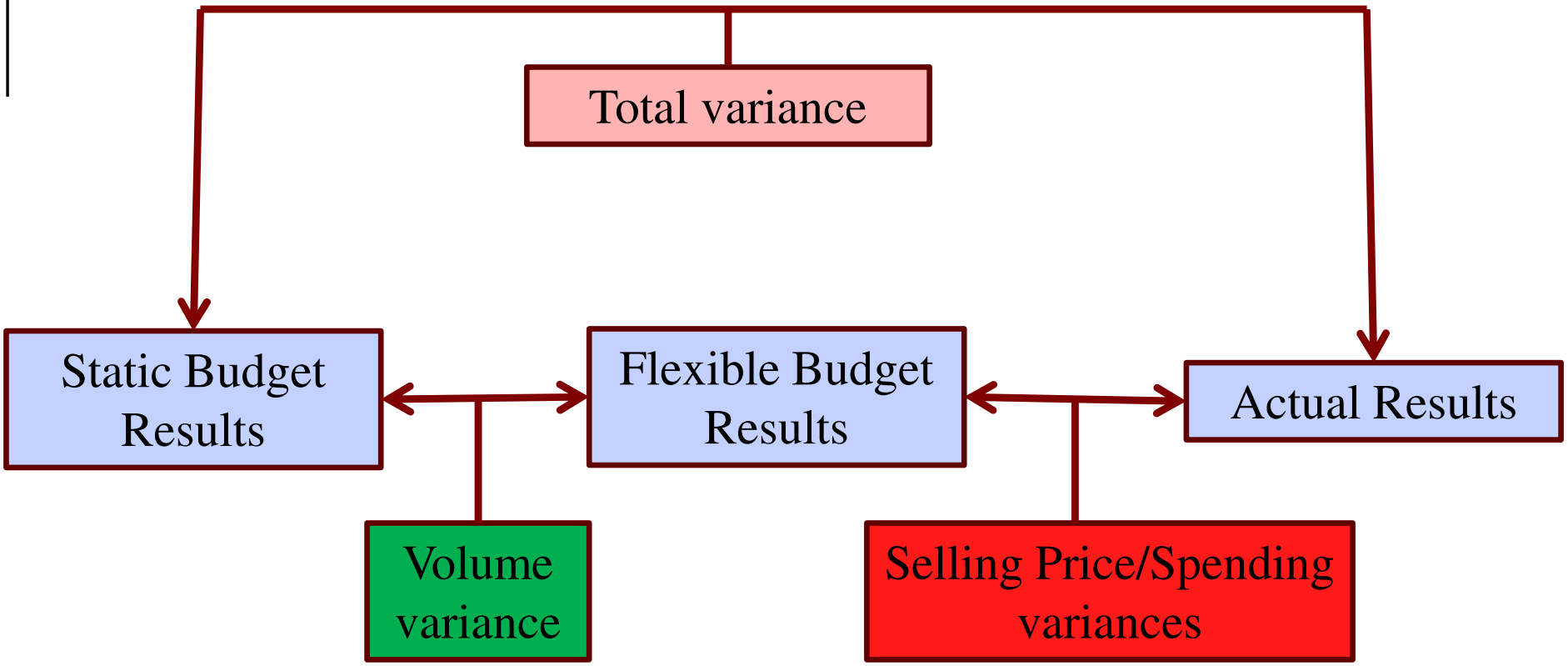
Deficiencies of static budgets

- For instance, suppose that a firm has prepared a static budget (i.e., at the beginning of the year) that indicates the following:
  - ✓Sales volume (in units): 1,000
  - ✓Net operating income: €10,000
- Instead, the actual results (i.e., at the end of the year) are:
  - ✓Sales volume (in units): 1,300
  - ✓Net operating income: €14,000
- Is the actual net operating income a "good result"? The answer is not obvious because:
  - ✓The actual sales volume was different causing an increase to variable costs.
  - ✓The increase in sales was 30%. Should we expect also an increase of 30% in net operating income? The answer is no, due to operating leverage.

Flexible budget

- The previous slide suggests that we need an ex-post budget based on the actual level of activity to evaluate potential variances. This budget is called as "flexible budget".
- A flexible budget has adjusted variable costs (and potentially some fixed costs) to the actual volume. This is a clear distinction to the static budget.
- In these terms, the flexible budget indicates the costs that should have occurred for the actual level of activity or volume.
- Indeed, the flexible budget ameliorates the "volume variance" (i.e., the difference between actual and planned volume of sales. However, even if we compare actual results with the flexible budget, variances may emerge again.
  - ✓These variances are called selling price/spending variances.

Static Budget, Flexible Budget and Actual Results



Example

- The next slide illustrates a simplified planned budget for a service provider, that is a hotel business. The accountant of the hotel has prepared a budget for the next year based on a planned activity of 130,000 customer visits (q).
- She has distinguished the costs between variable (e.g., Food and Beverage) and mixed (e.g., General Expenses) costs. No cost is considered as purely fixed.
  - ✓For the variable part of each cost, she has also estimated a formula (e.g., FnB:12q, GE: 80,000+13q).
- However, the actual volume was finally 150,000 visits. Thus, a number of variances has occurred…

Example

	Static/Planning Budget	Actual Results	Total Variances	
Volume (q)	**130,000**	**150,000**	**20,000**	**F**
Sales Revenue (60×q)	**7,800,000**	**8,250,000**	**450,000**	**F**
Expenses				
Salaries (2,000,000+2q)	**2,260,000**	**2,350,000**	**90,000**	**U**
FnB (12q)	**1,560,000**	**1,830,000**	**270,000**	**U**
General Expenses (80,000+13q)	**1,770,000**	**1,800,000**	**30,000**	**U**
Total Expenses	**5,590,000**	**5,980,000**	**390,000**	**U**
Operating Profit	**2,210,000**	**2,270,000**	**60,000**	**F**

- This table juxtaposes the static budget, the actual results, and the total variances. It is clear that this comparison does not tell much. Indeed, to evaluate variances, we need a flexible budget.

-Exercise 7 (Q1-Q4)-

Operating leverage

- In case of the hotel, the flexible budget suggested that for 150,000 visits the expected Net Operating Income was €2,870,000. Apparently, the percentage increase in activity does not equal to the percentage increase to NOI:
  - ✓Percentage increase in activity: (150,000 – 130,000)/130,000 = 15.38%.
  - ✓Percentage increase in NOI in the flexible budget: (2,870,000 – 2,210,000)/2,210,000 = 29.86%.
- What is the cause of this difference? Apparently, the presence of fixed costs that remain stable despite the increase in volume. Is there any way to calculate the NOI without preparing the flexible budget?
- The answer is yes, provided that we calculate the contribution margin and the operating leverage (OL):

  OL = Contribution Margin (static budget) / NOI (static budget)

  NOI (flexible budget) = (1+OL×%increase in activity)×NOI(static budget)

-Exercise 7 (Q5)-

Section 3

Marginal costing

CVP analysis

Relevant costs

Short-term Decision-making

Marginal costing

- So far, we have examined Full Absorption Costing which considers as product/service costs the production-related costs, regardless they are variable or fixed.
- A different approach is Marginal Costing which focuses on variable costs. According to marginal costing **all fixed costs should be treated as period costs** because they cannot be adjusted to the activity needs.
- A valuable concept that marginal costing offers is the "contribution margin", that is, the sales revenue less all the variable costs:

$$\textit{Contribution Margin} = \textit{Sales Revenues} - \textit{Variable Costs}$$

Note that several times, we use the **contribution margin per unit** which is simply the selling price less the variable cost per unit (or total contribution margin divided by the total volume of activity).

- The contribution margin is an extremely useful concept in several analyses and types of decision making. Common examples include the CVP analysis, and short-term decisions.

CVP analysis

- The Cost-Volume –Profit analysis is a quick way to determine which is the minimum volume threshold which if passed the firm makes profits. Otherwise, the firm makes losses.
- This minimum threshold is frequently called as “break-even point”. A graphical illustration is very useful to clarify this points, but first note that total cost equals fixed and variable cost.

$$Total\ cost = Fixed\ Costs + Variable\ Costs$$

- Fixed costs is a constant (c) while variable costs is the variable cost per unit (b) multiplied by the activity (Q). Therefore, we conclude the following:

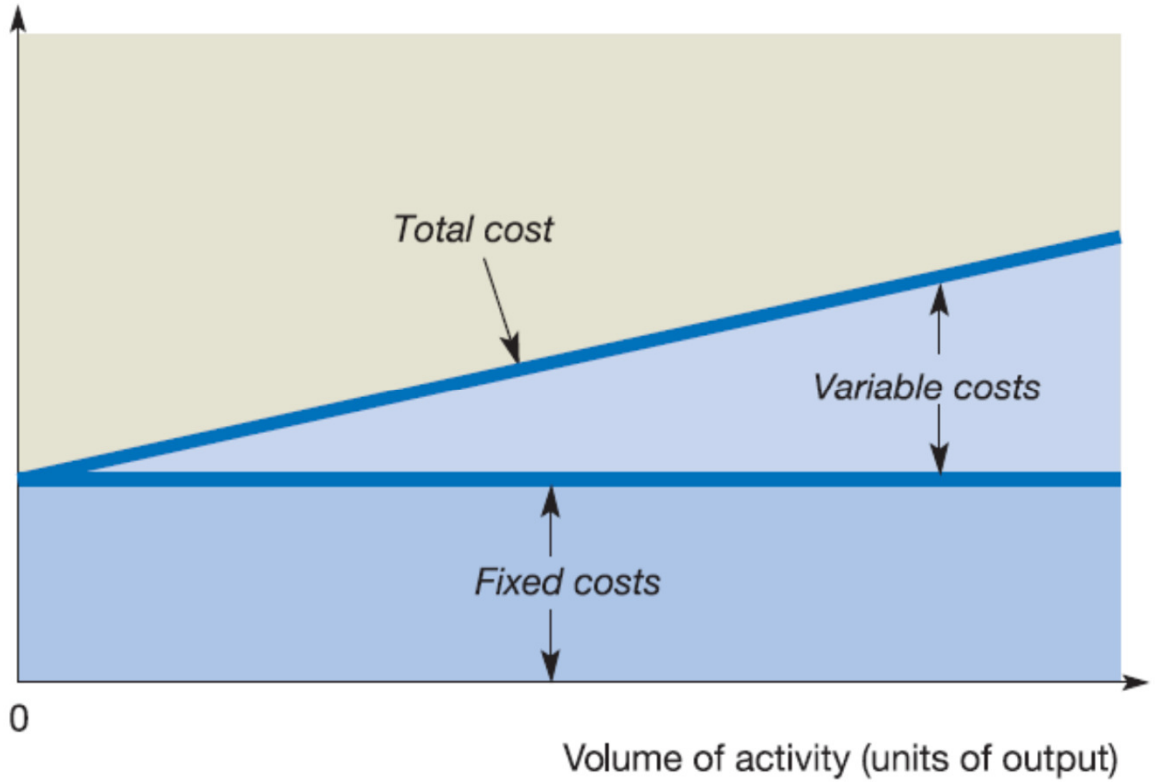
$Fixed\ Cost = c$

$Variable\ Cost = bQ$

$=> Total\ Cost = c + bQ$

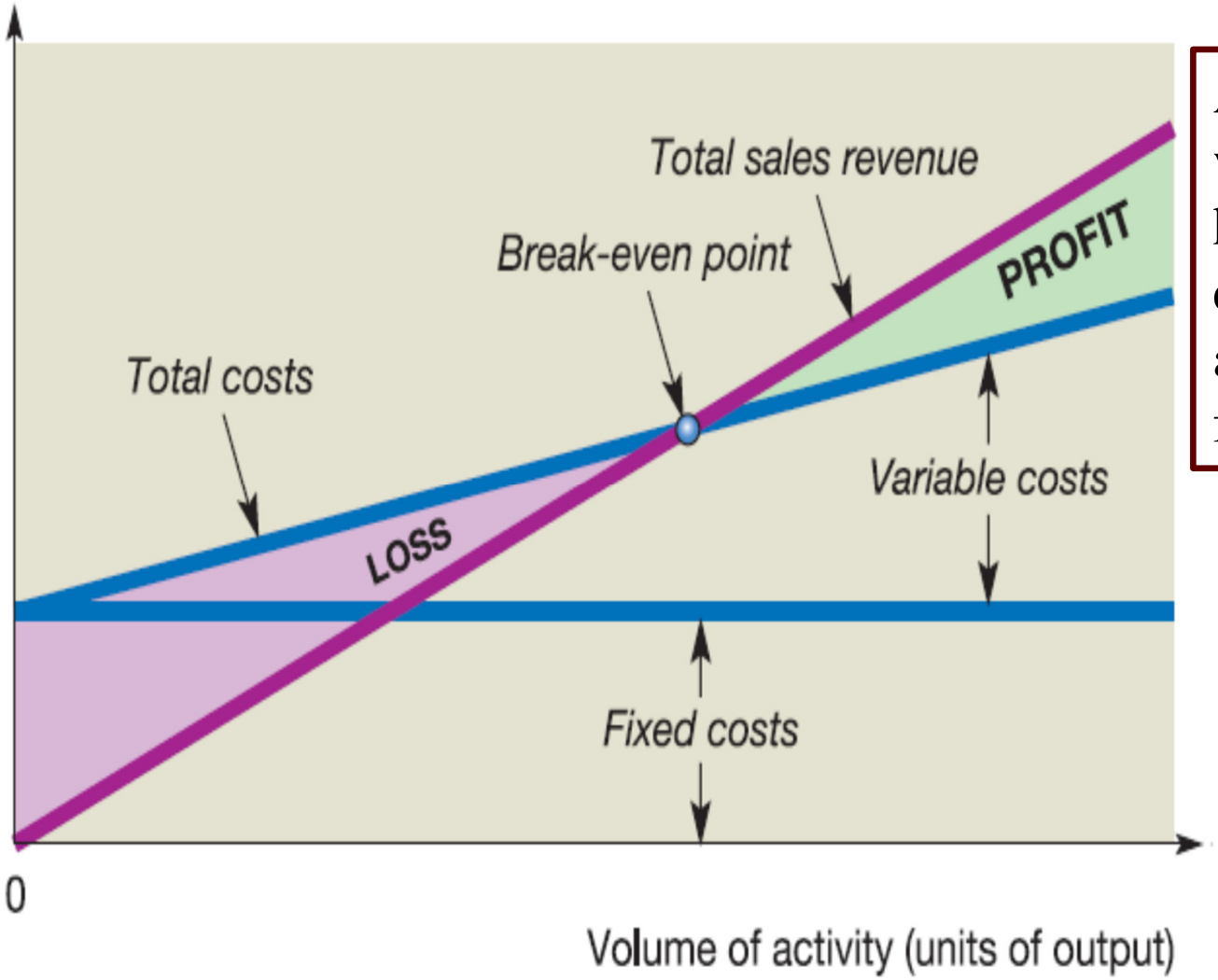
CVP analysis

A graphical illustration of the total cost ($c+bQ$) is as follows:



- The revenues line is as follows: *Revenues* = pQ, where p is the selling price.
- Now we can put the two lines together and find the break-even point.

CVP analysis



As the graph illustrates, when the activity is higher than the break-even point, the firm earns a profit. Otherwise, the firm incurs a loss.

CVP analysis

- Apparently, we cannot always depend on graphs to find the break-even point. We need a more practical way to do so. Recall that at the break-even point quantity (Q*) holds that total costs equal total revenues. Therefore, we can calculate the break-even quantity as follows:

$$Total\ revenues = Total\ Costs$$

$$Total\ revenues = Fixed\ Costs + Variable\ Costs$$

$$p \times Q^* = Fixed\ Costs\ (c) + b \times Q^*$$

$$p \times Q^* - b \times Q^* = Fixed\ Costs$$

$$(p-b) \times Q^* = Fixed\ Costs$$

$$Q^* = Fixed\ Costs\ /\ (p-b)$$

In simple terms, the break-even point quantity is the fixed cost divided by the contribution margin per unit.

-Exercise 9-

Relevant costs and short-term decision making

- Marginal analysis provides the fundamentals for the relevant costs analysis and short-term decisions.
- Marginal analysis indicates that the only relevant costs are those costs that are "marginal", that is, **the costs (and revenues) that change** when a decision is made. Stated differently, costs (and revenues) that do not change are not relevant.
- Consider the following firm that has to decide between two mutually exclusive products:

	Product X	Product Y	
Sales revenues	10,000×14 = 140,000	12,000×10 = 120,000	Relevant
Variable Manufacturing Cost	10,000×4 = 40,000	10,000×7 = 70,000	Relevant
Fixed Manufacturing Cost	15,000	15,000	Not relevant
SGA Expenses	20,000	20,000	Not relevant

Relevant costs and short-term decision making

- Regarding costs, there are 3 common types that are considered irrelevant.
  - ✓Costs that are sunk, that is, they occurred in the past and they do not change from one decision to another. Many depreciation costs fall in that category.
  - ✓Costs that will be equal across alternatives (e.g., the SGA expenses in my previous example).
  - ✓Costs that are common for all alternatives. Allocated fixed costs that support the firm in general fall in this category (e.g., the manufacturing fixed costs in my previous example).

Relevant costs and short-term decision making

- This analysis is useful for 3 types of short-term decisions: terminate or not an activity, special orders and outsourcing.
- A common misconception is that only relevant cost in these decision is the variable cost. Therefore, several textbooks (and practitioners) suggest that the contribution margin reveals the solution.
- However, recall that we are interested in relevant costs – not variable cost. Although variable cost is commonly relevant, it is not always the case (consider two mutually exclusive products with equal total variable costs). Moreover, **traceable fixed cost** (i.e., fixed cost that change across alternatives) and **implicit opportunity costs** may make things more complicated.
- The best way to deal with these decisions is the **differential analysis**, that is to calculate the **differential outcome** of the two decisions.

-Exercise 10-

-Exercise 11-

Contribution margin and capacity constrains

- A final useful application of contribution margin is when we have a constrain in one of the resources that we use for production of goods or for service provision.
- For example, we may produce Product A, Product B, and Product C, but we have a constrain in our machine hours. This is called as the “constraining factor”, and we have to decide which is the product that should be produced first, second, etc.
- When we have only one factor that is constrained and the fixed cost remains the same across products, we choose the product with the **highest contribution margin per unit of the constraining factor**.
- Note that if we have more than one constraining factors, we have to use alternative approaches such as linear programming.

-Exercise 12-

Section 4

Transfer Pricing

Decentralized organizations

- We have already discussed master budgets, flexible budgets, and variance analysis. These evaluation methods are usually applied to organizations that are of low to medium size and centralized.
- However, may organizations that increase in size delegate responsibilities and authorities to managers of their departments to achieve decentralization. For example, Multinational Enterprises (MNEs) are decentralized due to geographical dispersion.
- Decentralization has many benefits, such as flexibility to changes. Moreover, lower-level managers become responsible for their departments, have stronger motives to succeed, and get prepared to take higher-level positions in the future.
- However, decentralized organizations need appropriate methods to evaluate their departments and enhance goal congruence. Each department must be responsible for its own performance. Therefore, each department becomes a “responsibility center”.

Responsibility Centers

- There are 4 kinds of responsibility centers:
  - ✓Cost centers: the manager of a cost center has control over costs but not over revenues (e.g., the legal department of a company)
  - ✓Revenues centers: the manager of a revenues center has control over revenues but not over costs. The sales departments are revenue centers.
  - ✓Profit centers: the manager of a profit center has control over revenues and over costs and therefore, she is evaluated with the department's profitability (e.g., the local branch of an MNE).
  - ✓Investment centers: the manager of an investment center has control over the profits, but she is also in charge of re-investing them (e.g., the manager of the previous example can also decide about the acquisition of new operating assets).

Performance evaluation

- In practice, there are 3 approach to evaluate the performance of decentralized departments:
  - ✓Budgets and variance analysis: This approach is more appropriate for cost, revenues and profit centers and is usually applied at departmental basis.
  - ✓Transfer pricing: This approach has many benefits when there are intra-firm transactions. For example, Department A gives an intermediate product to Department B.
  - ✓Investment performance measures: This approach is appropriate for investment centers.
- We have already discussed about budgets and variance analysis. This section will present the transfer pricing approach.

Transfer prices

- Transfer prices are widely known as a tax avoidance tool. Arguably, shipping firms are notorious for transfer pricing schemes. However, the initial development of the transfer prices concepts was in the field of Management Accounting.
- A transfer price is the price that a department charges another department of the same firm for the provision of a service or a product.
- For example, assume that a car manufacturing firm has the following two departments:
  - ✓Department A that constructs the car engine.
  - ✓Department B that assembles the car parts.
- If Department A charges a price to Department B for the engine, this price is a transfer price. The product is an intermediate product.
- It is notable that the transfer price converts Department A to a profit center.

Transfer pricing methodologies

- Defining transfer prices is a non-trivial task. In real life, we have 3 approaches:
  - ✓Negotiated transfer prices: The departments that make transactions negotiate the transfer prices applied.
  - ✓Cost-based transfer prices: The transfer prices applied are based on cost (variable or full cost) and they potentially include a markup.
  - ✓ Market-based transfer prices: Transfer prices applied are based on market prices for similar products or services.

Next, each approach is discussed separately. However, negotiated transfer prices have become increasingly popular in recent years.

Negotiated Transfer Prices

- Negotiated transfer prices are the outcome of a bargaining process between the department that provides the product (selling department) and the department that receives it (purchasing department). There is a range that the transfer price will be concluded. Obviously, the bargaining skills of each department matters. However:
  - ✓The selling department will not accept a transfer price that is lower that is marginal cost, and
  - ✓The purchasing department will not accept a transfer price that is higher than its marginal benefit.
- Therefore, the acceptable range is the following:

Marginal cost of the selling department **< = Transfer Price < =** **Marginal benefit of the purchasing department**

Τιμές μεταφοράς βάσει διαπραγμάτευσης

- This analysis leads us to conclude that:
  - ✓The selling department will accept the transfer price if:

    Transfer price ≥ Variable Cost + Opportunity Cost + Traceable Fixed Cost

  - ✓The purchasing department will accept the transfer price if:

    Transfer Price ≤ min(Cost of purchasing by external supplier, Marginal Selling Profit without the cost of transfer price)

Recall that the opportunity cost arises when we sacrifice sales to other customers, and that it is approached through the contribution margin.

-Exercise 13-

Cost based transfer prices

- Many organizations set transfer prices based on the variable or the full cost of a department. Although this approach is quite simple, it has many issues:
  - ✓A transfer price equal to the variable cost yield a loss to each departments except for the last one. The loss equals the fixed cost.
  - ✓A transfer price equal to the full cost yields zero results to each department except for the last one.
- Due to these drawbacks, many organizations allow the departments to impose a markup over their full cost to yield profits. Moreover, they allow the purchasing department to decide whether it will purchase internally or externally. For example, if Department A has a full cost per product €1,000, it imposes a markup 10% and set the transfer price to €1,100. Department B then decides whether to purchase the product from Department A or from an external supplier. However, this approach:
  - ✓Provides no incentives to the departments to decrease their costs (!).
  - ✓Leads the next department to consider the fixed cost of the previous department as variable cost and therefore, to treat it as avoidable cost for the company (!!!).

Market based transfer prices

- A final approach is to set transfer prices according to the prices used in the external market.
- This approach is quite efficient, but two conditions should be met:
  - ✓An external market should exist for intermediate products.
  - ✓The external market should be competitive to reflect fair values free from monopoly rents.
  - ✓Finally, if we have synergies across the departments, there will be conflicts about the benefit allocation (as previously).

-Exercise 14-

Section 5

Evaluation of Investment Centers

Evaluation of Investment Centers

- Transfer pricing is a powerful tool which converts revenue and cost centers to profit centers. However, when we deal with investment centers, we intend to evaluate not just their profit, but their investment returns too.
- Put it differently, we consider that profitability (effectiveness) is not enough – we also focus on efficiency regarding the capital employed.
- In real life, firms use 3 measures to evaluate investment centers:
  - ✓The Return On Investment (ROI) ratio,
  - ✓The Residual Income (RI), and
  - ✓The Economic Value Added (EVA)

  In essence, EVA is just a more sophisticated version of RI.

Return On Investment ratio (ROI)

- ROI is defined as profit to invested capital:

$$ROI = Profit / Invested\ Capital$$

- Obviously, ROI indicates the profit for each currency unit of invested capital.
- A huge practical issue is to define exactly the variables of the ratio.
  - ✓For example, the numerator may be the operating profits, the profits before taxes , the net income, etc.
  - ✓Similarly, the denominator may be total assets, operating assets, etc.
- Most firms use operating profits and operating assets but still there is heterogeneity regarding the values used (e.g., fair values, accounting values, liquidation values, etc.).
- Therefore, for the purposes of this course, we will use a simple version of the ratio but keep in mind that each firm may make its own adaptations.

Du Pont analysis

- ROI may be decomposed into two separate ratios: Sales Margin and Asset Turnover:

  $ROI = Profit / Invested\ Capital$

  $= (Profit / Sales\ Revenues) \times (Sales\ Revenues / Invested\ Capital)$

  $= Sales\ Margin \times Asset\ Turnover$

- This decomposition indicates that there are two ways to improve your ROI:
  - ✓Improve your Sales Margin, or
  - ✓Improve your Asset Turnover.
- Can a firm improve both of them? Traditional strategy theory suggests that each firm has to focus on a specific strategic profile: differentiation strategy or cost leadership.

Criticisms of ROI

- ROI is widely used. However, there are the following criticisms:
  - ✓It can be easily manipulated in the short term (e.g., quick liquidation of assets) but this is not sustainable.
  - ✓The current investments will be in place even if the manager changes.
  - ✓An investment project that is beneficial for the firm may have a negative effect to departmental ROI. Therefore, the manager of the department may reject the project.
  - ✓ROI may be high but still insufficient. This may occur because ROI does not consider the required return.

-Exercise 15-

(Question 1)

Residual Income

- Residual income (RI) is an alternative measure of evaluation. RI is the extra profit that a department yields beyond its required return.

$$RI = Profit - (Required\ return\ rate \times Invested\ Capital)$$

- Again, we encounter different definitions of the variables across firms. Therefore, we will stick to the core terms of the ratio.
- There are discernible differences between ROI and RI. For example, ROI is a ratio whereas RI is a monetary value. Therefore, they do not always lead to the same decisions.
- In principles, RI is a superior measure than ROI. Surprisingly, most firms still prefer ROI.

-Exercise 16-

(Questions 2 and 3)

-Exercise 18-

Economic Value Added (EVA)

- Economic Value Added (EVA) is an adaptation of ROI with many adjustments. However, the adjustments are so many that EVA is considered a stand-alone measure. EVA is defined as:

$$\text{EVA} = \begin{matrix}\text{Operating Profit} \\ \text{After Taxes} \\ \text{(adjusted)}\end{matrix} - \left[\begin{matrix}\text{Weighted} \\ \text{Average} \\ \text{Cost of Capital}\end{matrix} \times \left(\begin{matrix}\text{Total} \\ \text{Assets} \\ \text{(adjusted)}\end{matrix} - \begin{matrix}\text{Short-term} \\ \text{Liabilities}\end{matrix}\right)\right]$$

- Recall that WACC is defined as:

$$\text{WACC} = \frac{\left(\begin{matrix}\text{Cost of debt} \\ \text{after taxes}\end{matrix} \times \begin{matrix}\text{Current value} \\ \text{of debt}\end{matrix}\right) + \left(\begin{matrix}\text{Cost} \\ \text{Equity}\end{matrix} \times \begin{matrix}\text{Current value} \\ \text{of equity}\end{matrix}\right)}{\begin{matrix}\text{Current value} \\ \text{of debt}\end{matrix} + \begin{matrix}\text{Current value} \\ \text{of equity}\end{matrix}}$$

EVA

- When firms apply EVA, they make a number of adjustments to accounting items. The intention is to convert accounting items to more appropriate measures for management accounting purposes.
- For example, R&D costs, and advertising costs are capitalized. Moreover, invested capital are calculated at the beginning of the evaluation period.
- Many consulting firms blazon that they make more than 50 adjustments. However, typical adjustments are about 12.
- Next slide summarizes the most typical adjustments.

EVA adjustments

Accounting Item	Adjustment to profits	Adjusted to invested capital
Advertising, R&D, and training costs	Added back but the economic depreciation is subtracted.	Capitalization of costs.
Depreciation	Added back but the economic depreciation is subtracted.	Net accounting value is adjusted to the economic depreciation.
Operating leases	Lease payments are added back. The depreciation of the capitalized assets is subtracted.	Capitalization of the future lease payments.
Provisions	They are added back	They are added back.
Rest items	Adjustment	
Taxes	Only the current tax is used but it is increased by the tax benefit of the interest.	

-Exercise 19-