Pathways to Higher Education Project

Center for Advancement of Postgraduate
Studies and Research in Engineering Sciences,
Faculty of Engineering - Cairo University
(CAPSCU)

Cairo University

Basics of Managerial Economics

Prof. Dr. Fakhry El-Din El-Feky

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by
Prof. Dr. Fakhry El-Din El-Feky
Professor of Economics
Faculty of Economics and Political Sciences,
Cairo University

Cairo
2005

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First Published 2005

Published by Center for Advancement of Postgraduate Studies and Research in Engineering Sciences, Faculty of Engineering - Cairo University (CAPSCU)
Tel: (+202) 5716620, (+202) 5678216
Fax: (+202) 5703620
Web-site: www.capscu.com
E-mail: capscu@tedata.net.eg

Deposit No. 10075/2005

ISBN 977-403-009-5

Acknowledgment

On behalf of Pathways to Higher Education Management Team in Egypt, the Project Coordinator wishes to extend his thanks and appreciation to the Ford Foundation (FF) for its full support to reform higher education, postgraduate studies and research activities in Egypt. The Management Team extend their special thanks and appreciation to Dr. Bassma Kodmani, Senior Project Officer at the Ford Foundation office in Cairo, who helped initiate this endeavor, and who spared no effort to support the Egyptian overall reform activities, particularly research and quality assurance of the higher education system. Her efforts were culminated by the endorsement to fund our proposal to establish the Egyptian Pathways to Higher Education project by the Ford Foundation Headquarters in New York.

The role of our main partner, the Future Generation Foundation (FGF), during the initial phase of implementation of the Pathways to Higher Education Project is also acknowledged. The elaborate system of training they used in offering their Basic Business Skills Acquisition (BBSA) program was inspiring in developing the advanced training program under Pathways umbrella. This partnership with an NGO reflected a truly successful model of coordination between CAPSCU and FGF, and its continuity is mandatory in support of our young graduates interested in pursuing research activities and/or finding better job opportunities.

The contribution of our partner, The National Council for Women (NCW), is appreciated. It is worth mentioning that the percentage of females graduated from Pathways programs has exceeded 50%, which is in line with FF and NCW general objectives. The second phase of the project will witness a much more forceful contribution from the NCW, particularly when implementing the program on the governorates level as proposed by CAPSCU in a second phase of the program.

We also appreciate the efforts and collaborative attitude of all colleagues from Cairo University, particularly the Faculties of Commerce, Art, Mass Communication, Law, Economics and Political Sciences, and Engineering who contributed to the success of this project.

Finally, thanks and appreciation are also extended to every member of the Center for Advancement of Postgraduate Studies and Research in Engineering Sciences (CAPSCU), Steering Committee members, trainers, supervisors and lecturers who were carefully selected to oversee the successful implementation of this project, as well as to all those who are contributing towards the accomplishment of the project objectives.

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CU Cairo University **NCW National Council for Women**
FF Ford Foundation **FGF Future Generation Foundation**
CAPSCU Center for Advancement of Postgraduate Studies and Research in Engineering Sciences, Faculty of Engineering - Cairo University

Publisher Introduction

The Faculty of Engineering, Cairo University is a pioneer in the field of learning and continual education and training. The Center for Advancement of Postgraduate Studies and Research in Engineering Sciences, Faculty of Engineering - Cairo University (CAPSCU) is one of the pillars of the scientific research centers in the Faculty of Engineering. CAPSCU was established in 1974 in cooperation with UNIDO and UNESCO organizations of the United Nations. Since 1984, CAPSCU has been operating as a self-financed independent business unit within the overall goals of Cairo University strategy to render its services toward development of society and environment.

CAPSCU provides consultation services for public and private sectors and governmental organizations. The center offers consultation on contractual basis in all engineering disciplines. The expertise of the Faculty professors who represent the pool of consultants to CAPSCU, is supported by the laboratories, computational facilities, library and internet services to assist in conducting technical studies, research and development work, industrial research, continuous education, on-the-job training, feasibility studies, assessment of technical and financial projects, etc.

Pathways to Higher Education (PHE) Project is an international grant that was contracted between Cairo University and Ford Foundation (FF). During ten years, FF plans to invest 280 million dollars to develop human resources in a number of developing countries across the world. In Egypt, the project aims at enhancing university graduates' skills. PHE project is managed by CAPSCU according to the agreement signed in September 22nd, 2002 between Cairo University and Ford Foundation, grant No. 1020 - 1920.

The partners of the project are Future Generation Foundation (FGF), National Council for Women (NCW) and Faculties of Humanities and Social Sciences at Cairo University. A steering committee that includes representatives of these organizations has been formed. Its main tasks are to steer the project, develop project policies and supervise the implementation process.

Following the steps of CAPSCU to spread science and knowledge in order to participate in society development, this training material is published to enrich the Egyptian libraries. The material composes of 20 subjects especially prepared and developed for PHE programs.

Dr. Mohammad M. Megahed
CAPSCU Director
April 2005

Foreword by the Project Management

Pathways to Higher Education, Egypt (PHE) aims at training fresh university graduates in order to enhance their research skills to upgrade their chances in winning national and international postgraduate scholarships as well as obtaining better job.

Pathways steering committee defined the basic skills needed to bridge the gap between capabilities of fresh university graduates and requirements of society and scientific research. These skills are: mental, communication, personal and social, and managerial and team work, in addition to complementary knowledge. Consequently, specialized professors were assigned to prepare and deliver training material aiming at developing the previous skills through three main training programs:

1. Enhancement of Research Skills
2. Training of Trainers
3. Development of Leadership Skills

The activities and training programs offered by the project are numerous. These activities include:

1. Developing training courses to improve graduates' skills
2. Holding general lectures for PHE trainees and the stakeholders
3. Conducting graduation projects towards the training programs

Believing in the importance of spreading science and knowledge, Pathways management team would like to introduce this edition of the training material. The material is thoroughly developed to meet the needs of trainees. There have been previous versions for these course materials; each version was evaluated by trainees, trainers and Project team. The development process of both style and content of the material is continuing while more courses are being prepared.

To further enhance the achievement of the project goals, it is planned to dedicate complete copies of PHE scientific publications to all the libraries of the Egyptian universities and project partners in order to participate in institutional capacity building. Moreover, the training materials will be available online on the PHE website, www.Pathways-Egypt.com.

In the coming phases, the partners and project management team plan to widen project scope to cover graduates of all Egyptian universities. It is also planned that underprivileged distinguished senior undergraduates will be included in the targeted trainees in order to enable their speedy participation in development of society.

Finally, we would like to thank the authors and colleagues who exerted enormous efforts and continuous work to publish this book. Special credit goes to Prof. Fouad Khalaf for playing a major role in the development phases and initiation of this project. We greatly appreciate the efforts of all members of the steering committee of the project.

Dr. Sayed Kaseb — **Project Manager**

Dr. Mohsen Elmahdy Said — **Project Coordinator**

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Course Objective and Outline

Objectives

Course Objective

The course is geared toward providing a practical introduction to managerial economics for trainees planning to participate actively in the labor market. The topics are designed in such a way to enhance their practical decision making capacity in their jobs, whether in the private, public sectors, or the NGOs.

Course Outlines

Course Outline

1.Chapter 1: What is Managerial Economics? (1.5hr)

1.Goals of the Firm.
2.Decision-Making Model.
3.Role of the Profit.
4.Alternative Objectives of the Firm.

2.Chapter 2: Basic Elements of Demand and Supply. (2.5hrs)

1.Demand-Supply & Market Equilibrium.
2.Demand Estimation
1. Qualitative Techniques.
2. Quantitative Techniques.
3. Demand Fore casting.

3.Chapter 3: Cost Analysis & Estimation. (2hrs)

1.Cost Classifications
2.Short Run VS Long Run Costs.
3.Estimation of Cost Functions.
4.Break-even Analysis VS. Operating Leverage.

Chapter 1: Introduction

What Is Managerial Economics

1.1 What Is Managerial Economics?

The concept of Managerial Economics applies principles of economic theory and methods to business and administrative decision making. It prescribes rules for improving managerial decisions and also helps managers recognize how economic forces affect organizations and describe the economic consequences of managerial behavior. It links traditional economics with the decision sciences to develop vital tools for managerial decision – making, managerial economics identifies ways to efficiently achieve both business profit and nonprofit goals.

Therefore, **managerial economics is relevant to the management of nonbusiness, nonprofit organization** *such as government agencies, cooperatives, schools, hospitals, museums, and similar institutions.* However, this training material focuses primarily on business applications.

Goals of the Firm

1.2 Goals of the Firm

To predict what any firm will do under specific conditions, some sort of assumption must be made about its goals. Managerial Economists assume that **the central goal of firms is to maximize economic profit.**

Economic Profit (EP) = Total Revenue (TR) – Total cost (TC)
……. (1)

Total Revenue = (Quantities sold) (Market Price per unit) - Total **Cost** = Explicit cost + Implicate cost
……. (2)

Explicit Cost *(Accounting cost) is the out of pocket paid money to hire labor, purchase raw material; power*...etc. **implicit cost** *is the unpaid opportunity cost.* **Economic profit** *is defined as the difference between total revenue and total cost* where total cost includes all cost; both explicit and implicit The definition is significantly different from the one used by accountants known as accounting profit or business profit it does not subtract implicit cost (opportunity cost) from total revenue

Therefore:
Accounting profit = Total Revenue – Explicit Cost …… (3)

Economic Profit = Total Revenue – (Accounting cost + Economic Cost including normal profit) .....…….. (4)

Managerial Decision-Making Model

1.3 Managerial Decision – Making Model

The management decision-making model is called the "Theory of the Firm". In its simplest version, the firm is thought to have profit maximization as its primary goal, the Firm's owner – manager goal is assumed to be working to maximize firm's profit in the short run. Today the emphasis on profit has been broadened to encompass uncertainty and the time value of money. In this more complete model, the primary goal of the firm is long-term expected value maximization that means the maximization of the value of the firm, as shown in Figure 1.1.

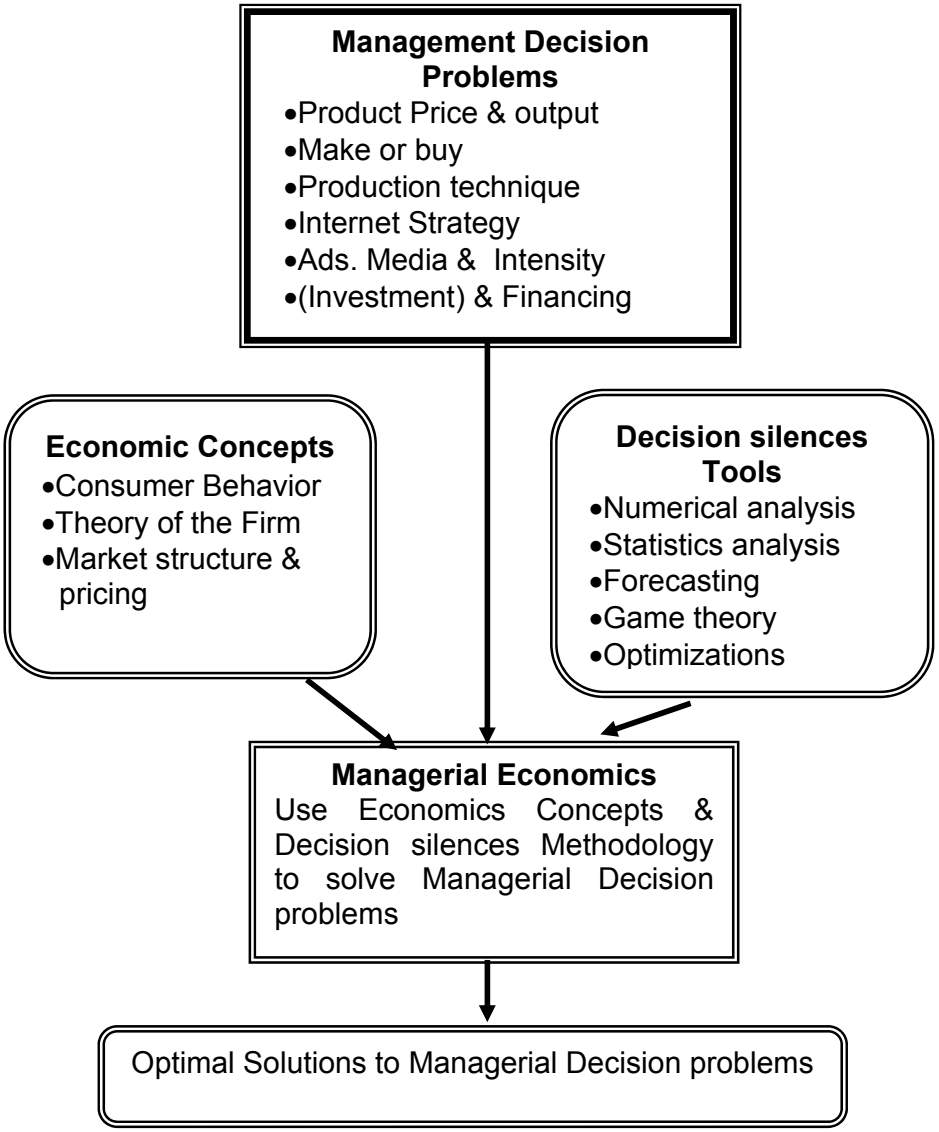

Figure 1.1: Decision-making model

The value of the firm

The value of the Firm

It is the present value of the expected future net cash flows (profits) discounted by the appropriate interest rate.

Value of the firm (VF) = $\frac{II_1}{(1+i)} + \frac{II_2}{(1+i)^2} + ...+ \frac{II_N}{(1+i)^N}$ ……. (5)

$$= \sum_{T=1}^{N} \frac{N\prod_T}{(I+i)^t} \qquad \text{N} \qquad \text{..... (6)}$$

Where: (Π is expected annual future profit as equal expected future net cash flows. (t) = Number of years & (*i*) is the discount rate.

To better understand the origins of economic profit, it is necessary to examine related theories and models. Economic profit could be generated by unanticipated changes in demand or cost conditions, Frictional Model), monopoly power due to barriers to entry in t limit competition, (monopoly Model) innovation protected by patent rights, (Innovation Model) or as a reward for efficiency, compensatory Model).

The Role of Profit

1.4 The Role of Profit

Numerous challenges have been raised to the profit maximization assumption. Some critics say that firm's goal is to maximize its chances of survival others believe that it aims at maximizing profit or / and creating more employment opportunities. Total sales and some economist even claim that firms do not try to maximize any thing at all. However it is reasonable to say that a firm does not always pursue profit maximization at the expense of all other alternative goals. Therefore, his issue still remains an empirical question. In this respect, some empirical researches show that vigorous competition in markets typically forces managers to seek firm's value maximization in their decision making. Also, none of the alternative business goals can substitute the basic long-run value maximization model as a foundation for analyzing managerial decision.

Role of Profit Maximization

Role of Profit Maximization

The rule of profit maximization can be summarized as:

- Managers seeking profit maximization could **enhance firm's capacity** to compete vigorously in highly competitive markets.
- It plays a vital role in **providing incentives for innovation** and productive efficiency.
- **Stockholders are, of course, interested in profit maximization** because it affects their rate of return on their capital share.

- **Managers could maintain their position and financial benefits in the firm** as long as they pursue profit maximization and stockholders interest.
- **Smart manager could seek profit maximization to avoid recent phenomenon** of buyout pressures from unfriendly firms (raiders) with the possibility of being replaced when takeover occurs.
- The value maximization model also **offers insight into firm's voluntary social responsibilities** and plays a role in achieving fair distribution of income, and also through improving efficiency.

Alternative Objectives of Firm

1.5 Alternative Objectives of Firm

Some critics' question **why value maximization criterion is used as a foundation for studying firm behavior?** Do managers always seek to optimize best results or merely achieve satisfactory rather than optimal results? It is impossible to give definitive answers to such difficult questions. This dilemma has lead to the development of alternative models of firm behavior.

Some of the more prominent alternatives are models in which firm size or growth maximization is the assumed primary objective of management. There are other models that argue that managers are most concerned with the own personal utility or welfare maximization, Models that treat the firm as a collection of individuals with widely divergent goals rather than as a single identifiable unit are aiming at maximizing stockholders benefits.

These alternative models of managerial behavior have added to our understanding of the firm objective. However, none of them can substitute completely for the basic long-run value maximization model.

Chapter 2: Basics of Demand and Supply

The Market Economy

2.1 The Market Economy

Competitive Markets illustrates how the forces of supply and demand determine the equilibrium prices and equilibrium quantities for all goods and services.

Demand

Demand

Demand is the quantity of a good or a service that consumers are willing and able to purchase under a given set of economic conditions. **Direct Demand** is the demand for products that directly satisfy consumer desires. **Derived Demand** is the demand for all input which is determined by the profitability of using several of it to produce outputs.

The Market demand function

The Market demand function for a product is a statement of the relationship between the quantity demanded and all factors that affect this quantity:

$$Q_x = b_o P_x + b_1 P_y + b_2 A + b_3 I + b_4 PoP \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (7)$$

Where :
Q_x - Quantity demanded
P_x - Price of (X)
P_y - Price of other related good (X)
A - Advertisment
I - Income
PoP - Population

Demand schedule vs, shown in Table 2.1. demand curve, shown in Figure 2.1. Quantity demanded could be expressed numerically or graphically holding other factors constant.

Table 2.1: Demand schedule

Px	Qx
2	500
4	400
6	300
8	200
10	100

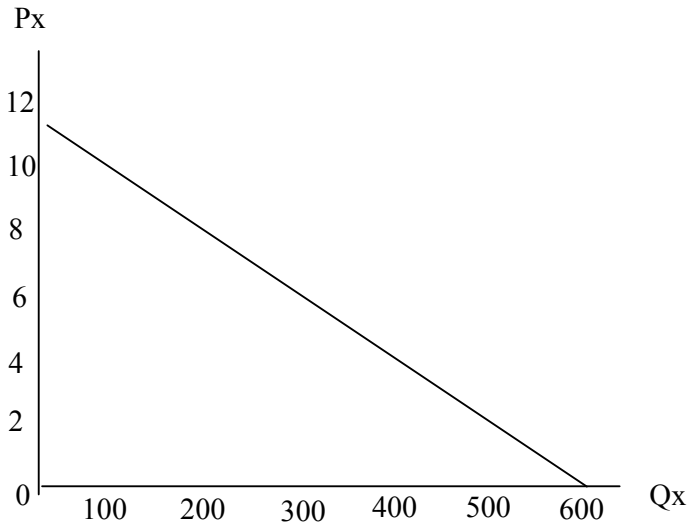

Figure 2.1: Demand curve

There is a negative relationship between P_x and Q_x holding other factors constant.

Supply

Supply

Supply is the quantity supplied of a goods or a service that producers are willing and able to sell under a given set of conditions. Supply function for a product is statement of the relationship between the quantity supplied and all factors affecting quantity supplied

$Q_x = a_0\, p_x + a_1 C_x + a_2$ Tech + a_3 Pros

Where

C_x = Cost of producing (x)
Tech. = Technology
Pros = Number of producers.

Supply **schedule and** Curve

Supply schedule and supply curve

Quantity supplied of a good and its relationship with the price of the same good holding other factors constant could be expressed numerically or graphically, as shown in Table 2.2 and Figure 2.2.

Table 2.2: Supply schedule

Px	Qx
2	100
4	200
6	300
8	400
10	500

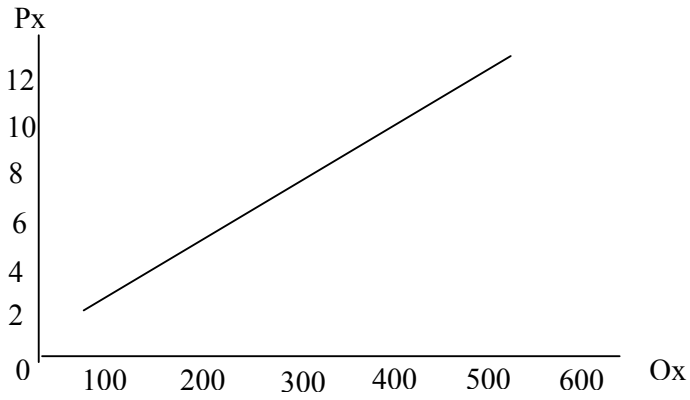

Figure 2.2: Supply curve

There is a positive relationship between P_x and Q_x supplied holding other factors constant.

Market Equilibrium

Market Equilibrium

It occurs when the Q_x demanded equals Q_x supplied at a given price where there is no shortage or surplus in the Q_x supplied, as shown in Table 2.3 and Figure 2.3.

Table 2.3: Market condition schedule

Px	Q_{xd}	Q_{xs}	Market condition
2	500	100	-400
4	400	200	-200
6	300	300	Equilibrium
8	200	400	+200
10	100	500	+400

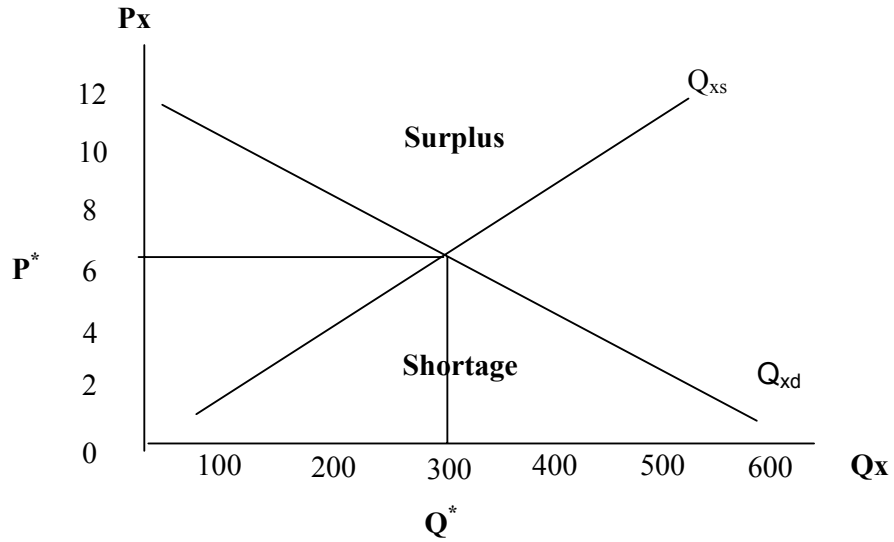

Figure 2.3: Market condition

From the above example:
The equilibrium price (P*) = 6 and
The equilibrium quantity (Q*) = 300

Estimation of Demand

2.2 Estimation of Demand

Demand estimation techniques have been getting extraordinary effective because of relatively inexpensive Personal Computers and user – friendly software. These techniques could be classified into two main categories:
(1) Qualitative methods (marketing research); such as consumer interviews, (surveys,) market experiments.
(2) Quantitative methods (statistical methods) and forecasting techniques such as regression analysis, game theory, and linear programming. These topics will be highlighted below:

- Marketing Research (Qualitative Techniques)
- Statistical Analysis (Quantitative Techniques)
- Forecasting Techniques

Marketing Research (Qualitative Techniques)

Marketing Research (Qualitative Techniques)

Successful companies should adopt a competitive marketing strategy that devotes to considerable resources toward answering simple questions: what does customer want? The question could be answered through conducting the following qualitative methods.

Consumer Interviews (Surveys)

Consumer Interviews (surveys)

It requires questioning customers or potential customers to estimate the relation between demand and variety of underlying factors. Quality of techniques ranges between a simple to sophisticated Consumer surveys through which data will be aggregated to estimate total demand for a specific product.

Consumer surveys have an important value. Using subtle inquiries, a trained interviewer can extract useful information from consumers, for example, is demand is highly sensitive to price changes, if so, producers should not attempt to increase the price of such a product. Therefore consumer surveys can be used to make better managerial decision.

Market Experiments

Market Experiments

One of those market experiment techniques entails examining consumer behavior in actual controlled market environment. However they have a number of serious shortcomings; they are expensive and usually undertaken on a scale too small to allow high levels of

confidence in the result. A change in economic condition during the experiment is likely to invalidate the results.

Therefore, market experiments are seldom run for sufficiently long periods to indicate the long-run effects of various price advertising or packaging strategies.

A local strike, layoffs by a major employer or severe snowstorm or very warm weather might ruin the experiment. Likewise, a change in a competing products promotion, price, or packaging can distort the results.

Quantitative Methods (statistical Analysis)

2.3 Quantitative Methods (Statistical Analysis)

Regression Analysis

Regression Analysis

It is a powerful statistical technique that describes the way in which one important economic variable is related to one or more of other economic variables. Regression analysis technique follows a number of steps.

Statistical Relation

Statistical Relation

When a statistical relation exists, the exact relation between two economic variables is not known with certainty and must be estimated. The most common means for doing so is to gather and analyze historical data. A time series of data is a periodic (daily, weekly, monthly annually) sequence of data on an economic variable such as; price, income or cost. A cross-section of data is a group of observations on an important economic variable a cross different location at any given point of time.

Scatter diagram

Scatter Diagram

The simplest and most common means for analyzing a sample of historical information is to plot a visually study of the data. It is a plot of data where the dependent variable is plotted on vertical axis (Y axis) and the independent variable is plotted on the horizontal axis (x axis)

Figure 2.4 shows scatter diagrams that plot the relation between price, income, or advertisement as independent variables in the (X) axis and quantity sold as dependent variable in the (Y) axis.

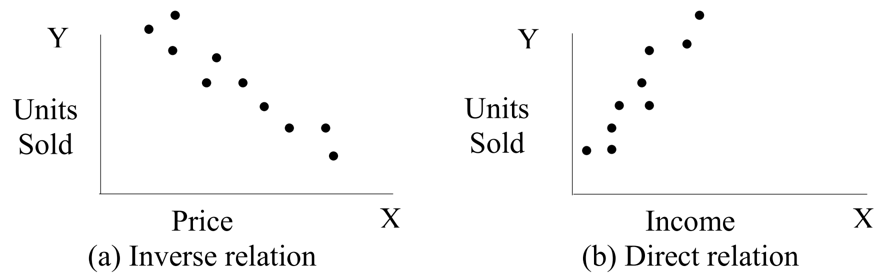

Figure 2.4: Scatter diagrams

The scatter diagrams illustrate the simple correlation between variables by themselves they do not establish causality, however, to warrant the inference of cause the correlation and effect , the two series of data must be interpreted in light of previous experience or the economic theory. The reason for analyzing the scatter diagram is to gain an instinctive feel for the date.

Specifying The Form of The Regression Model

Specifying the Form of the Regression Model

The first procedure in this step is to specify variables to be included in the regression model. The second procedure is to gather the necessary accurate data. The third procedure is to determine the form of the regression model. The most common specification is a linear model such as the following demand function:

$Q_x = b_o + b_1 P_x + b_2 A + b_3 I$ ……………………………….. . (8)

Where: Q x: the quantity demanded of (x) good
b_o: the intercept
P x = the price of (x) good
A = Advertising expenditures.
I = Per capita disposable income

The broad appeal of linear functions stems from the fact that the ordinary least square (OLS) technique could be used to estimate the regression model coefficient b_o, b_1, b_2, b_3.

Another common form of regression models is the multiplicative model where the relation between the economic variable is nonlinear, and takes the following equation:

$Q_x = b_0 P_x^{b1} A^{b2} I^{b3}$ …………………...……………(9)

This multiplicative model can be transformed into a linear relation by using logarithms, and then estimated by the OLS technique as follows:

$\text{Log } Q_x = \text{log}b_0 + b_1 \log(P_x) + b_2 \log(A) + B_3 \log(I)$ ……… (10)

Some important statistical tests

Some important statistical tests

The following are a number of statistics tests that are useful in examining the accuracy of any regression model:

(t) Statistics

1- (t) Statistics: to estimate the significance of regression coefficient: In regression analysis (t) test is performed to learn if an individual slope coefficient estimate b_1 = o this known as the null hypotheses. That is the quantity demanded for x and price of (x) are unrelated. IF b_1 = o the hypotheses can be rejected, then it is possible to infer that b_1 = o and the relation between the two economic variables does in fact, exist

$$t_{n-k} = \frac{b_i \hat{} i}{\sigma\, b \hat{}} \quad \text{..... (11)}$$

Where: n: the number of observations
k: the number of estimated coefficient
if t ≥ 2 then b i # o with degree of confidence of 95%
If t ≥ 3 then b i # o with degree of confidence of 99%

Goodness of fit (R^2 and adjusted R^2)

2- Goodness of fit (R^2 and adjusted $R^{2)}$
R^2= t Variation Explained by Regression Coefficient of Total variation determination: measures the goodness of fit for a multiple regression model.

- normally 0 ≤ R^2 or R^2 ≤ I
- If R^2 or R^2 = 0 this Indicate that the model provides no explanation of he variation in the dependent variable.
- If R^2 or adjusted R^2 = I this indicates that all the variation of the model is explained fully by the independent variables.

For example:

- If R^2 or R^2 = .85, this indicates that 85% of the total variation in the dependent variable can be explained by the independent variables.

Statistic Significance

2.4 Statistic Significance

It is measure of statistical for the share of dependent variable variation explained by the regression model.

$$F_{k-1,n-k} = \frac{Explained\ Variation\ (k-1)}{Un\exp lained\ Variation\ (n-k)} \quad \text{..... (12)}$$

The hypothesis actually tested is that the dependent variable is statistically unrelated to all the independent variable included in the model. If the hypotheses can be rejected. Performing (F) tests involves comparing F statistics with critical value from the table of the (F) distribution.

- IF $F_{Calculated} \geq F_{critical}$ then hypotheses of no relation between the dependent variable and all independent variables in the model could be rejected. For example, the following equation could clarify the above statistical tests.

$Q_X = -117.5 – 0.30\ P_X + 0.04\ A + 0.07\ (-0.35)\quad (-2.91)\quad (2.56)(4.61)$

$F_{3,8} = 85.4$, $R^2 = 95.8\%$ $R = 97.0\%$ $F_{3.8}$ Critical = 5

This means that P_x, A, and I they are separately significant independent variables in affecting Q_x. Also the whole relationship is significant. Finally the variation in Q_X, 95.8% or 97% of it is explained by the three independent variables. Also the whole relationship is significant.

Forecasting Techniques

2.5 Forecasting Techniques

Several techniques are available for forecasting Demand. The most common applied techniques can be classified to the following broad categories:

Qualitative Techniques

Qualitative Techniques

- Exponential Smoothing.
- Econometric models.
- Trend analysis and projection.

Qualitative Analysis

Qualitative analysis

Qualitative analysis is an intuitive judgmental approach to forecasting. It can be useful if it allows for the systematic collection and organization of data derived from unbiased, informed opinion.

Experts opinion (personal insights)

Expert opinion (personal insights)

The most basic form of qualitative analysis forecasting is personal insight in which an individual uses his own long-gained experience as a basis for developing future expectations. When forecast method is based on the informed opinion of several individual we call this panel consensus. When the latter are analyzed and forecasted by an independent party this is known as **Delphi method.**

Survey techniques

Survey Techniques

Survey Technique is skillfully use interviews or mailed questionnaires that are considered important forecast tool, especially for short term projection. Survey in formation about a firm attempts to project new product demand may be all that is available in certain forecasting study

It can be used as an alternative quantitative forecast techniques, however they frequently supplement rather than replacing it.

Trend analysis and projection

Trend analysis and projection

Trend analysis and projection is based on the premise that economic Performance follows an established pattern and that historical data can be used to predict future business activity. It is based on the assumption of a continuation of the past relation between economic variables. Pattern of time series could take several forms such as trends, cyclical fluctuations, seasonality, or random pattern.

Econometric Methods (EM)

Econometric Methods (EM)

Econometric model is combining economic theory with mathematical and statistical tools to analyze economic relations.

- **Econometric forecasting techniques** have several distinct advantages over alternative methods.
- **They increase the reliability of the results** by informing the forecaster to make explicit assumptions about the causal relations among the economic variables in light of the economic theory.
- **The forecaster** can compare forecast with actual results and use insight gained experience to improve the predicative power of the econometric model.
- **Econometric Model** indicates not only the direction of change but also the magnitude of expected change, and hence explains economic phenomena.
- **Econometric model** can be classified into:

Single –Equation Models

$$Q_x = b_o + b_iP_x + b_2A + b_3I \ldots\ldots\ldots\ldots\ldots\ldots \quad (12)$$

Single-Equation Models

Multiple – equation Model, I contain two basic kinds of expressions – identities and behavioral equations such as the market simultaneous equation model.

Multiple-equation Model

$QD_x = a_O + a_l P_x$ **(Behavioral equations)**
$QS_x = b_O + b_l P_x$
$QS_x = QD_x$ (Identity) – Market equilibrium

Chapter 3: Cost Analysis and Estimation

Cost Analysis

3.1 Cost Analysis

Cost analysis and estimation is made difficult by the effects of unforeseen inflation, unpredictable changes in technology, and the dynamic nature of input and output markets. Wide divergences between economic cost and accounting valuations are common. This makes it extremely important to adjusted accounting data to generate an appropriate basis for managerial decisions. Cost in decision-making analysis could be classified into:

Historical vs. Current Costs

a- **Historical vs. Current Costs**: Cost data are **historical** if they are stored for a period of time and then used, while cost data are current when they are paid under prevailing market conditions. Although it is typical for current costs to exceed historical costs. However, this is not always the case. Computers cost much less today than they did just a few years age. Therefore, **current cost** for such items is determined by what is referred to as a replacement cost which is defined as the cost of duplicating these items by using the current technology.

Explicit vs. Implicit Cost

b- **Explicit vs. Implicit Cost: Explicit Costs** are defined as the out of pocket money, such as paid wages, utility expenses, payment for raw materials and so on. **Implicit costs** are more difficult to compute and are likely to be overlooked in decision analysis. Implicit cost is normally computed based on the opportunity cost concept so as to reach an accurate estimate of total cost.

Incremental vs. Sunk Costs

c- **Incremental vs. Sunk Costs: Incremental cost** refers to change in cost caused by a given managerial decision while **sunk cost** is cost that does not change or vary across decision alternatives.

For example, suppose a firm has spent **$ 5,000** on an option to purchase land for a new factory at a price of **$100,000.** Also, assume that it is later offered an equally attractive site for $90,000. What should the firm do? The first thing to recognize is that the $5,000 spent on the purchase option is a sunk cost that must be ignored. To understand this, consider the firm's current decision alternatives. If the firm proceeds to purchase the first property, it must pay a price of $100,000. The newly offered property required an expenditure of $90,000 and results in a $10,000 savings. In retrospect, purchase of the $5.000 option was a mistake. It would be a compounding of this initial error to follow through with purchase of the first property and lose an additional $10,000.

Short-Run vs. Long-Run Cost

d- **Short-Run vs. Long-Run Cost: Short-run cost** is the cost of production at various production (output) levels for a specific plant size and a given operating environment. There for total short-run cost can be classified into fixed cost (FC) which is known as contractual costs in **the long-run** (rent, interest payments, and overhead cost) and variable cost (VC) such as wages, cost of raw material, power bills, and so on, as shown in Figure 3.1.

a) Total cost (TC) = FC + VC

b) Average cost (AC)

$$AFC = \frac{FC}{Q}$$

$$AVC = \frac{VC}{Q}$$

$$AC = AFC + AVC = \frac{TC}{Q}$$

c) Marginal Cost (MC) $= \frac{\Delta TC}{\Delta Q} = \frac{\Delta VC}{\Delta Q}$

Figure 3.1: Short-run and long-run cost

Numerical Example:

Q	TC	TFC	TVC	ATC	AFC	AVC	MC
1.	$ 120	$ 100	$ 20	$ 120.0	$ 100	$ 20.0	$ 20
2.	138	100	38	69.0	50.0	19.0	18
3.	151	100	51	50.3	33.3	17.0	13
4.	162	100	62	40.5	25.0	15.5	11
5.	175	100	75	35.0	20.0	15.0	13
6.	190	100	90	31.7	16.7	15.0	15
7.	210	100	110	30.0	14.3	15.7	20
8.	234	100	134	29.3	12.5	16.8	24
9.	263	100	163	29.2	11.1	18.1	29
10.	300	100	200	30.0	10.0	20.0	37

Long-run cost

a. **Long-run cost**: In the long-run all costs are variable costs. It shows the cost of production at various plant size or scale and operating conditions. It reflects the economies, diseconomies of scale, and optimal plant sizes which are a helpful guide for decisions-making process, as shown in Figure 3.2.

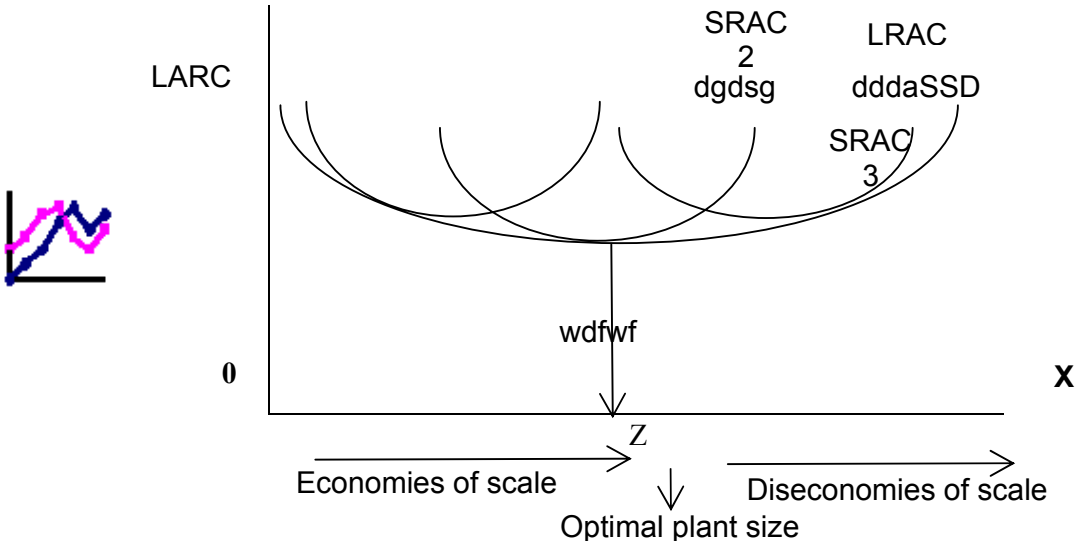

Figure 3.2: Long-run cost

Economies vs. Diseconomies of Scale

Economies vs. Diseconomies of Scale

Economics of scale exist when long-run average cost (LRAC) declines with enlarging the size of the as output expands along with the plant size due to labor specialization, applying better technology, commercial, financial-managerial advantages, and also through learning economies.

Diseconomies of scale exist when long-run average cost (LRAC) increase as output along with the plant size enlarges. This cost increases due mainly to administrative disadvantage of large scale when the firm size expand beyond the optimal size.

Learning curve concept

Learning curve concept

When knowledge gained from manufacturing, experience is used to improve production methods. This accumulated "know how" result in a decline in the LRAC is said to reflect itself in the firm's learning curve.

Estimate of Cost & Profit Maximization

3.2 Estimate of Cost & Profit Maximization

The shape of LRAC curve is important not only because of its implications for plant scale decision but also because of its effects on the potential level of competition especially when it declines in some industries. Normally firms encounter a (U) shaped LRAC while other firms encounter an (L) shape LRAC. Insight of the competitive implications of cost/output relation can be gained by estimating the minimum LRAC (Plant optimal size), as shown in Figure 3.3.

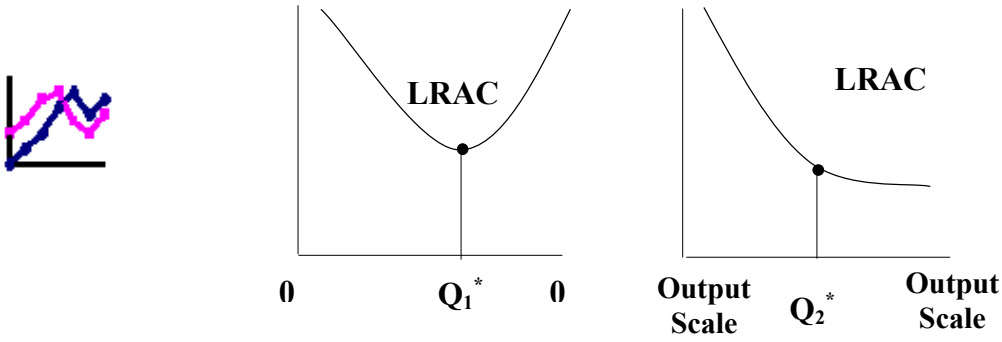

Figure 3.3: Estimate of cost and profit

Estimate of Minimum Efficient Scale (MES)

3.3 Estimate of the Minimum Efficient Scale (MES)

MES is determined at the minimum point of U-shaped LRAC curve, (Q_1) or the minimum point of L-shaped LRAC curve (Q_2). The following numerical example explains the underlined concept.
Profit Maximization:

The following example shows the procedures of how profit is maximized:

Assume that (X) company has the following:

1) P = 940 – 0.02 Q (estimated demand equation)
MR = 940 – 0.04 Q (estimated Marginal Revenue-derived equation)

2) TC = 250000 + 40 Q + 0.01 Q^2 (estimated total cost equation)
Mc = 40 + 0.02 Q (derived marginal cost equation profit identity.

π = TR – TC
= (p) (Q) – TC
= (940 – 0.02 Q) Q – (250000 – 40 Q – 0.01 Q^2)
= - 0.03 Q^2 + 900 Q – 250000

The profit-maximizing activity level with centralized production is the output level at which marginal profit (MH) = MR – MC = 0 and, therefore, MR=MC.

Setting marginal revenue (MR) equal to marginal cost (MC) and solving for the related output quantity as follows:
MR = MC
$940 - $0.04Q = $40Q + $0.02Q
$0.06Q = $900
Q = 15000

At Q = 15000, Profit will be maximized at the following calculated.

P = $940 - $0.02Q
= $940 - $ 0.02 (15000)
= $640

And maximum profit is calculated as follows:

$\pi = -\$0.03(15000)^2 + \$900(15000) - \$250000$
= $6500.000

Economies of Scope Concept

Economies of Scope Concept:

Economies of scope exist when the cost of joint production is less than the cost producing multiple outputs separately. In other words, a firm will produce products that are complementary in the sense that producing them together costs less than producing them individually. **Suppose** that a regional airline offers regularly scheduled passenger service between midsize city pairs and that it expects some excess capacity. Also, assume that there is a modest local demand for air parcel and small- package delivery service. Given current airplane sizes and configurations, it is often costly for a signal carrier to provide both passenger and cargo services in small regional markets than to specialize in one or the other. Thus, regional air carriers often provide both services. This is an example of economies of scope. Other example of scope economies abound in the provision of both goods and services. In fact, the economies of cope concept explain why firms typically produce multiple products. Also, studying economies of scope forces management to consider both direct and indirect benefits associated with individual lines of business.

Exploiting Economics of Scope

Exploiting Economies of Scope

Economies of scope are important because they permit a firm to translate superior skill in a given product line into unique advantages in the production of complementary products. **Effective competitive strategy** often emphasized the development or extension of product lines related to a firm's current stars, or areas of recognized strength. For example, PepsiCo, Inc. has long been a leader in the soft drink market. **Over time**, the company has gradually broadened its product line to include various brands of regular and diet soft drinks. Fritos and Doritos Corn chips, Grandma are Cookies, and other snack foods. **PepsiCo** can no longer be considered just a soft drink manufacturer. It is a widely diversified snack foods company for whom well over one-half of total current profits come from non-soft drink line. PepsiCo snack foods product line extension strategy was effective because it capitalized on the distribution network and marketing expertise developed in the firm's soft drink business. In the case of PepsiCo, snack foods and soft drinks are good example of how a firm has been able to take the skills gained in developing one star (soft drinks) and use them to develop a second star (snack foods).

The economies of scope concept offer a useful means for evaluating the potential of current and prospective lines of business. It naturally leads to definition of those areas in which the firm has a comparative advantage and its greatest profit potential.

Break-Even Analysis & Operating Leverage

3.4 Break-Even Analyzing & Operating Leverage

Breakeven analysis called Cost-volume-profit analysis is an important analytical technique used to study relations among costs, revenues, and profit. Both graphic and algebraic methods are used. **For simple problems**, simple graphic methods work best. In more complex situations, analytic methods, possibly involving spreadsheet software programs, are preferable, as shown in Figure 3.4.

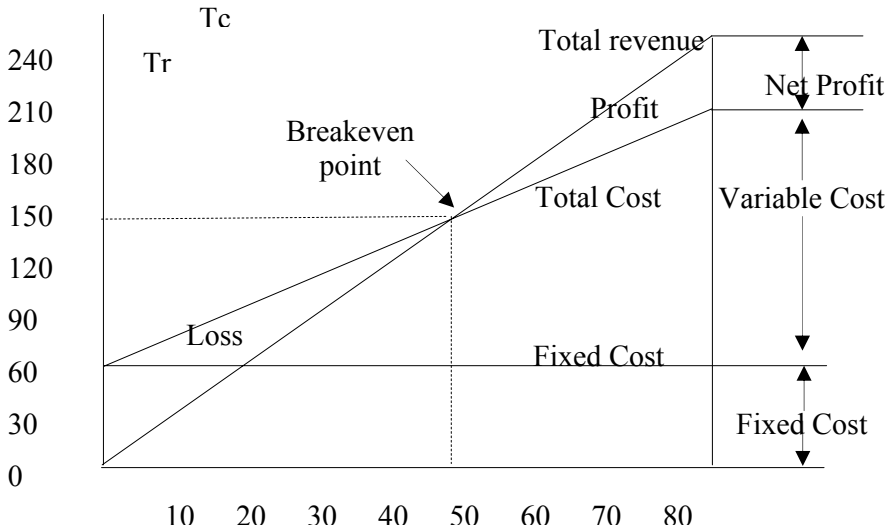

Figure 3.4: Cost-volume profit Chart

A basic cost-volume-profit chart composed of a firm's total cost and total revenue curves is depicted in Figure 3.4. **Volume of output** is measured on the horizontal axis; revenue and cost are shown on the vertical axis. Fixed costs are constant regardless of the output produced and are indicated by horizontal line. Variable costs at each output level are measured by the distance between the total cost curve and the constant fixed cost. The total revenue curve indicates the price/demand relation for he firm's product; profits or losses at each output are shown by the distance between total revenue and total cost curves.

In the example depicted in Figure 3.4, fixed costs of $60000 are represented by a horizontal line. Variable costs for labor and materials are $1.80 per unit, so total costs rise by that amount for each additional unit of output. Total revenue based on a price of $3 per unit is a

straight line through the origin. The slope of the total revenue line is steeper than that of the total cost line.

Output levels below the breakeven point produce losses. As output grows beyond the breakeven point; increasingly higher profits results.

Degree of Operating Leverage

Degree of Operating Leverage

Cost-volume-profit: analysis also a useful tool for analyzing the financial characteristics of alternative production systems. This analysis focuses on how total costs and profits vary with operating leverage or the extent to which fixed production facilities are used.

The relation between operating leverage and profits is shown in Figure 3.5, which contrasts the experience of three firms, A, B, and C, with differing degrees of leverage. The fixed costs of firm B are typical. Firm A uses relative less capital equipment and has lower fixed costs, but it has a steeper rate of increase in variable costs. Firm A breaks even at a lower activity level than does firm B. For example, at a production level of 40000 units, B is losing $8000 but breaks even. Firm C is highly automated and has the highest fixed costs, but it variable costs rise slowly. Firm C has a higher breakeven point than either A or B, but once C passes the breakeven point, profits rise faster than those of the other two firms.

The degree of operating leverage is the percentage changes in profit that results from 1% change in units sold:

$$Degrree\ of\ Operating\ Leverage = \frac{Percentage\ Change\ in\ \mathrm{Pr}ofit}{Percentage\ Change\ in\ Sales} \ldots\ldots (11)$$

The degree of operating leverage is an elasticity concept. It the elasticity profits with respect to output. When based on linear cost and revenue curves, this elasticity will vary. The degree of operating leverage is always greatly close to the breakeven point.

For firm B in Figure 3.5, the degree of operating leverage at 100000 units of output is 2.0, calculated as follows:

$$\mathrm{DOL} = \frac{40\%}{20\%} = 2$$

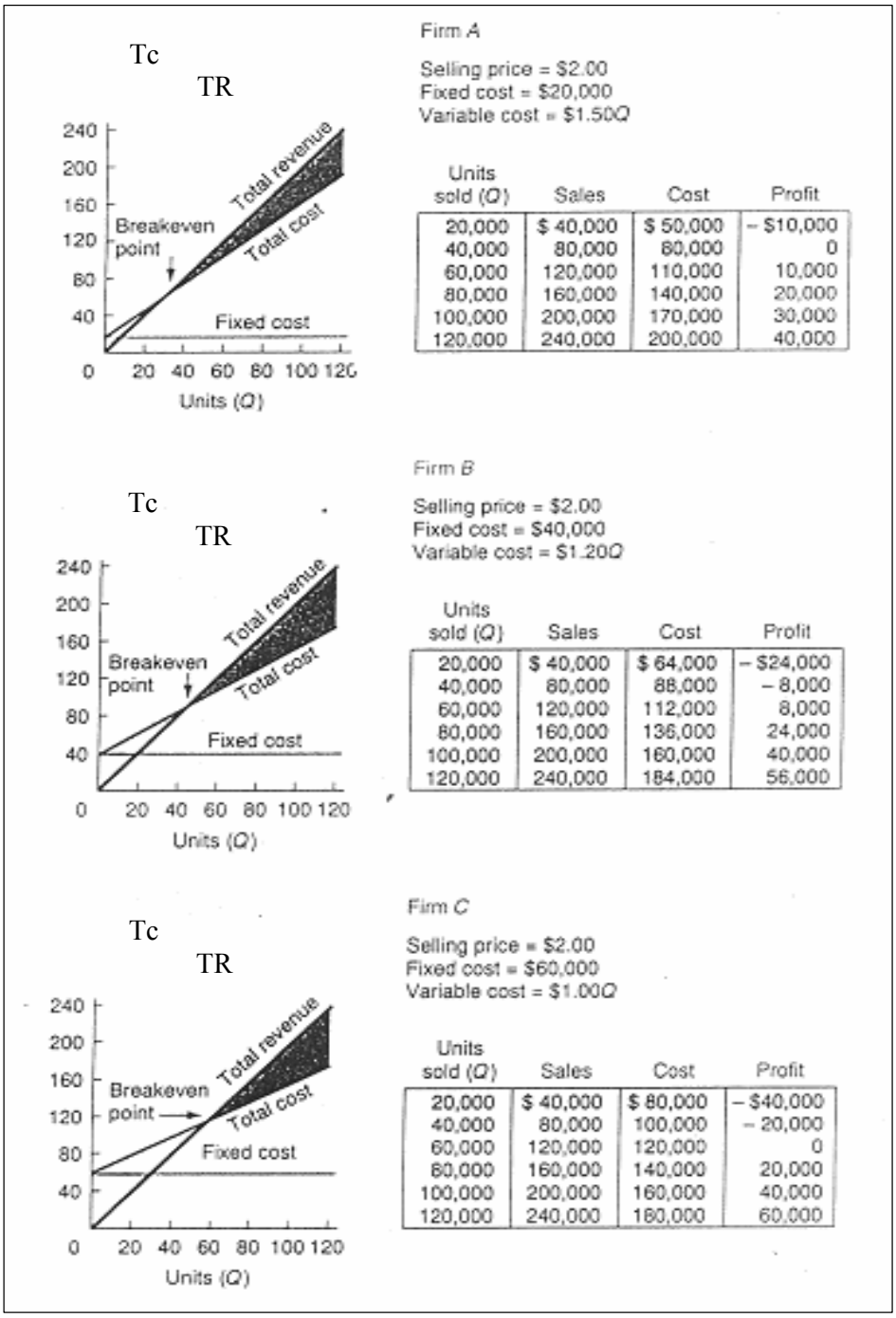

Figure 3.5: The degree of operating leverage

Glossary

Glossary

- **Economics:** the art of applying economic theory in business and administrative decision making.
- **Economic profit** = Total revenue – Economic cost
- **Economic cost** = Explicit cost + implicit cost
- **The value of the firm (VF)** is the PV of the expected future net cash flows discounted by the appropriate discount rate.
- **Direct Demand**: is the demand for the product.
- **Derived Demand**: is the demand for inputs which are determined by the profitability of producing various products, and experts' opinion.
- **Qualitative Marketing Techniques** include consumer interviews, and market experiments.
- **Quantitative Marketing Techniques** include statistical relationships, trends, regression analysis, and game theory.
- **Short-run Cost** is when the time is not enough to change all inputs; therefore costs are classified into fixed and variable costs.
- **Long-run Cost** is when the time is long enough to change all inputs, therefore all costs are variable.
- **Sunk Cost** is the cost that does not change or vary across decision alternatives.
- **Opportunity Cost:** often known as implicit cost or non-cash cost. It is the foregone cost associated with current next best use of an asset.
- **Learning Curve** when knowledge gained, experience is used to improve production techniques which results in a decline in the long-run average cost.
- **Economies of Scope** occurs when the joint production cost is less then the cost of producing multiple outputs separately.

- **Cost-Volume-Profit Analysis** is the volume of output which equates TR with TC.

- **Degree of Operating leverage**: it focuses on how TC and profits vary with operating leverage or the extent to which fixed production facilities are used.

- **Internal Rate of Return**: it is the discount rate which equates the present value if the expected cash flow to the initial cost of investment.

- **Pay back Period**: is the number of years it takes a firm to recover its original investment.

- **Capital Budgeting** is to make investment decisions that will maximize the value of the firm.

- **Expected Value of Profit** is the values of the profits weighed by the underlying probability distribution.

- **Certainty Equivalent Adjustment** Factor X Equivalent certain sum / Expected risky sum

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Published by: CAPSCU – Center for Advancement of Postgraduate Studies and Research in Engineering Sciences, Faculty of Engineering - Cairo University
Tel: (+202) 5716620, (+202) 5678216 Fax: (+202) 5703620
Web-site: www.capscu.com E-mail: capscu@tedata.net.eg