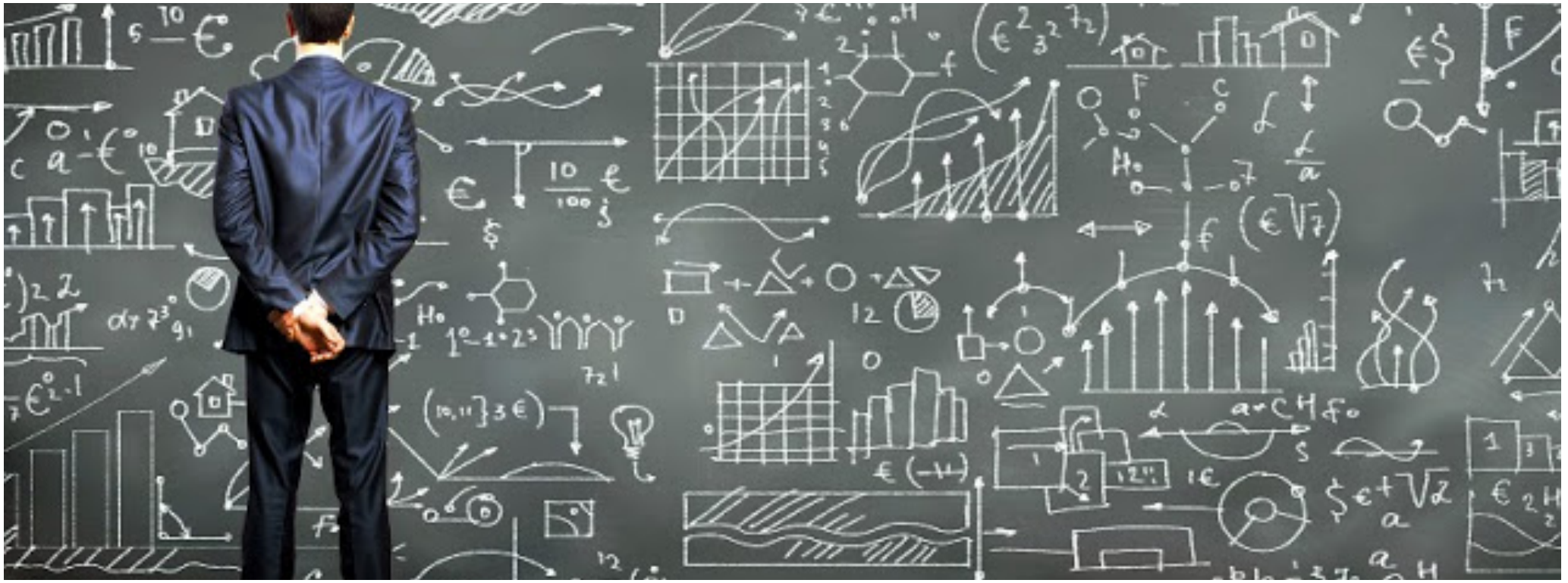
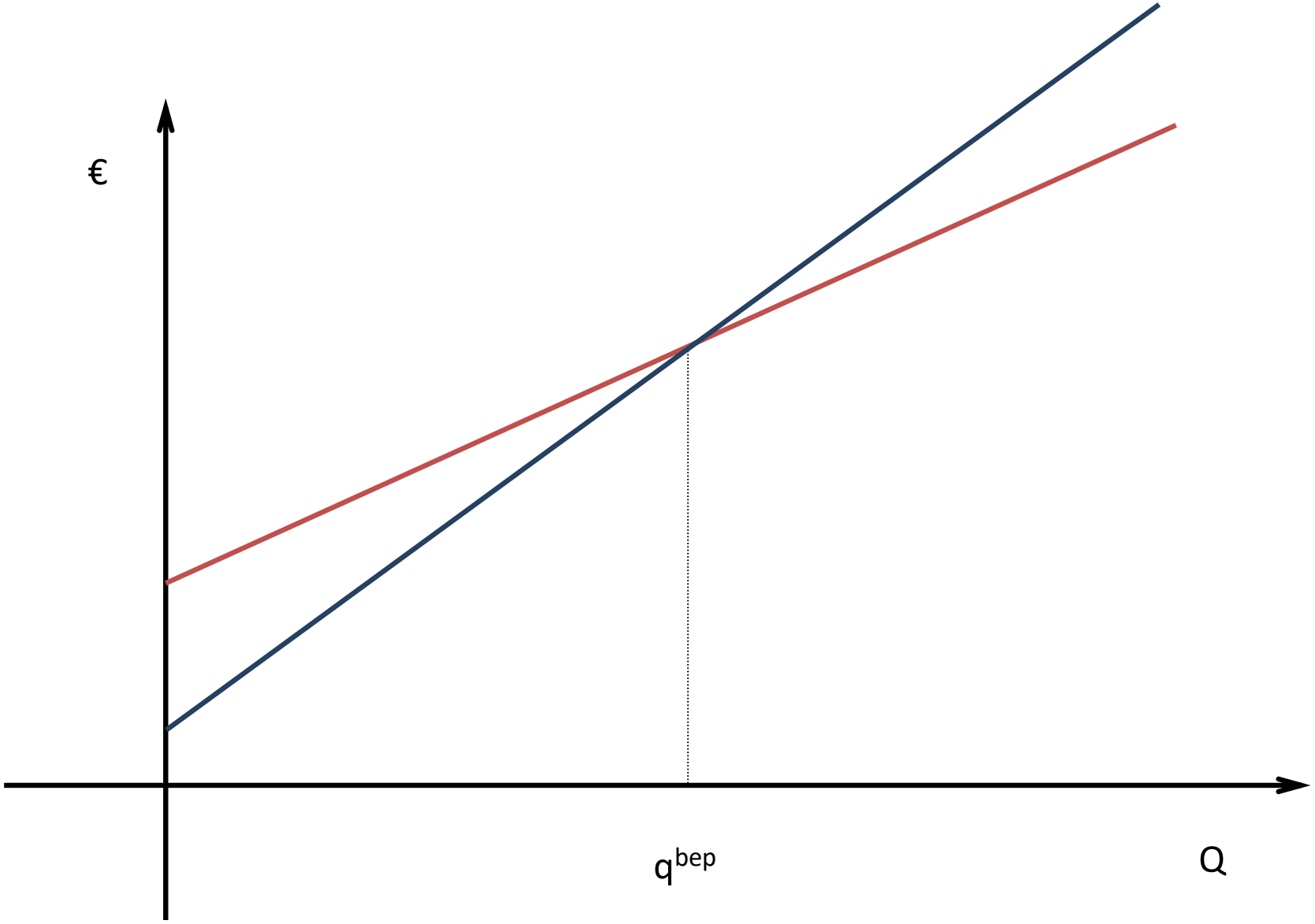
MANAGERIAL COSTING AND CVP ANALYSIS

(A) Some initial reflections



COST-VOLUME-PROFIT ANALYSIS



MENTAL MODELS

In 1971 Jay Wright Forrester defined mental models as follows:

"The image of the world around us, which we carry in our head, is just a model. Nobody in his head imagines all the world, government or country. He has only selected concepts, and relationships between them, and uses those to represent the real system"

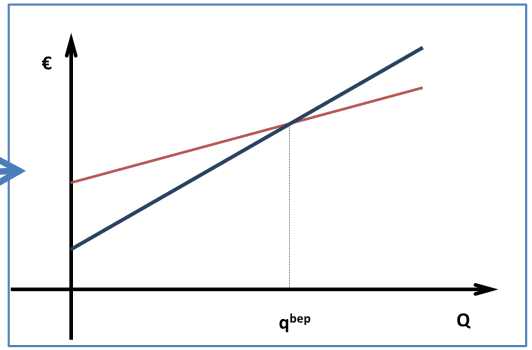
Mental model is an explanation of someone's thought process about how something works in the real world. It is a representation of the surrounding world, the relationships between its various parts and a person's intuitive perception about his or her own acts and their consequences. Mental models can help shape behavior and set an approach to solving problems (similar to a personal algorithm) and doing tasks.

A mental model is a kind of internal symbol or representation of external reality, hypothesized to play a major role in cognition, reasoning and decision-making. Kenneth Craik suggested in 1943 that the mind constructs "small-scale models" of reality that it uses to anticipate events.

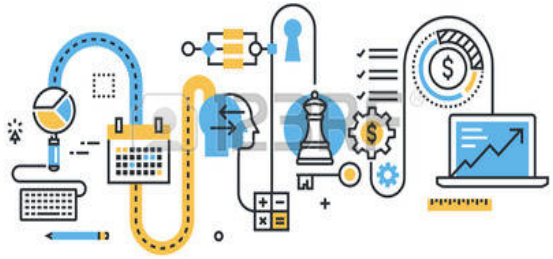
SOURCE: https://en.wikipedia.org/wiki/Mental_model

DECISION MODELS

SELECTED CONCEPTS AND SELECTED RELATIONSHIPS BETWEEN THEM

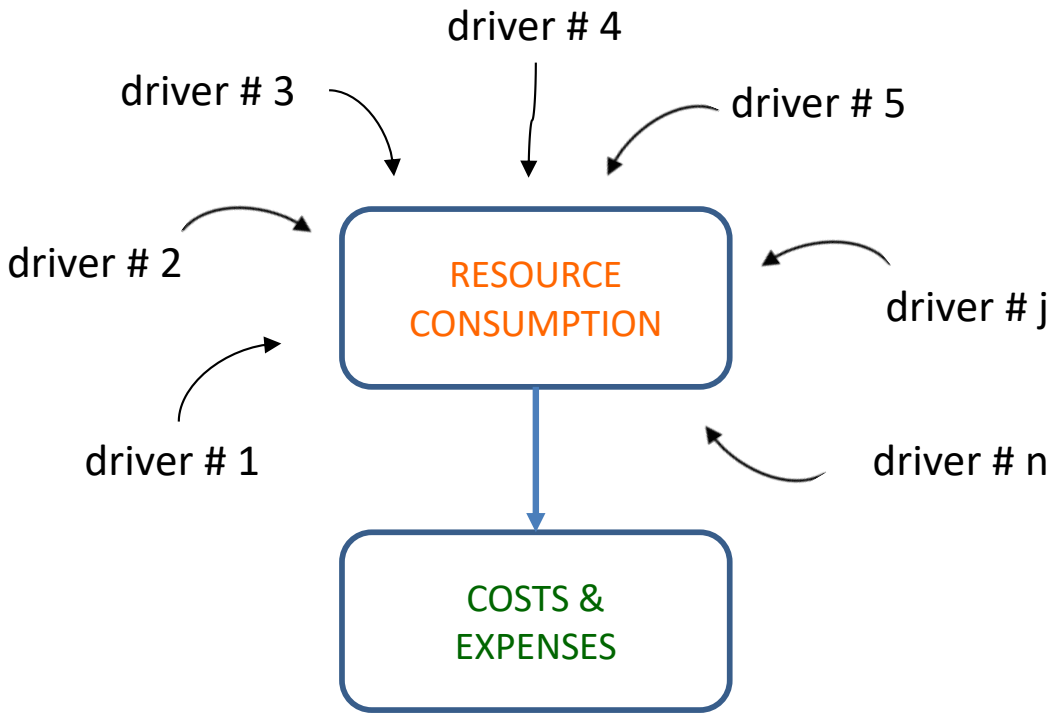


DECISION MODEL (ABSTRACTION)



BUSINESS PROCESSES (REALITY)

COSTS, RESOURCES AND DRIVERS

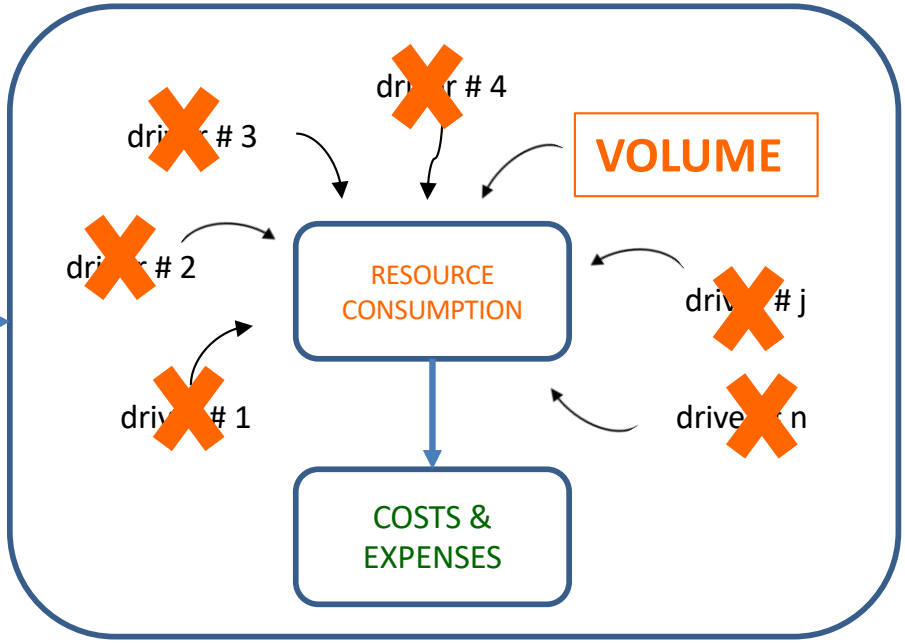


A **cost** is a sacrifice of resources. More precisely the cost (and therefore an expense) is **the monetary reflection** of the **sacrifice of one or more resources** that are used in order to perform business processes. The **usage** of a resource is determined by different kinds of causes (generally indicated in accounting as drivers)

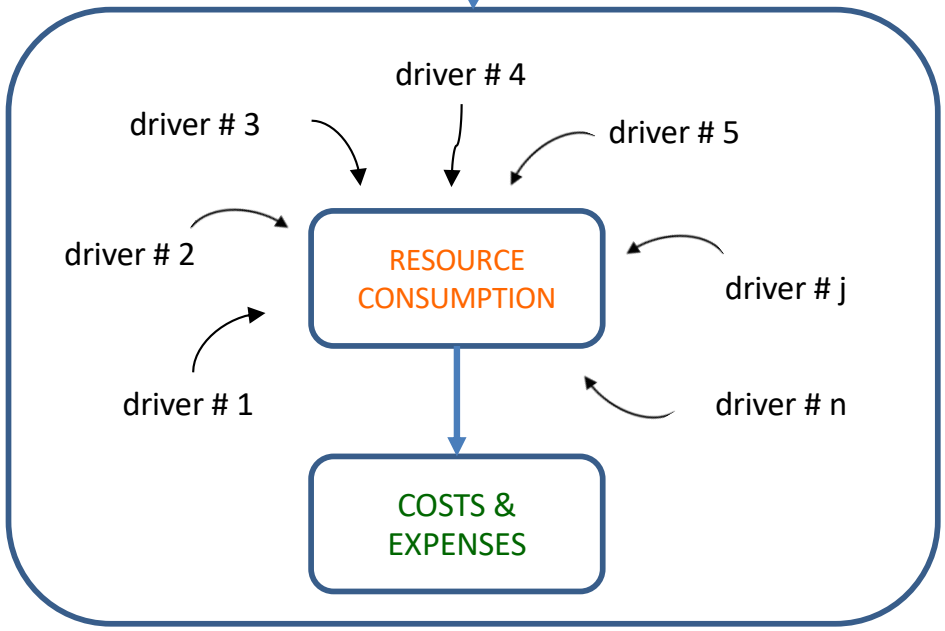
«The objective of managerial **costing** is to provide a **monetary reflection** of the **utilization** of business **resources** and related cause and effect insights».

COST-VOLUME-PROFIT MODEL

SELECTED CONCEPTS AND SELECTED RELATIONSHIPS BETWEEN THEM



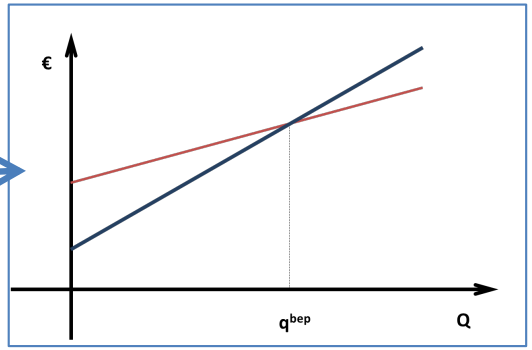
DECISION MODEL



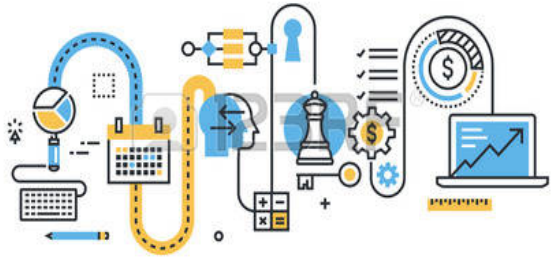
REALITY

DECISION MODELS

SELECTED CONCEPTS AND SELECTED RELATIONSHIPS BETWEEN THEM

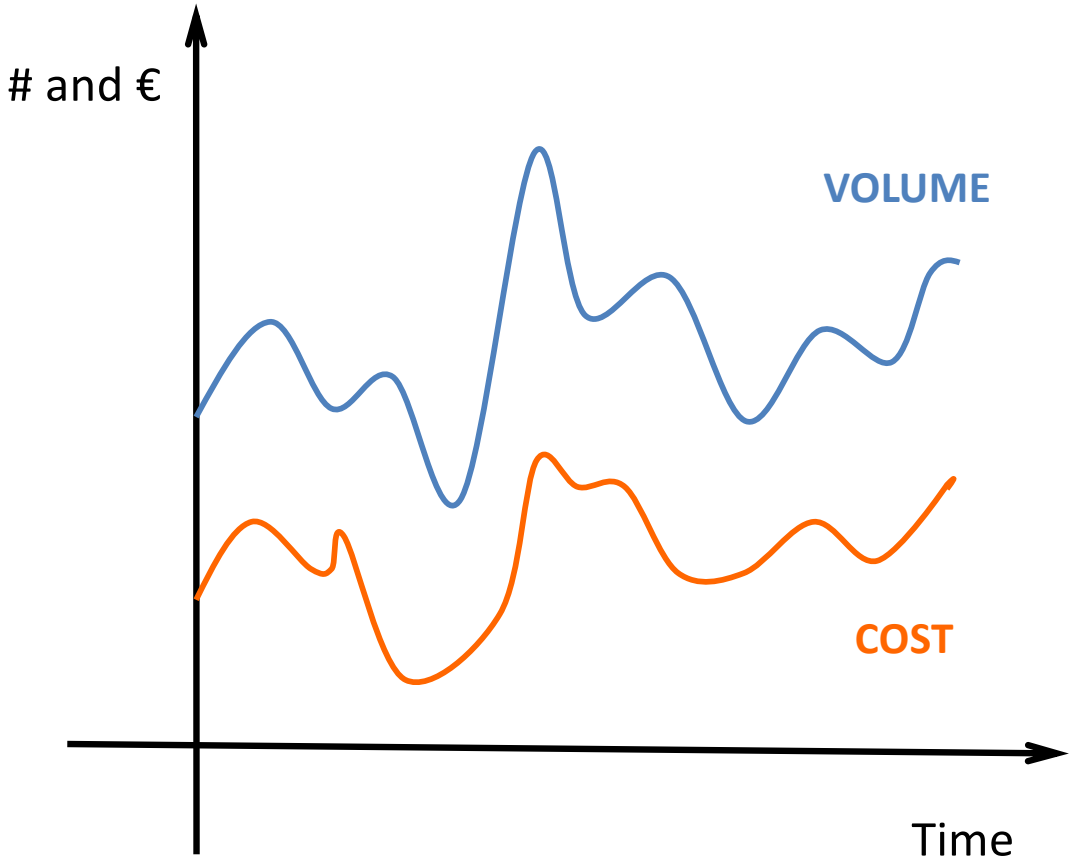


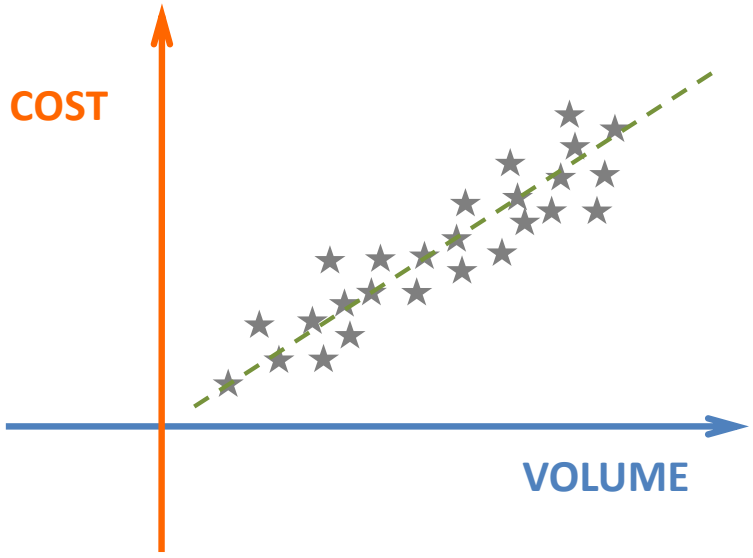
DECISION MODEL (ABSTRACTION)



BUSINESS PROCESSES (REALITY)

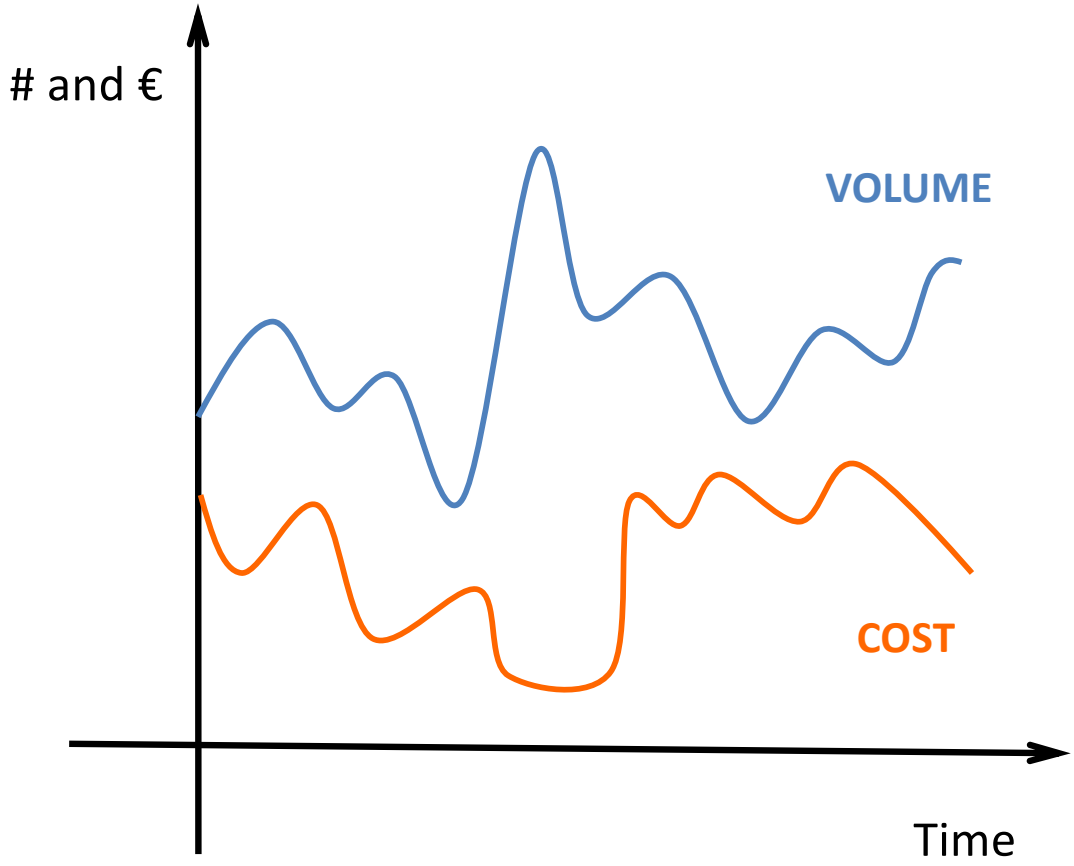
VARIABLE: CORRELATED

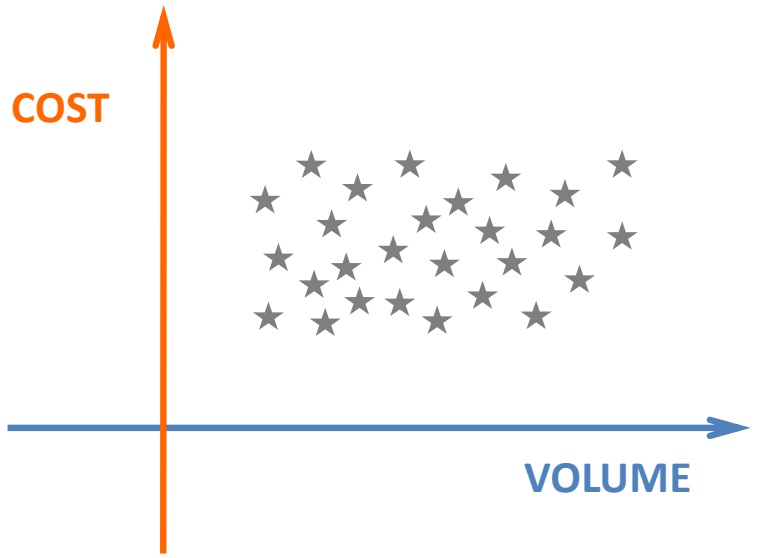




POSITIVE CORRELATION

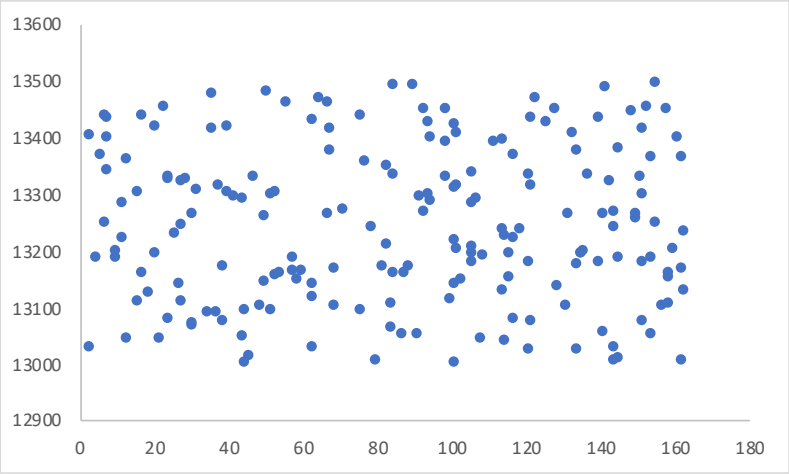
FIXED: UN-CORRELATED

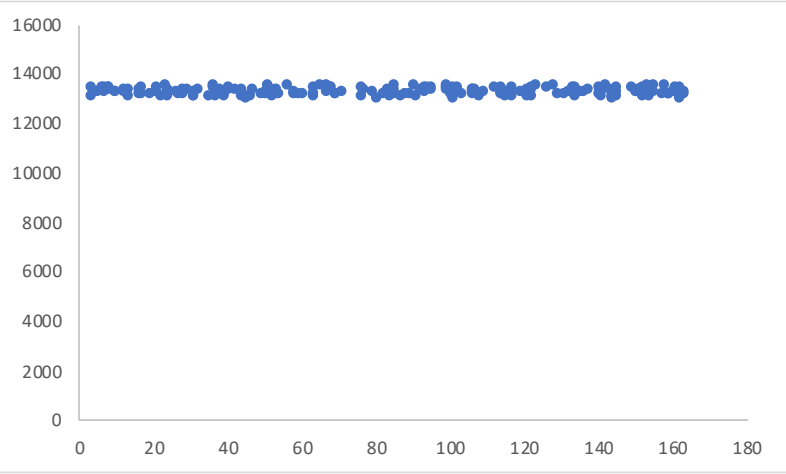




NO CORRELATION

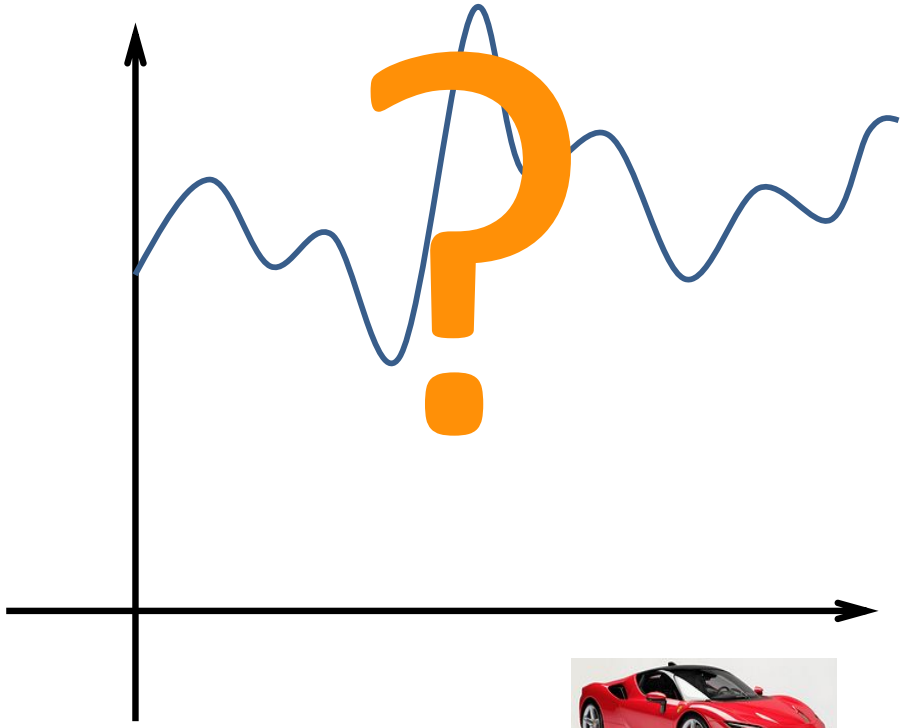
UNCORRELATED BUT NORMALLY QUITE STABLE (IN THE SHORT TERM)





If nothing 'structural' changes (in particular, if there are no changes in production capacity or significant changes in prices), we can assume that the amount of fixed costs, while varying, remains sufficiently stable. This, of course, is hardly true in the long run precisely because in the long run structural changes are inevitable. In particular, production capacity will hopefully have to grow in order to follow the evolution of sales volumes. In the long run, therefore, all costs are variable.

REVENUES FROM TRADEMARK USE (ROYALTIES)

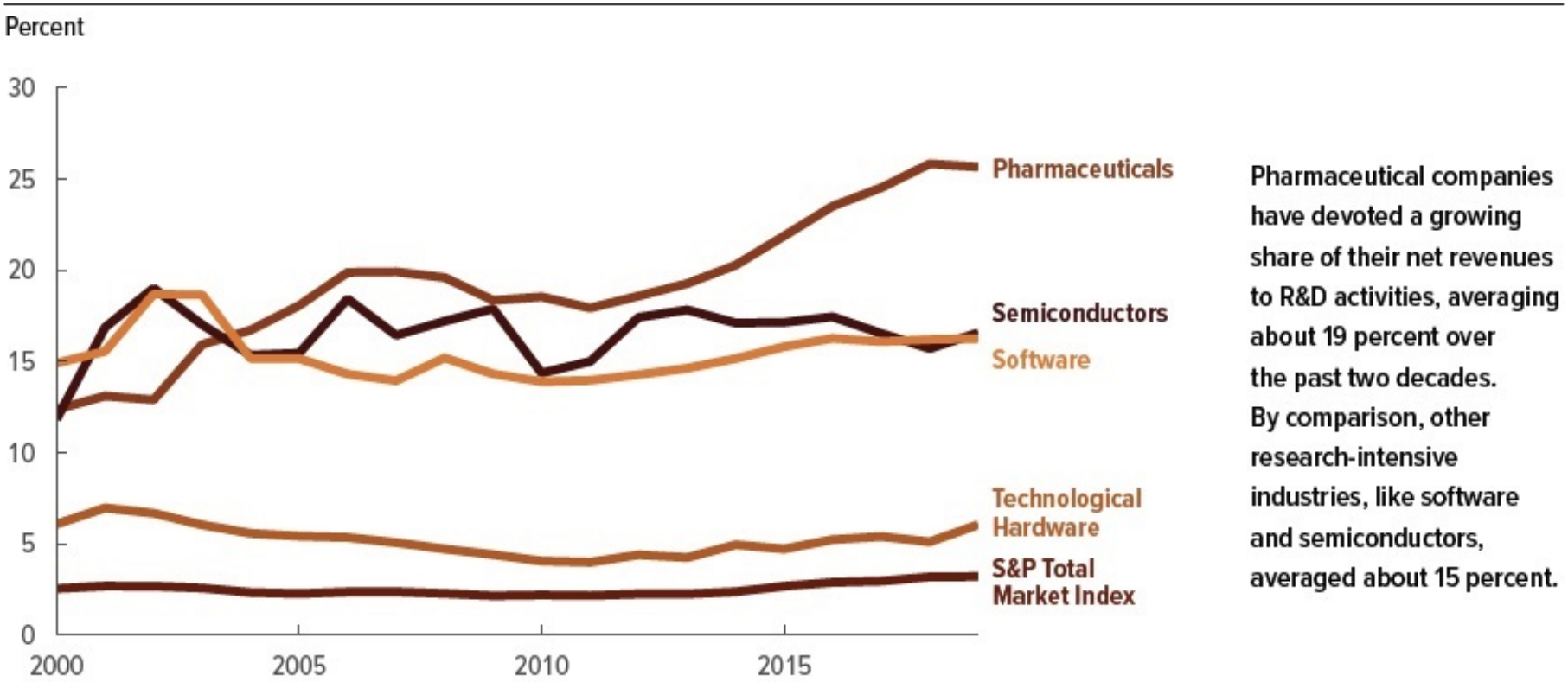


A royalty is a legally binding payment made to an individual or company for the ongoing use of their assets, including copyrighted works, franchises, and natural resources.

ARE R&D EXPENSES VARIABLE?

Figure 1.

Average R&D Intensities for Publicly Traded U.S. Companies, by Industry



Data source: Congressional Budget Office, using data from Bloomberg, limited to U.S. firms as identified by Aswath Damodaran, "Data: Breakdown" (accessed January 13, 2020), https://tinyurl.com/yd5hq4t6. See www.cbo.gov/publication/57025#data.

R&D intensity is research and development spending as a share of net revenues (sales less expenses and rebates).

R&D = research and development; S&P = Standard and Poor's.

“CORRELATION IS NOT CAUSATION”

KAPLAN FINANCIAL

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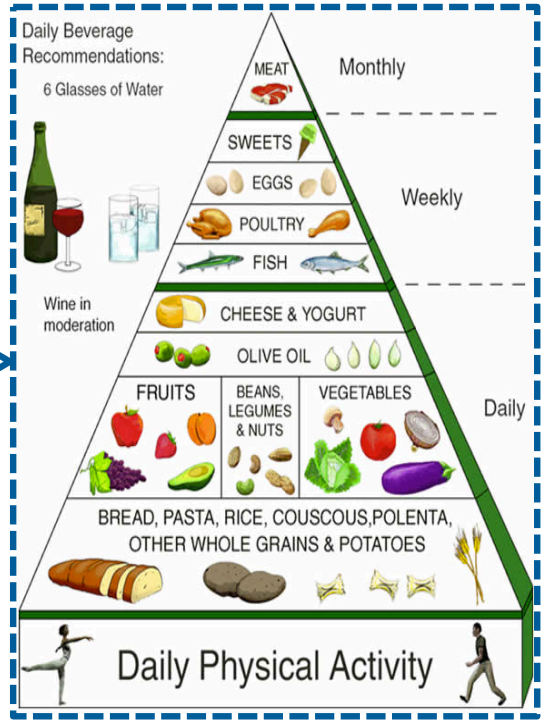
KAPLAN FINANCIAL - SEMINAR COSTS

- ✧Speaker
- ✧Flipchart pads
- ✧Markers
- ✧Binders, notepads, pens
- ✧Auditorium, conference room,
- ✧Coffee, beverages, fruit and snacks
- ✧Computer and Projector
- ✧Energy costs

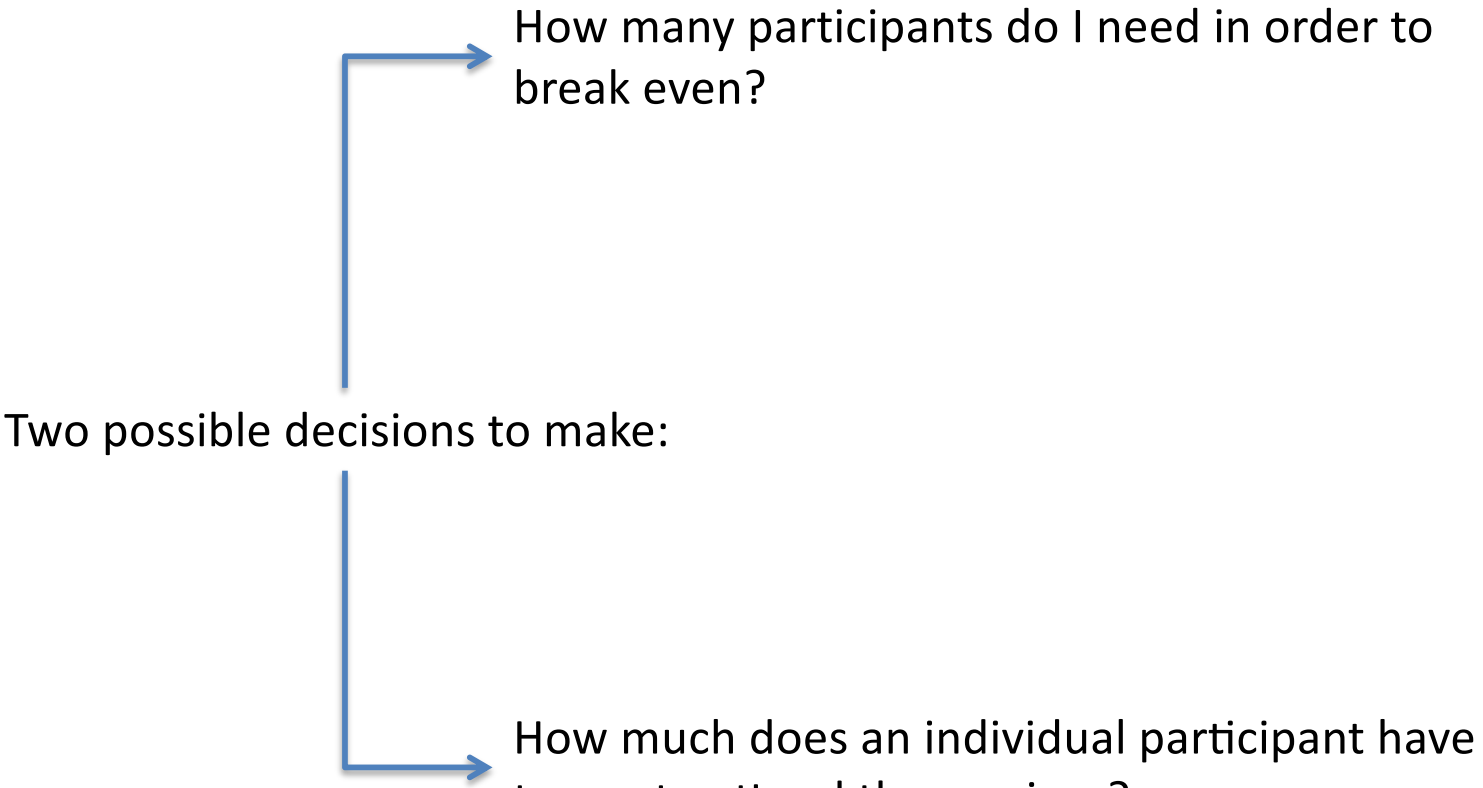
COHERENCE BETWEEN INFORMATION AND DECISIONS



DECISION MODELS

The information must be **RELEVANT** for the decisions that managers, operating in a particular business environment with a particular strategy, make.

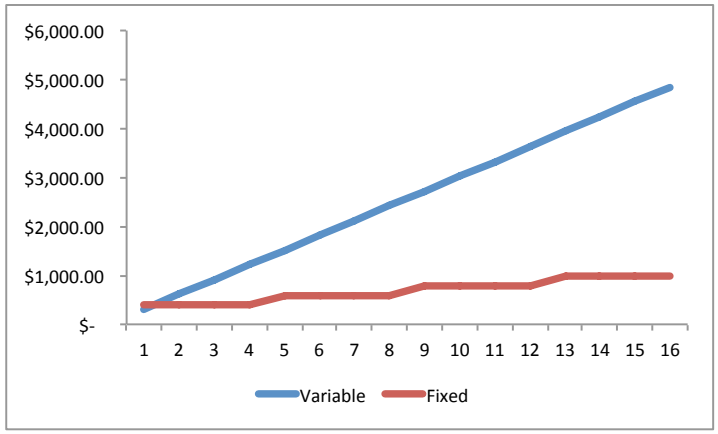
KAPLAN FINANCIAL - SEMINAR COSTS



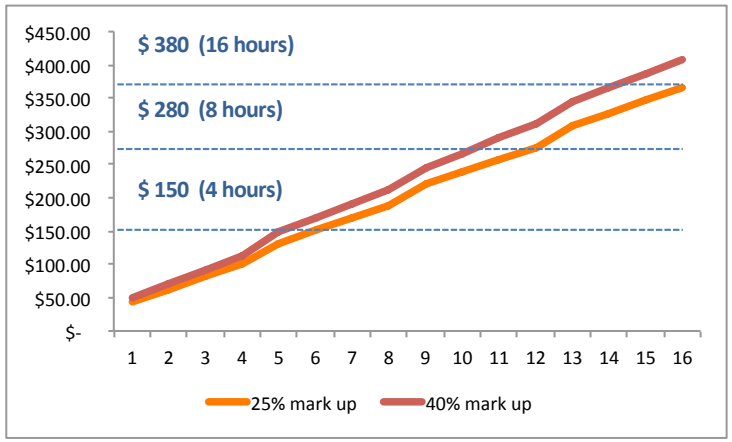
FIXED OR VARIABLE?

	# PARTECIPANTS	# HOURS
Speaker	Fixed	Variable
Flipchart pads	Fixed	Variable
Markers	Fixed	Variable
Binders, notepads, pens	Variable	Fixed/Variable
Auditorium, conference room,	Fixed	Variable
Coffee, beverages, fruit and snacks	Variable	Fixed/Variable
Computer and Projector	Fixed	Variable
Energy costs	Fixed/Variable	Variable

HOW MUCH DOES AN INDIVIDUAL PARTICIPANT HAVE TO PAY?



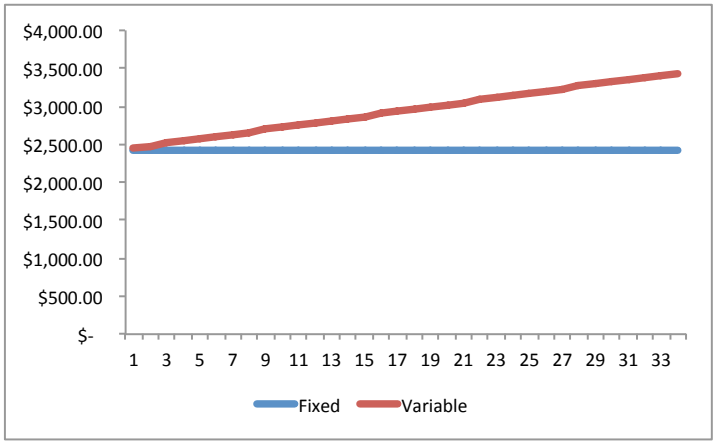
Target number of participants: **20**



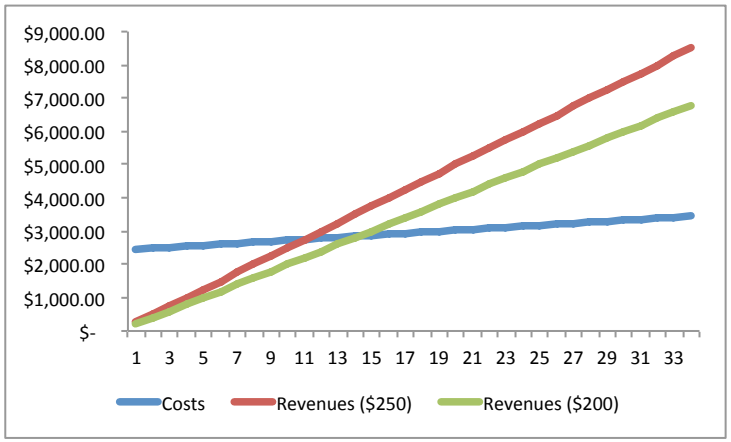
Analysis of cost behavior using "number of hours" as a parameter

Comparison with competitors' prices for different "formats"

HOW MANY PARTICIPANTS DO I NEED IN ORDER TO BREAK EVEN?

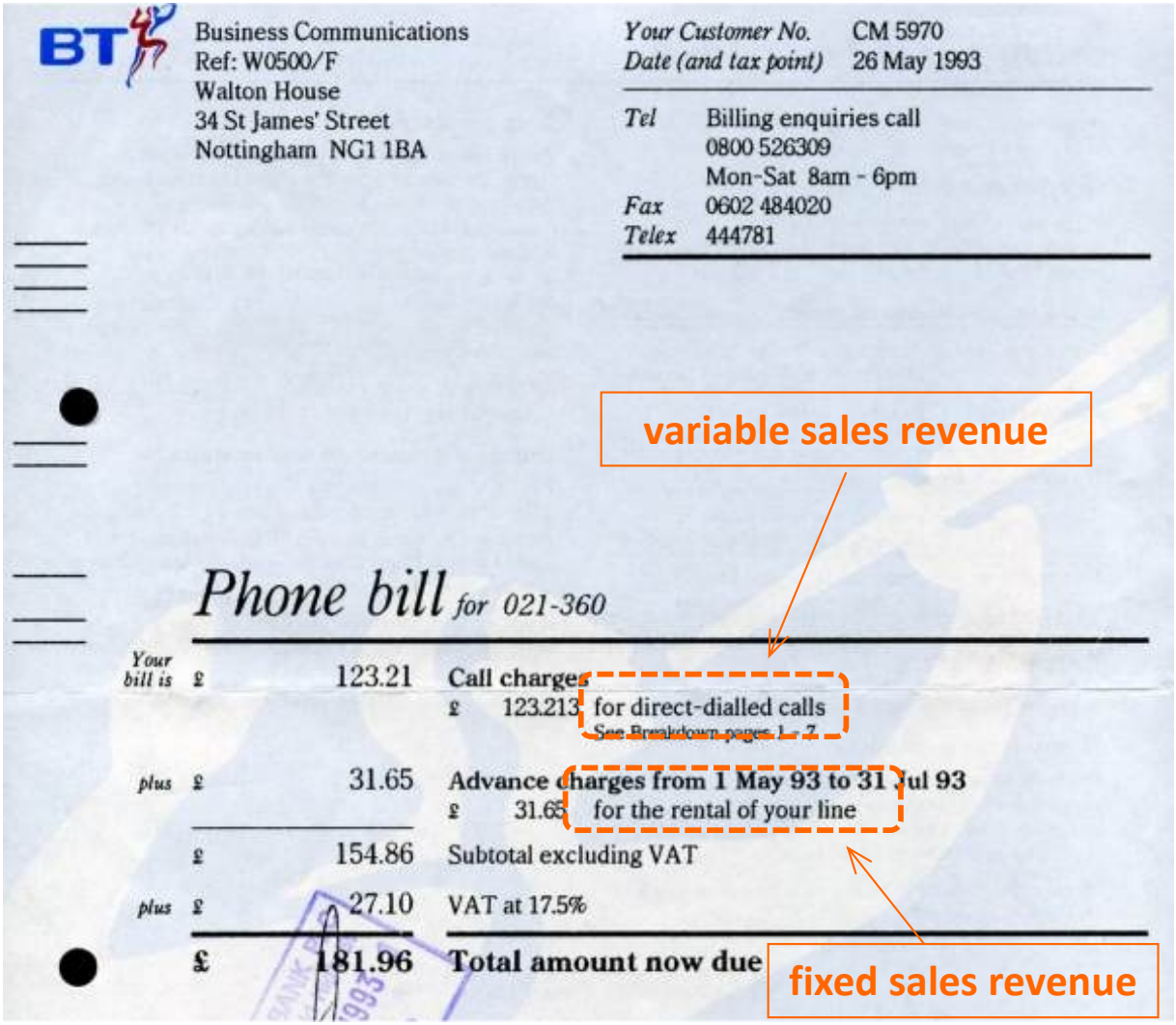


Analysis of cost behavior using “number of participants ” as a parameter



Break even point in term of number of participants needed

TELECOM SERVICE PROVIDERS: ORIGINALLY



BT

Business Communications
Ref: W0500/F
Walton House
34 St James' Street
Nottingham NG1 1BA

Your Customer No. CM 5970
Date (and tax point) 26 May 1993

Tel Billing enquiries call 0800 526309 Mon-Sat 8am - 6pm
Fax 0602 484020
Telex 444781

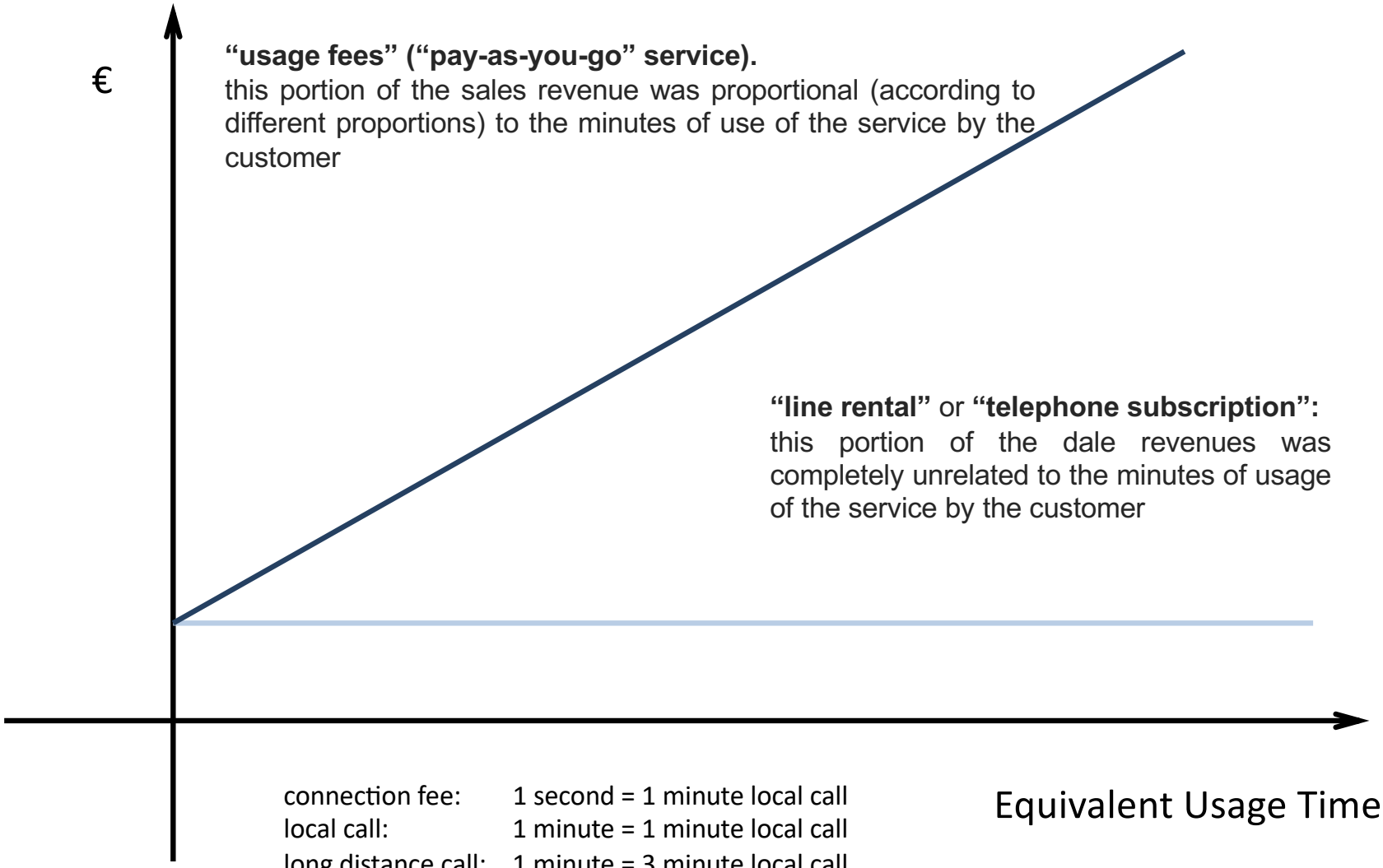
variable sales revenue

Phone bill *for 021-360*

Your bill is	£	123.21	**Call charges**
	£	123.213	for direct-dialled calls
			See Breakdown pages 1 – 7
plus	£	31.65	**Advance charges from 1 May 93 to 31 Jul 93**
	£	31.65	for the rental of your line
	£	154.86	Subtotal excluding VAT
plus	£	27.10	VAT at 17.5%
	£	**181.96**	**Total amount now due**

fixed sales revenue

TELECOM SERVICE PROVIDERS: ORIGINALLY



TELECOM SERVICE PROVIDERS: NOW

att.com

JOHN G DOE
123 ANY STREET
DULUTH GA 30097-1234

Page 1 of 2
Account Number 678 123-1234 545 1889
Billing Date Mar 05, 2010

Web Site att.com

at&t

Monthly Statement

Bill-At-A-Glance

Previous Bill	29.05
Payment Received 2-11 Thank You!	29.05CR
Adjustments	.00
Balance	.00
Current Charges	29.05
Total Amount Due	**$29.05**
Amount Due in Full by	**Mar 27, 2010**

Billing Summary

Questions? Visit att.com	**Page**	
Plans and Services	1	29.05
1 888-757-6500		
PIN: 9999		
Repair Service:		
611		
Total Current Charges		**29.05**

AT&T Benefits

- Smarter TV. Better value. AT&T U-versež .

There has never been a better time to get AT&T U-versež . Now you can get incredible channels and features at a better value than cable. Plus, you can take advantage of some of our best offers ever. Geographic and service restrictions apply. Call 1.866.291.2278 or go online at att.com/uversenow today!

Plans and Services

Monthly Service - Mar 5 thru Apr 4

1. Residential Line	17.55

Surcharges and Other Fees

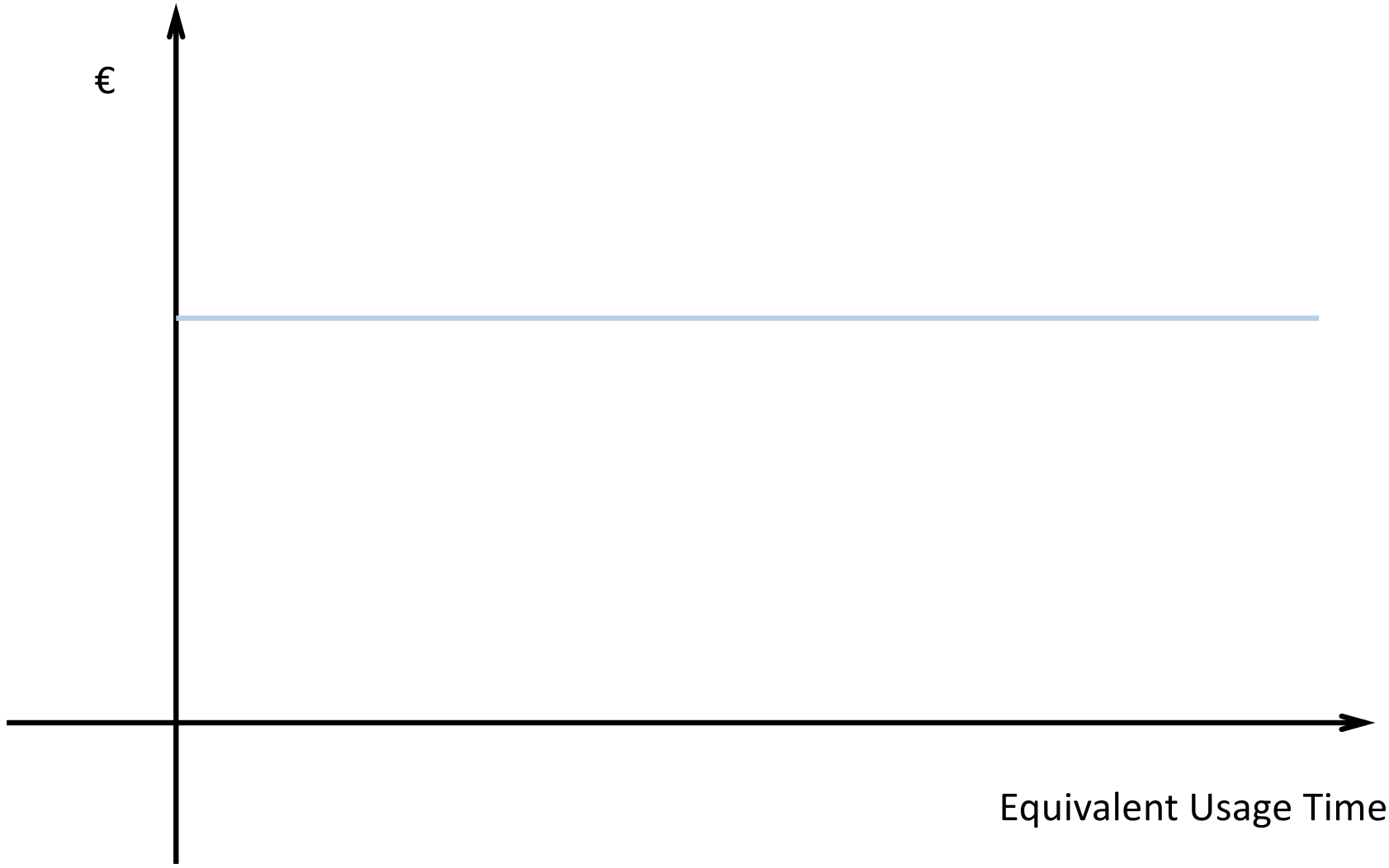
Item No.	Description	Quantity	
2.	Federal Universal Service Fee	1	.91
3.	Federal Subscriber Line Charge	1	6.50
Total Surcharges and Other Fees			**7.41**

Government Fees and Taxes

Item No.	Description	Quantity	
4.	Federal Excise Tax		.74
5.	GA - State/Local Tax		1.27
6.	GA-Johns Creek Franchise Fee		.53
7.	Telecommunication Relay Svc Fund	1	.05
8.	Emergency 911 - Johnscreek	1	1.50
Total Government Fees and Taxes			**4.09**

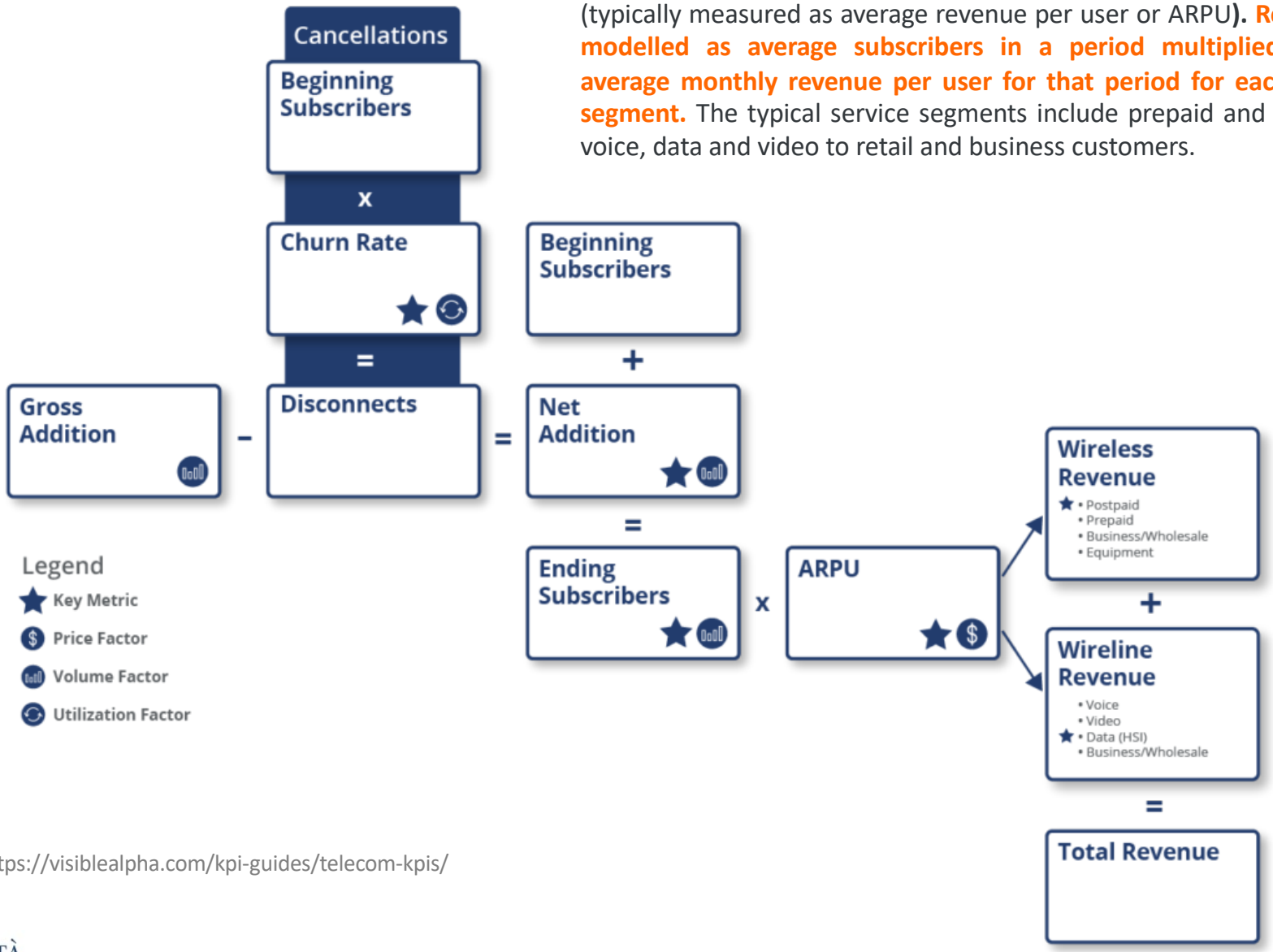
Total Plans and Services **29.05**

TELECOM SERVICE PROVIDERS: NOW



TELECOM SERVICE PROVIDERS: NEW BUSINESS MODEL

A TSP's primary business model is driven by the volume of their subscribers and the price they charge for the services rendered (typically measured as average revenue per user or ARPU**). Revenue is modelled as average subscribers in a period multiplied by the average monthly revenue per user for that period for each service segment.** The typical service segments include prepaid and post-paid voice, data and video to retail and business customers.

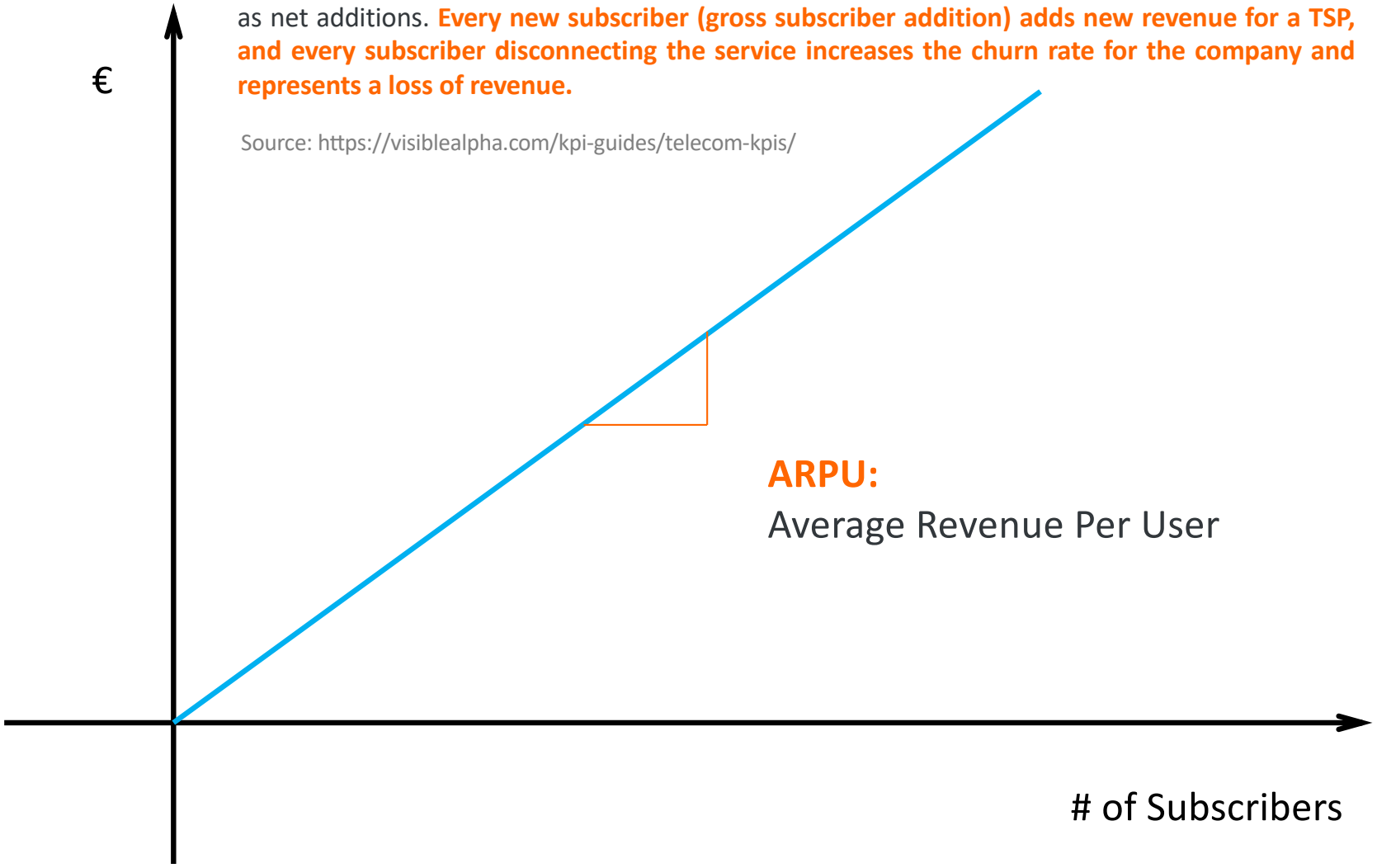


Source: https://visiblealpha.com/kpi-guides/telecom-kpis/

TELECOM SERVICE PROVIDERS: NOW

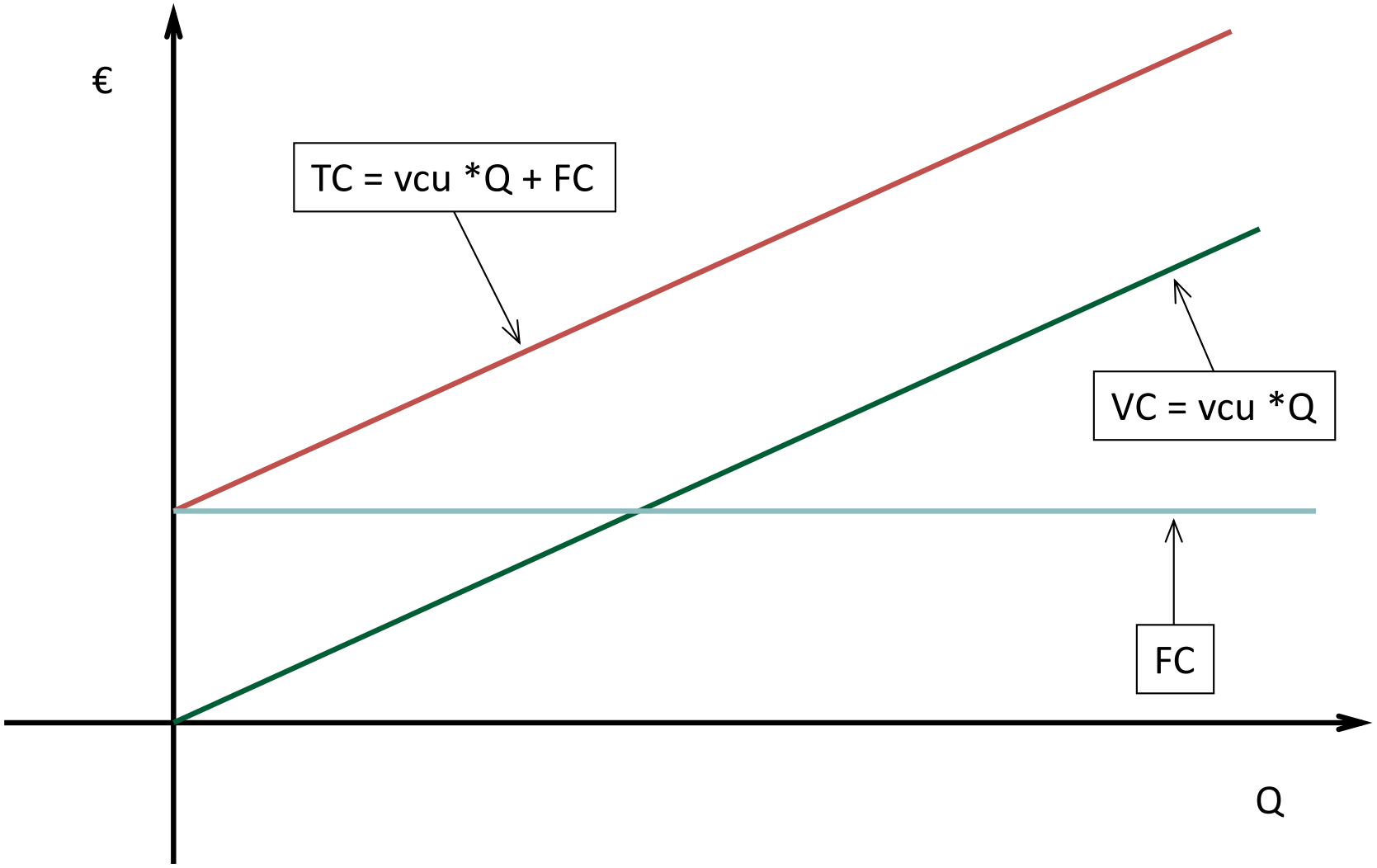
As a customer-facing business, **one of the key metrics tracked by investors for TSPs is ending subscribers.** Increases and decreases in subscribers are also closely monitored and are identified as net additions. **Every new subscriber (gross subscriber addition) adds new revenue for a TSP, and every subscriber disconnecting the service increases the churn rate for the company and represents a loss of revenue.**

Source: https://visiblealpha.com/kpi-guides/telecom-kpis/



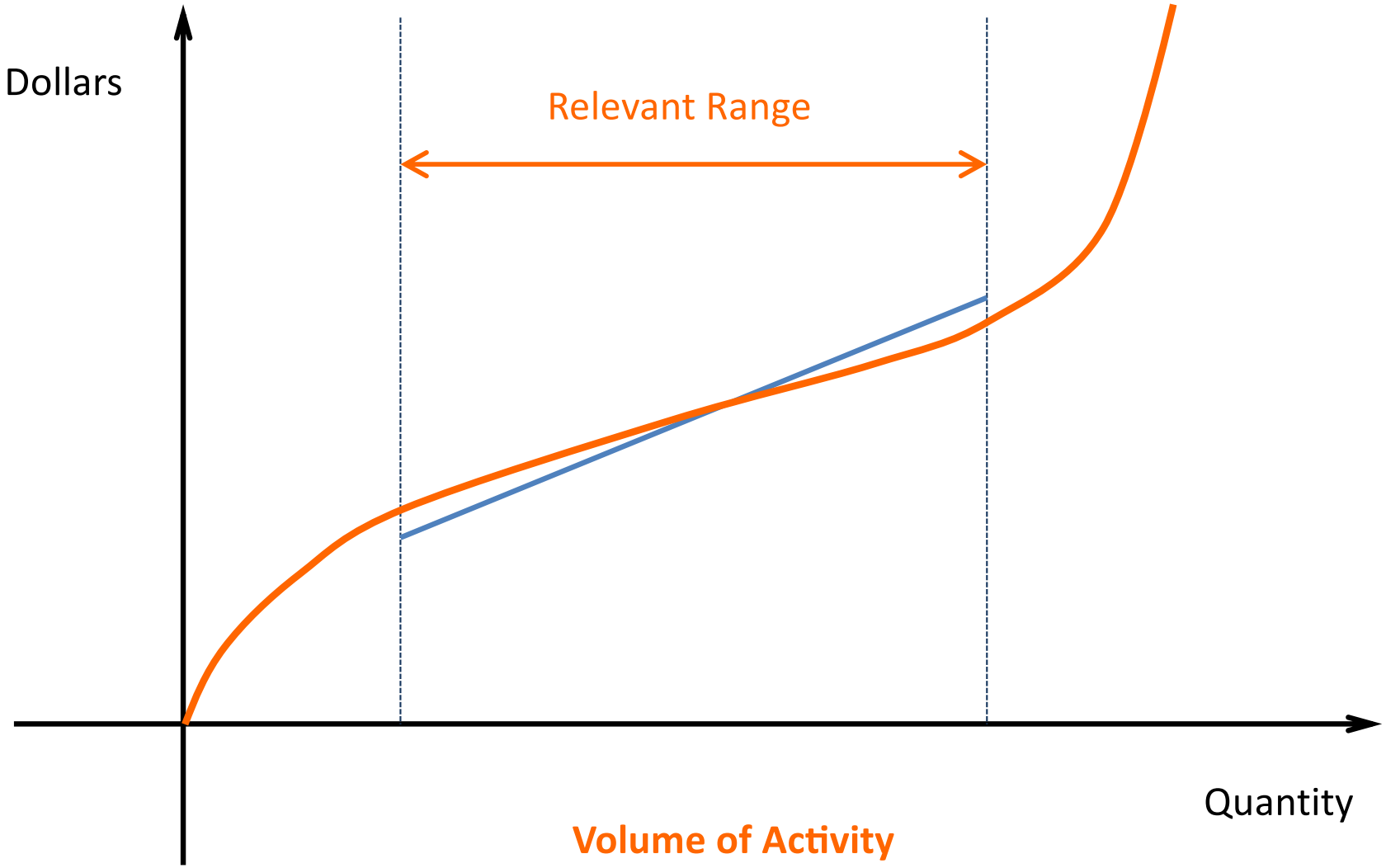
ARPU:
Average Revenue Per User

VARIABLE AND FIXED COSTS IN GRAPHIC FORM



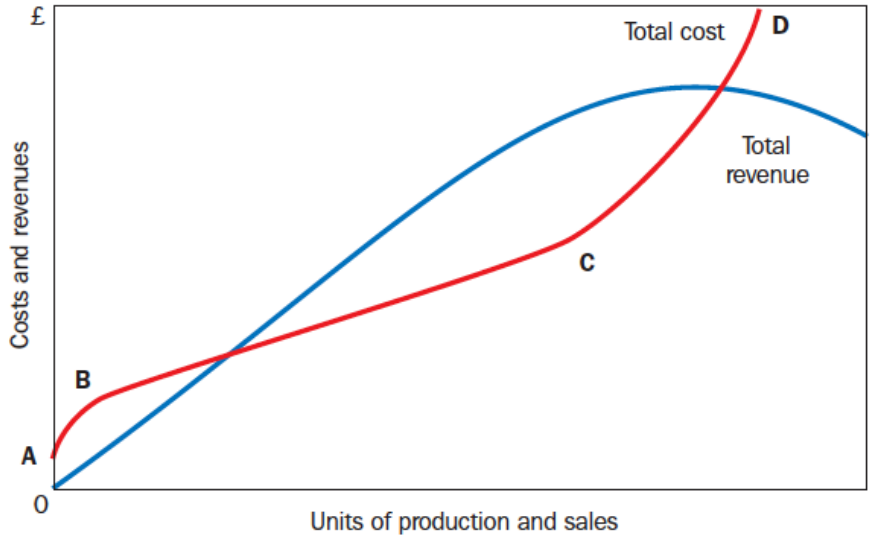
RELEVANT RANGE

Economists correctly point out that many costs that the accountant classifies as variable actually behave in a *curvilinear* fashion.

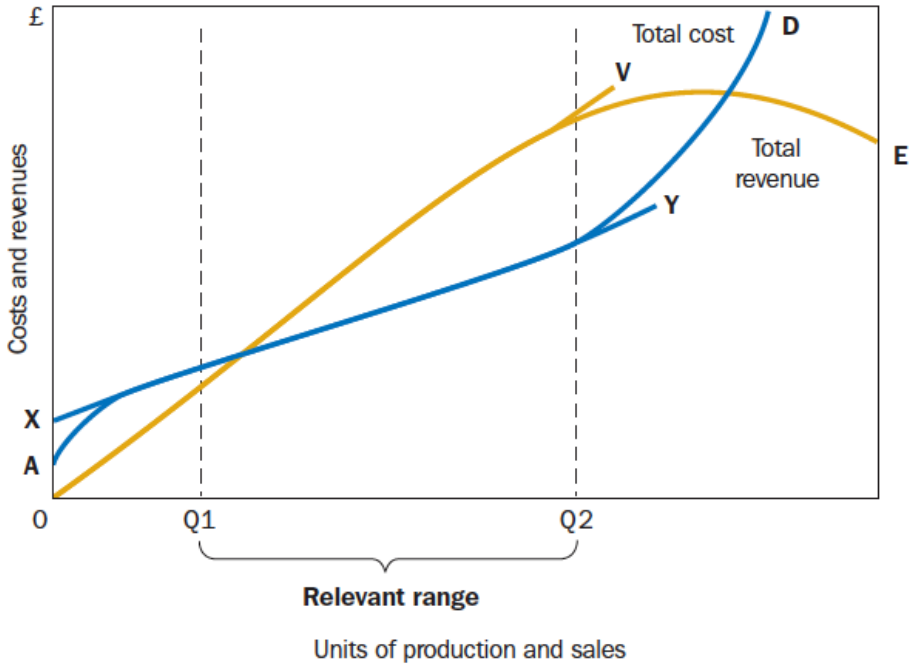


RELEVANT RANGE

ECONOMIST'S VIEW



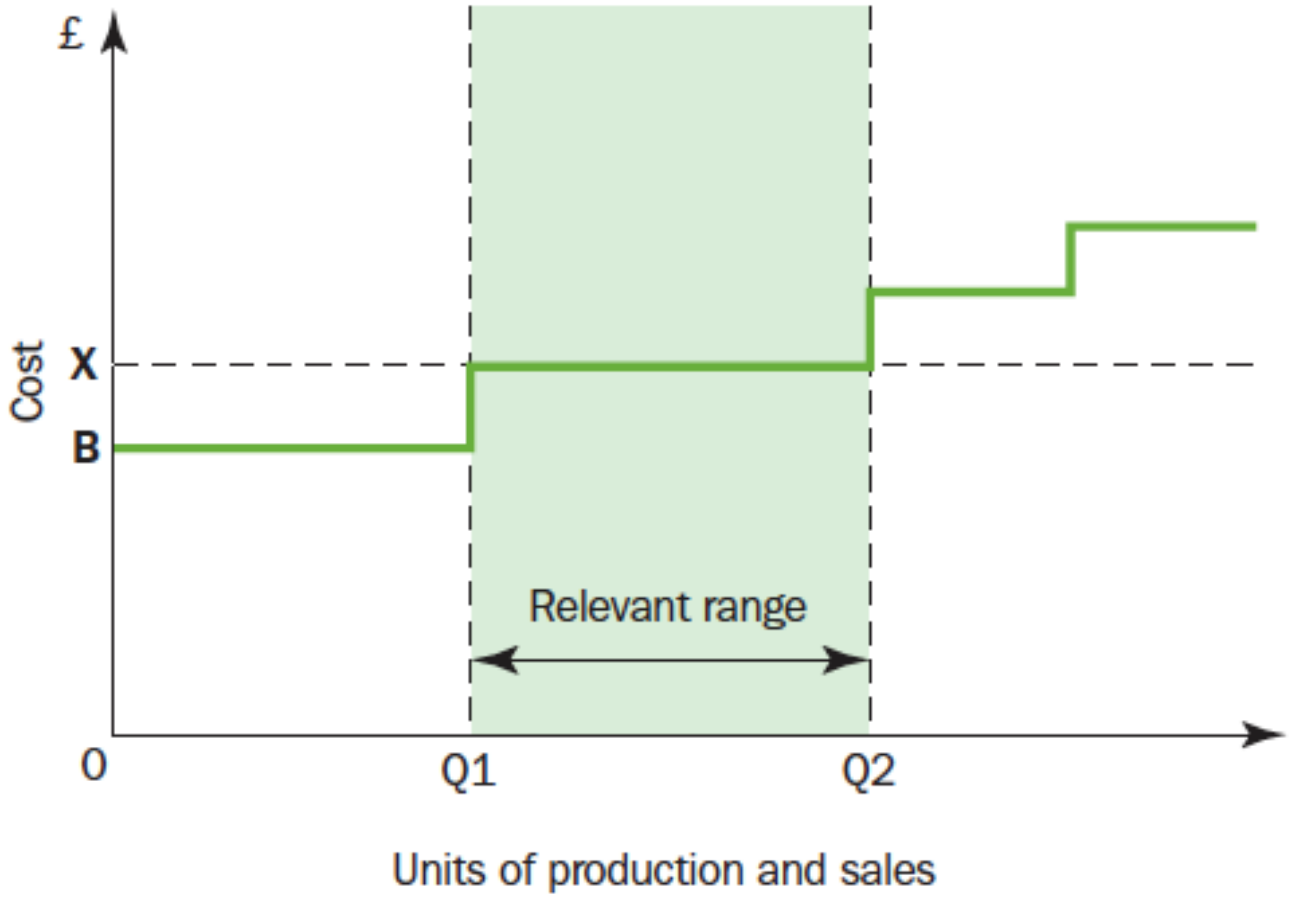
ACCOUNTANTS'S VIEW



«Linear relationships are not intended to provide an accurate representation of total cost and total revenue throughout all ranges of output. The objective is to represent the behaviour of total cost and revenue over the range of output at which a firm expects to be operating within a short-term planning horizon. […] The term relevant range is used to refer to the output range at which the firm expects to be operating within a short-term planning horizon. This relevant range also broadly represents the output levels that the firm has had experience of operating in the past and for which cost information is available.
[Within the relevant range] the cost and revenue relationships are more or less linear. It would be unwise, however, to make this assumption for output levels outside the relevant range. CVP analysis should therefore only be applied within the relevant range. If the relevant range changes, different fixed and variable costs and selling prices must be used».

Source: Colin Drury, "Management and Cost Accounting", eighth edition, Cengage Learning

FIXED COSTS APPLICABLE WITHIN THE RELEVANT RANGE



Source: Colin Drury, "Management and Cost Accounting", eighth edition, Cengage Learning

RELEVANT RANGE

Relevant range is the band of normal activity level or volume in which there is a specific relationship between the level of activity or volume and the cost in question.

For example, a fixed cost is fixed only in relation to a given wide range of total activity or volume (at which the company is expected to operate) and only for a given time span (usually a particular budget period).

Fixed costs may change from one year to the next.

The basic assumption of the relevant range also applies to variable costs. That is, outside the relevant range, variable costs, such as direct materials, may not change proportionately with changes in production volume. For example, above a certain volume, direct material costs may increase at a lower rate because of price discounts on purchases greater than a certain quantity.

COMMITTED FIXED COSTS

Those costs that **can't be significantly reduced even for short periods of time** without making fundamental changes.

Examples include depreciation of buildings and equipment, real estate taxes, insurance expenses, and salaries of top management and operating personnel. Even if operations are interrupted or cut back, committed fixed costs remain largely unchanged in the short term.

During a recession, for example, a company won't usually eliminate key executive positions or sell off key facilities—the basic organizational structure and facilities ordinarily are kept intact.

The costs of restoring them later are likely to be far greater than any short-run savings that might be realized.

SOURCE: Noreen–Brewer– Garrison, "Managerial Accounting for Managers", Second Edition

DISCRETIONARY FIXED COSTS

Often referred to as *managed fixed costs* usually **arise from *annual* decisions by management to spend on certain fixed cost items.**

Examples of discretionary fixed costs include advertising, research, public relations, management development programs, and internships for students.

Two key differences exist between discretionary fixed costs and committed fixed costs.

First, **the planning horizon for a discretionary fixed cost is short term—usually a single year.** By contrast, committed fixed costs have a planning horizon that encompasses many years.

Second, **discretionary fixed costs can be cut for short periods of time with minimal damage to the long-run goals of the organization**. For example, spending on management development programs can be reduced because of poor economic conditions. Although some unfavorable consequences may result from the cutback, it is doubtful that these consequences would be as great as those that would result if the company decided to economize by laying off key personnel.

SOURCE: Noreen–Brewer–Garrison, "Managerial Accounting for Managers", Second Edition

IS LABOR A VARIABLE OR A FIXED COST?

Wages and salaries may be fixed or variable.

The behavior of wage and salary costs will differ from one country to another, depending on labor regulations, labor contracts, and custom.

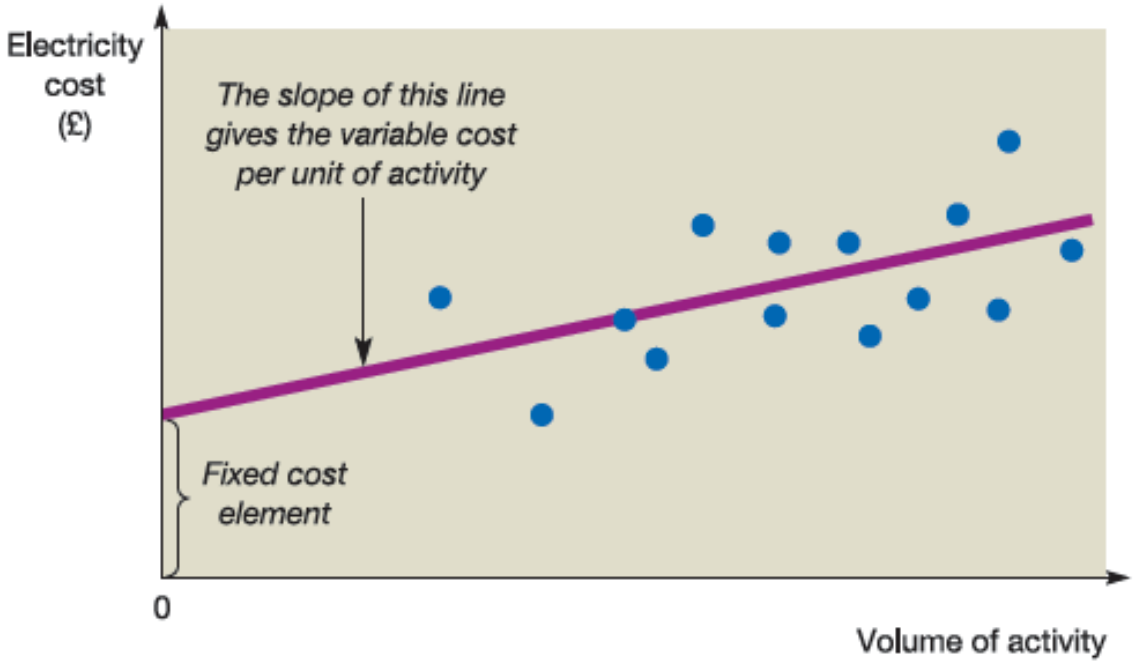
In some countries, such as Italy, France, Germany, and Japan, management has little flexibility in adjusting the labor force to changes in business activity. In countries such as the United States and the United Kingdom, management typically has much greater latitude. However, even in these less restrictive environments, managers may choose to treat employee compensation as a fixed cost for several reasons.

First, many managers are reluctant to decrease their workforce in response to short term declines in sales. These managers realize that the success of their businesses hinges on retaining highly skilled and trained employees. If these valuable workers are laid off, it is unlikely that they would ever return or be easily replaced. Furthermore, laying off workers undermines the morale of those employees who remain.

Second, managers do not want to be caught with a bloated payroll in an economic downturn. Therefore, managers are reluctant to add employees in response to short-term increases in sales. Instead, more and more companies rely on temporary and part-time workers to take up the slack when their permanent, full-time employees are unable to handle all of the demand for their products and services. In such companies, labor costs are a complex mixture of fixed and variable costs.

ESTIMATING SEMI-FIXED (SEMI-VARIABLE) COST

Figure 3.4 Graph of electricity cost against the volume of activity



Here the electricity bill for a time period (for example, three months) is plotted against the volume of activity for that same period. This is done for a series of periods. A line is then drawn that best 'fits' the various points on the graph. From this line we can then deduce both the cost at zero activity (the fixed element) and the slope of the line (the variable element).

Source: Peter Atrill and Eddie McLaney, "Management accounting for decision makers, 6th edition, FT Prentice Hall

VARIABLE AND FIXED REVENUES

There are two basic types of cost-behavior patterns that could be found in accounting systems.

A variable revenue is a cost that varies, in total, in direct proportion to changes in the level of activity.

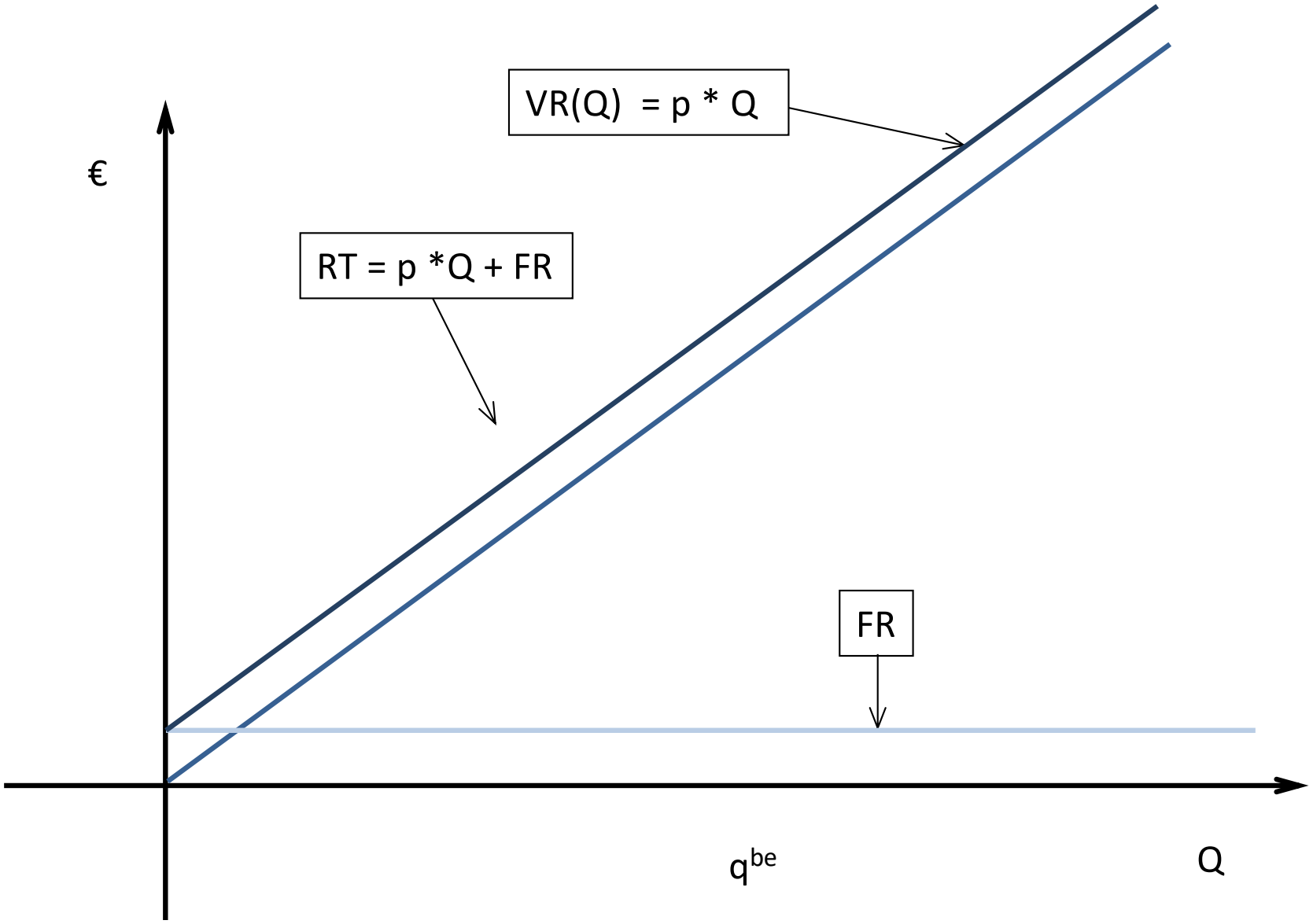
A fixed revenue is a revenue that remains constant, in total, regardless of changes in the level of activity. Unlike variable revenue, fixed revenue are therefore not affected by changes in the parameter used to measure the activity performed.

The amount of other operating income or sundry income (rent revenues, late fees, profits on the sales of minor assets or foreign exchange gains) generally is not linked to the level of units sold.

Total Operating Revenues = Variable Costs + Fixed Costs

$$TR = VR(Q) + FR$$

VARIABLE AND FIXED REVENUES IN GRAPHIC FORM



COST-VOLUME-PROFIT ANALYSIS

Cost-volume-profit (CVP) analysis is a powerful tool that helps managers understand the relationships behavior and relationship among total revenues, total costs, and income as changes occur in the level of the "activity performed" (volume).

Operating Income = Total Operating Revenues – Total Operating Costs

OI = TR –TC

Cost-volume-profit analysis focuses on how profits are affected by the following five factors:

1. Selling prices.
2. Sales volume.
3. Unit variable costs.
4. Total fixed costs revenue.
5. Total fixed costs revenue.

CVP RELATIONSHIPS IN EQUATION FORM

Operating Income = Total Operating Revenues – Total Operating Costs

Total Operating Revenues = Variable Revenues + Fixed Revenues

Variable Revenues = Selling price per unit * Quantity of units sold

Total Operating Expenses = Variable Costs + Fixed Costs

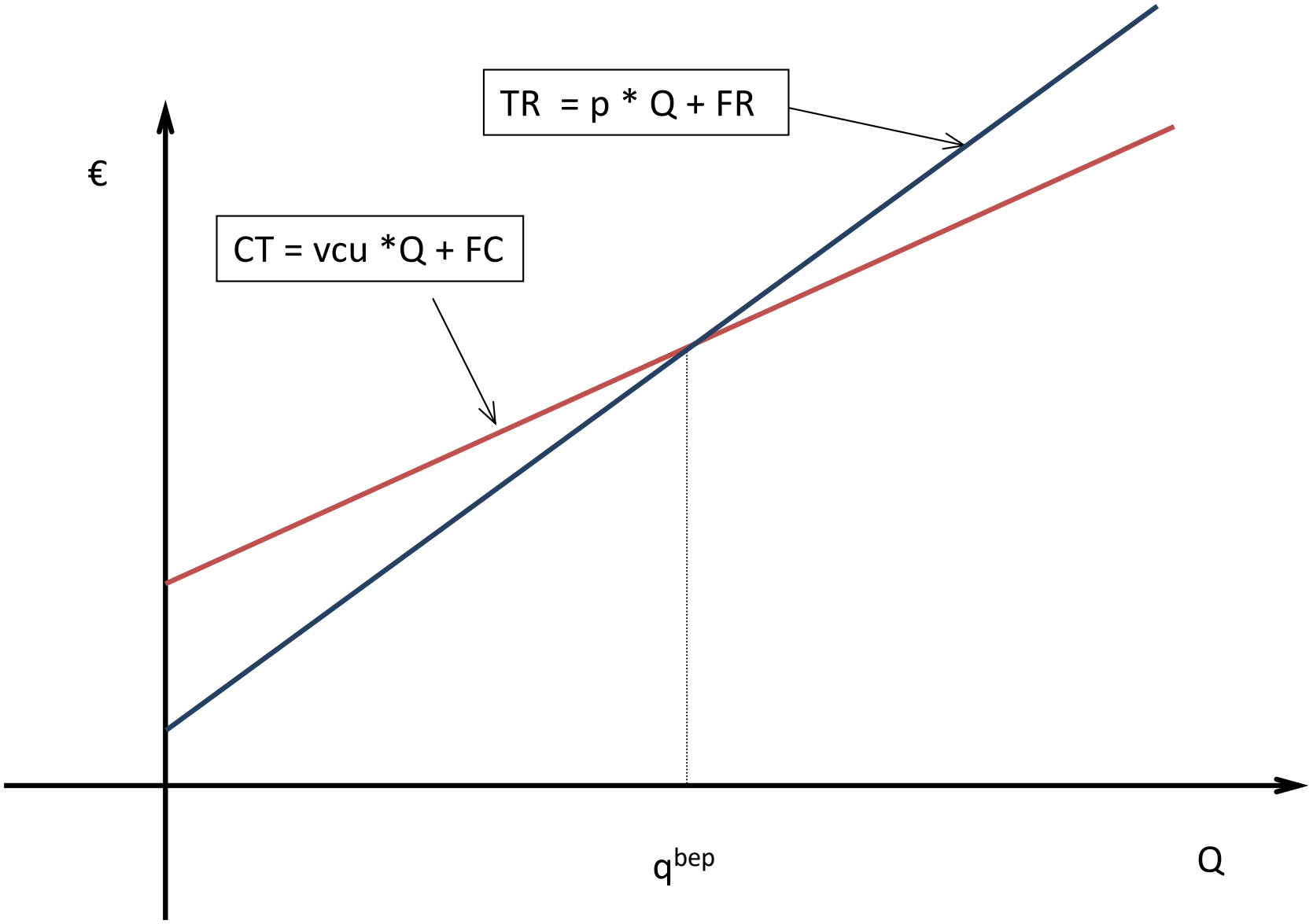
Variable Costs = Variable cost per unit * Quantity of units sold

$$OI = [(p * Q) + FR] – [(vcu * Q) + FC]$$

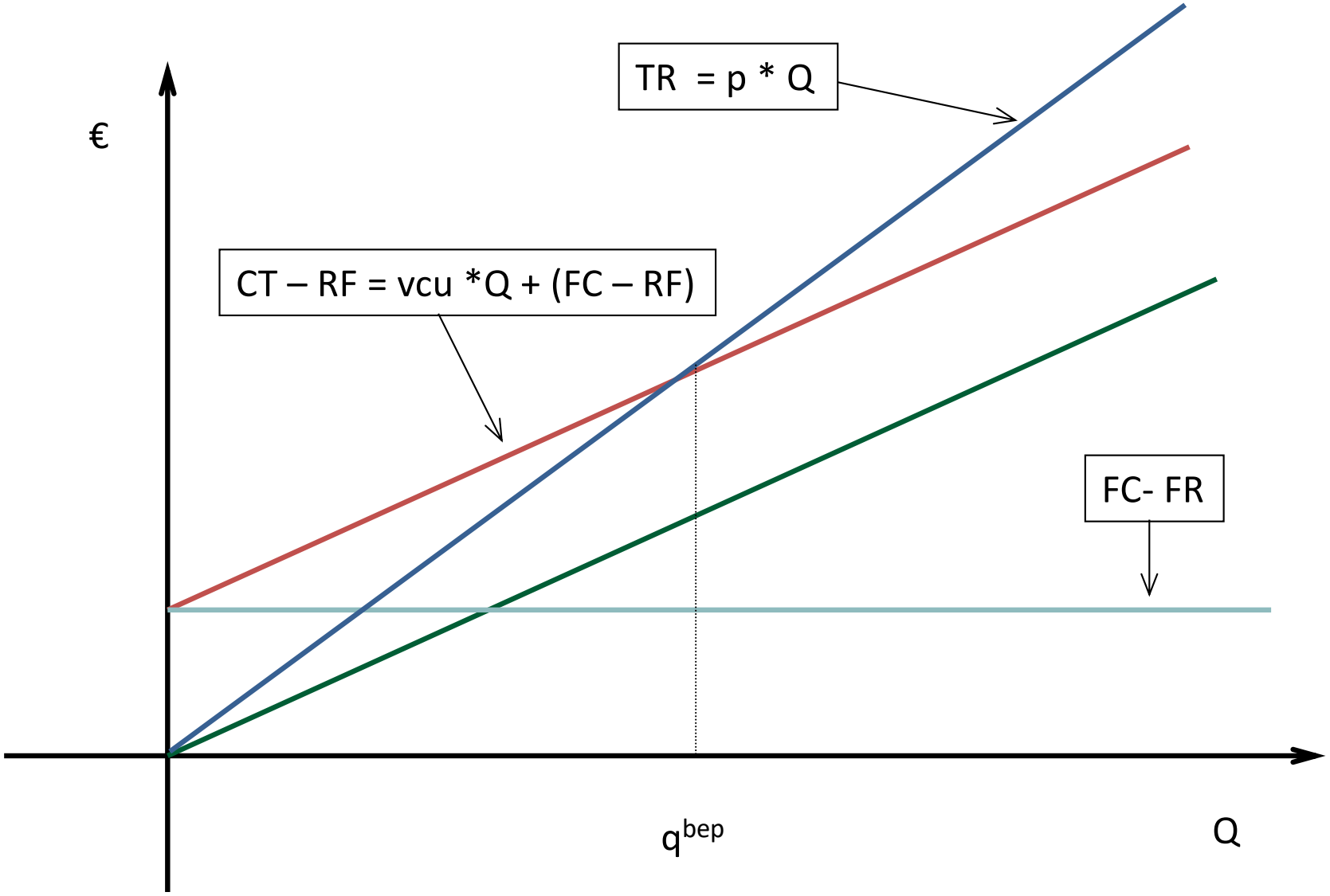
$$= [(p * Q) – (vcu * Q)] – (CF – RF)$$

$$= (p – vcu) * Q - RFC$$

CVP RELATIONSHIPS IN GRAPHIC FORM (1)



CVP RELATIONSHIPS IN GRAPHIC FORM (2)



CONTRIBUTION MARGINS & CONTRIBUTION MARGIN PER UNIT

The difference between total variable revenues and total variable costs is called contribution margin. That is,

Contribution margin = Total variable revenues - Total variable costs

Contribution margin indicates why operating income changes as the number of units sold changes.

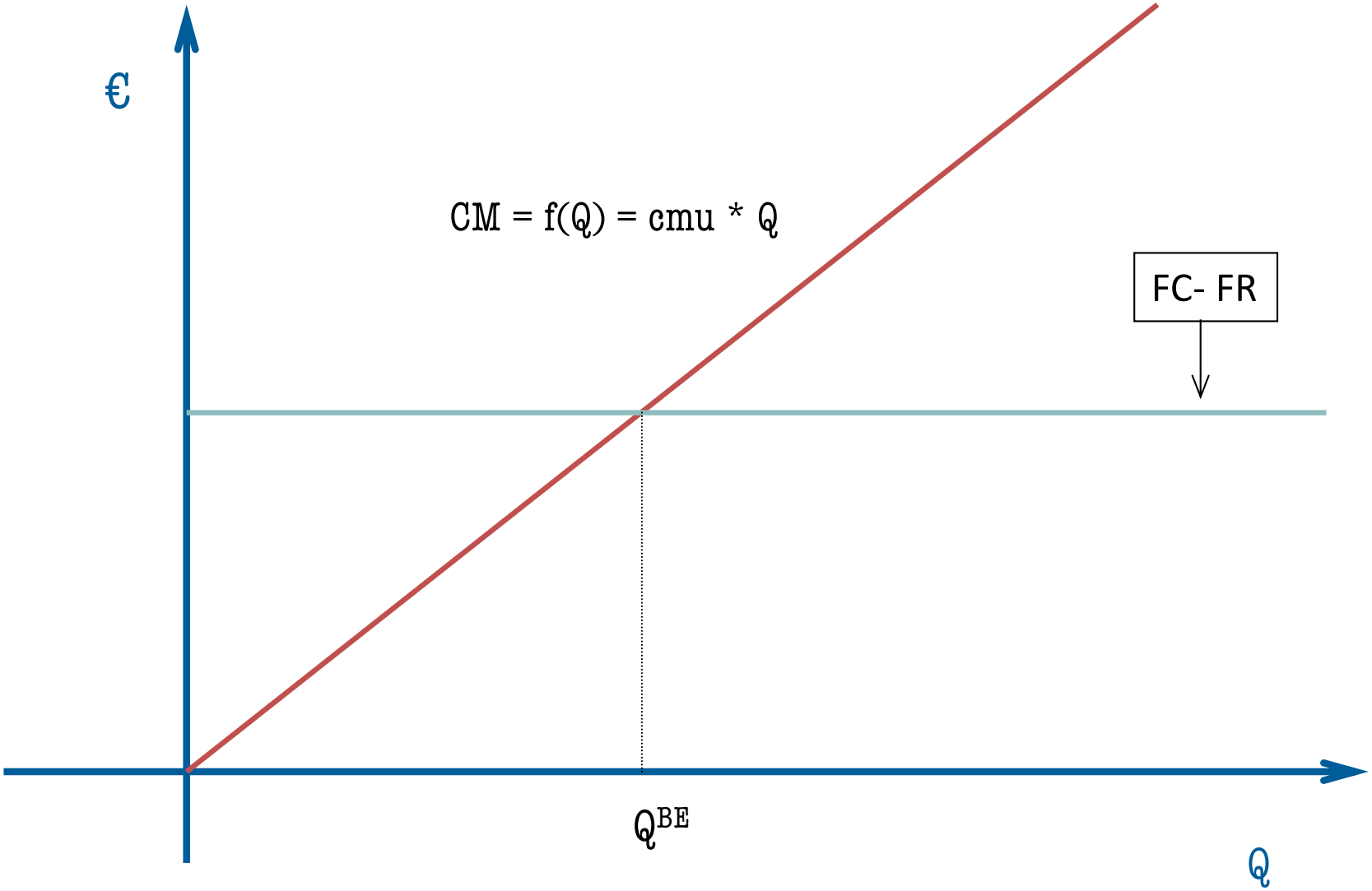
Contribution margin per unit is a useful tool for calculating contribution margin and operating income. It is defined as,

Contribution margin per unit = Selling price - Variable cost per unit

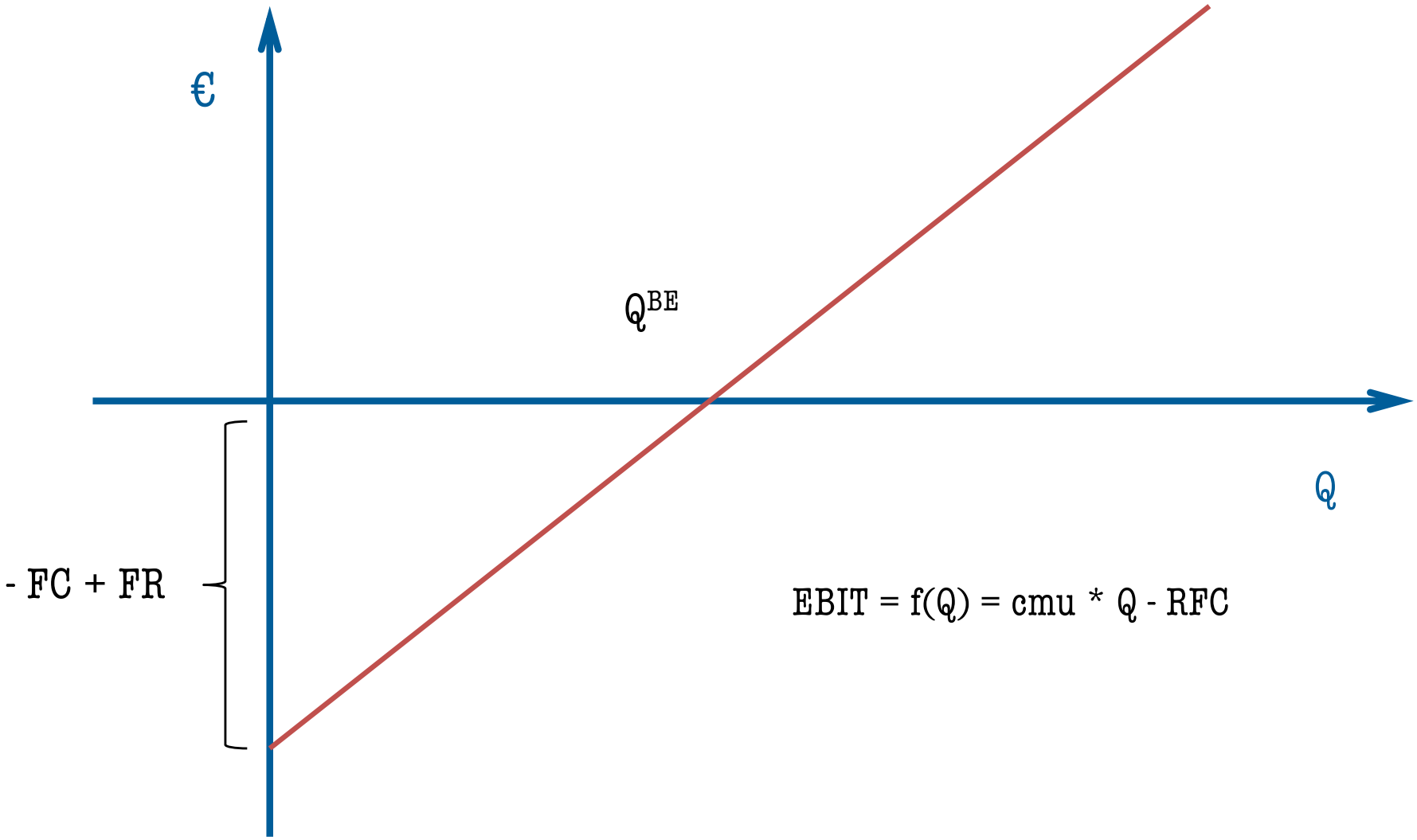
Contribution margin per unit provides a second way to calculate contribution margin:

Contribution margin = Contribution margin per unit * Number of units sold

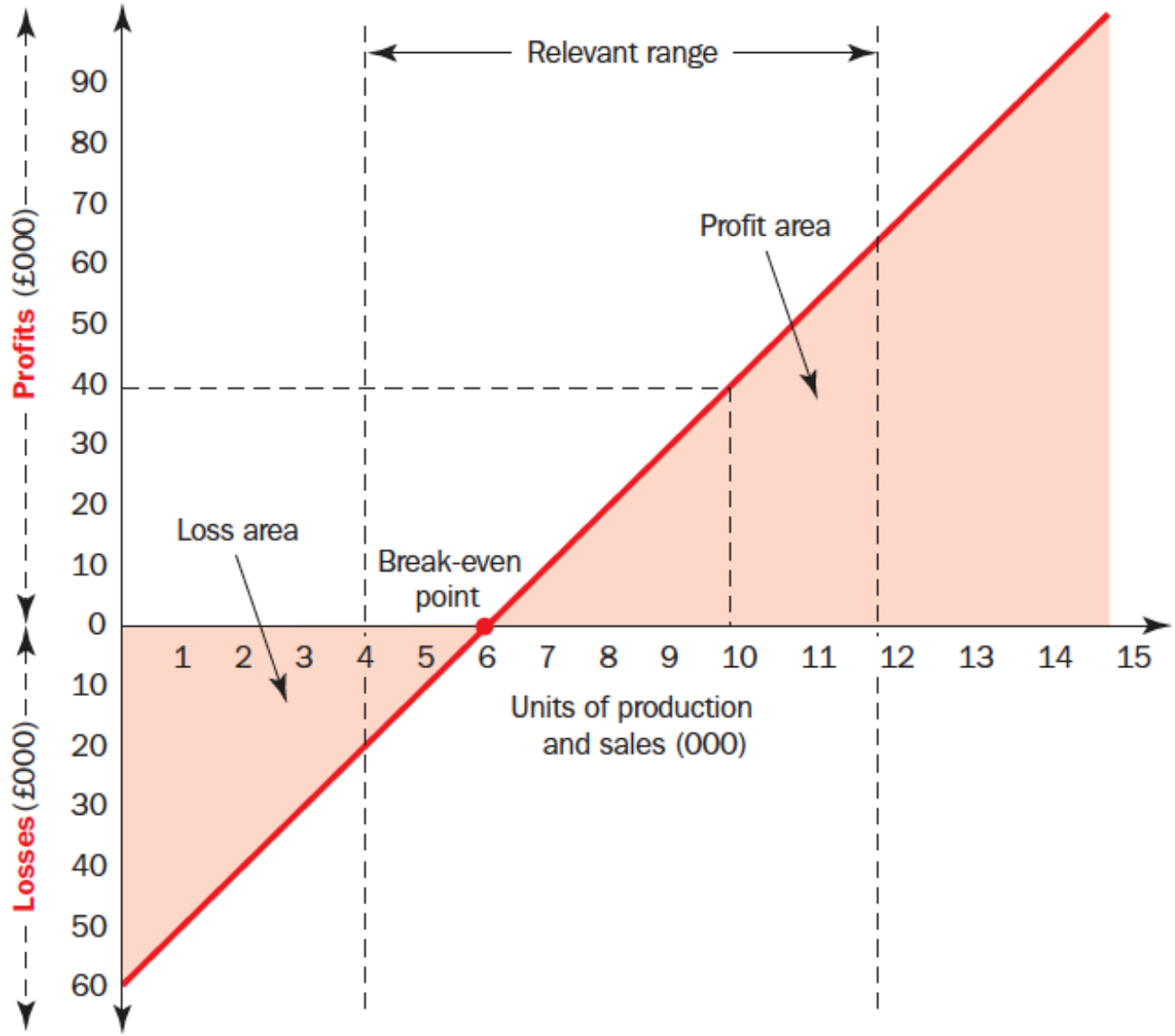
THE CONTRIBUTION MARGIN FUNCTION



THE EBIT FUNCTION



PROFIT-VOLUME GRAPH



Source: Colin Drury, "Management and Cost Accounting", eighth edition, Cengage Learning

CONTRIBUTION INCOME STATEMENT

+ Variable Revenue	$	2,000.00
- Variable Costs	$	(650.00)
= Contribution Margin	**$**	**1,350.00**
+ Fixed Revenue	$	180.00
- Fixed Costs	$	(1,150.00)
= Operating Income	**$**	**380,00**

Contribution Margin Income Statement

The traditional income statement for external reporting shows the functional classification of costs, that is, manufacturing costs versus nonmanufacturing expenses (or operating expenses). An alternative format of income statement, known as the contribution margin income statement, organizes the costs by behavior rather than by function. It shows the relationship of variable costs and fixed costs a given cost item is associated with, regardless of the functions.

The contribution approach to income determination provides data that are useful for managerial planning and decision making. The statement highlights the concept of contribution margin, which is the difference between sales and variable costs. The traditional format emphasizes the concept of gross margin, which is the difference between sales and cost of goods sold.

These two concepts are independent and have nothing to do with each other. Gross margin is available to cover nonmanufacturing expenses, whereas contribution margin is available to cover fixed costs. A comparison is made between the traditional format and the contribution format below.

Traditional Format

Sales		$15,000
Less: Cost of Goods Sold		7,000
Gross Margin		$8,000
Less: Operating Expenses		
Selling	$2,100	
Administrative	1,500	3,600
Net Income		$4,400

Contribution Format

Sales		$15,000
Less: Variable Expenses		
Manufacturing	$4,000	
Selling	1,600	
Administrative	500	6,100
Contribution Margin		$8,900
Less: Fixed Expenses		
Manufacturing	$3,000	
Selling	500	
Administrative	1,000	4,500
Net Income		$4,400

VARGO VIDEO COMPANY
CVP Income Statement
For the Month Ended June 30, 2010

	Total		Per Unit
Sales		$800,000	$500
Variable expenses			
Cost of goods sold	$400,000		
Selling expenses	60,000		
Administrative expenses	20,000		
Total variable expenses		480,000	300
Contribution margin		**320,000**	**$200**
Fixed expenses			
Cost of goods sold	120,000		
Selling expenses	40,000		
Administrative expenses	40,000		
Total fixed expenses		200,000	
Net income		**$120,000**	