# Chapter 2: Basics of Demand and Supply

## 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 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** for a product is a statement of the relationship between the quantity demanded and all factors that affect this quantity:

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

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 |

Px

12

10

8

6

4

2

0
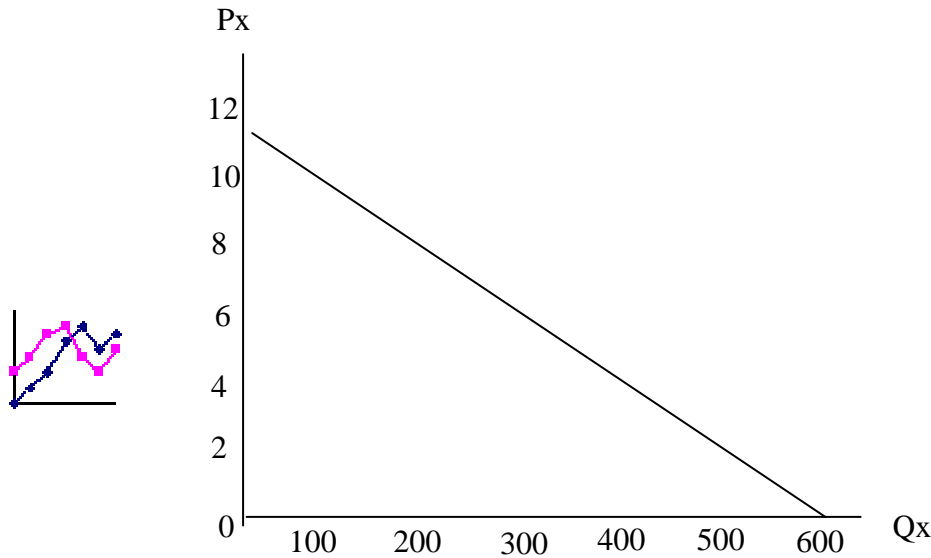    100    200    300    400    500    600    Qx
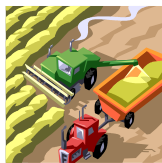
**Figure 2.1: Demand curve**

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

$Q_x = a_0 p_x + a_1 C_x + a_2 \text{ Tech} + a_3 \text{ Pros}$

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**

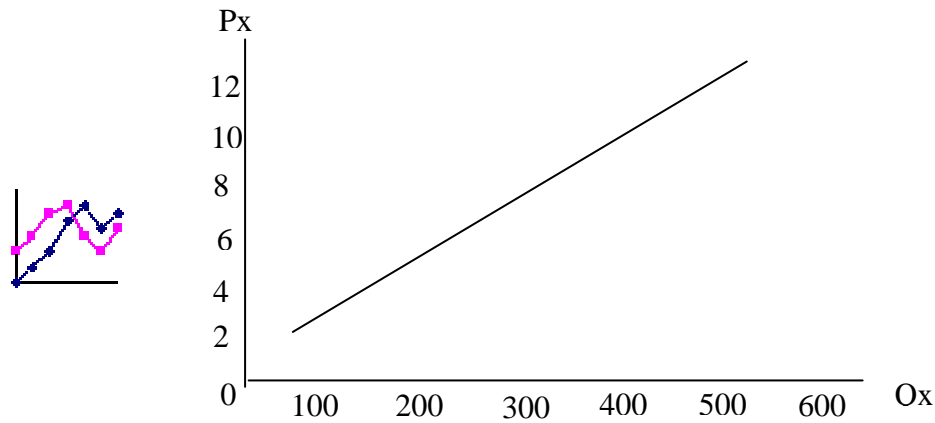| Px | Qx |
|----|-----|
| 2  | 100 |
| 4  | 200 |
| 6  | 300 |
| 8  | 400 |
| 10 | 500 |

**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**

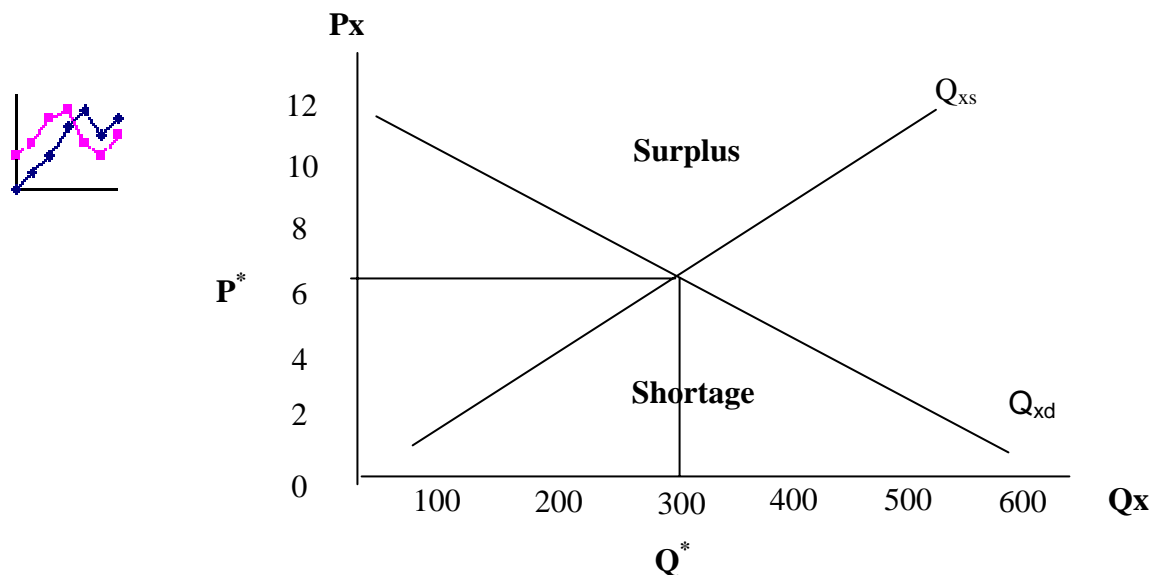| Px | $Q_{xd}$ | $Q_{xs}$ | Market condition |
|----|----|----|----|
| 2 | 500 | 100 | -400 |
| 4 | 400 | 200 | -200 |
| 6 | 300 | 300 | Equilibrium |
| 8 | 200 | 400 | +200 |
| 10 | 100 | 500 | +400 |



**Figure 2.3: Market condition**

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

## 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)

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)

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



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
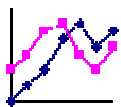
Statistical Relation



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.
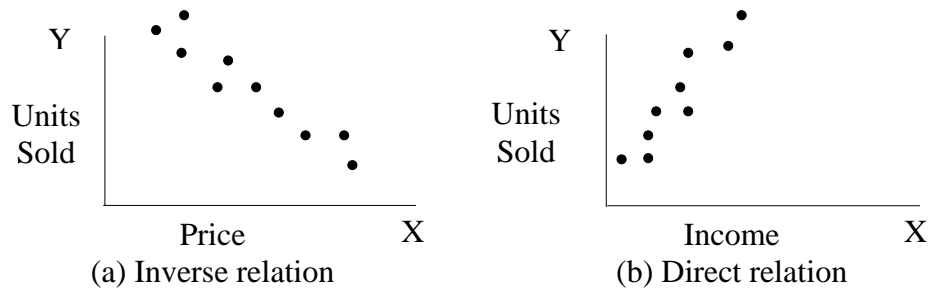
**Figure 2.4: Scatter diagrams**

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.

<span style="float:left">Specifying The Form of The Regression Model</span>

## 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:

$$Q_x = b_o + b_1 P_x + b_2 A + b_3 I \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots . (8)$$

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:

$$Q_x = b_0 P_x{}^{b1} A^{b2} I^{b3} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (9)$$

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

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

# Some important statistical tests

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

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

$$t_{n-k} = \frac{b_i^\wedge i}{\sigma b^\wedge} \quad \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots \text{(11)}$$

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

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 $0 \leq R^2$ or $R^2 \leq I$
- 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.

# 2.4 Statistic Significance

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

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

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)    (-2.91)   (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 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 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
$$Q_x = b_o + b_i P_x + b_2 A + b_3 I \ldots\ldots\ldots\ldots\ldots\ldots. \qquad (12)$$

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

$$QD_x = a_O + a_l P_x \qquad \textbf{(Behavioral equations)}$$
$$QS_x = b_O + b_l P_x$$
$$QS_x = QD_x \quad \text{(Identity) – Market equilibrium}$$

*Marginal labels:*
Trend analysis and projection

Econometric Methods (EM)

Single-Equation Models

Multiple-equation Model