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## **ABSTRACT**

Urban property prices are dependent on and vary with legal requirements within a city, availability of construction finance, the construction scenario, availability of vacant land, demand (further defined by population and migration characteristics), etc. In real estate as in other sectors, the commodity is valued for the benefits / profits that may arise from it. Therefore, it is inevitable that within a city, prices vary from area to area depending on the development characteristics of the area.

Residential property prices are very sensitive to what users perceive to be benefits that may be accrued from the flat. From purely the user's point of view a house must provide security/safety, good comfortable living conditions that may mean well ventilated homes and a pollution free environment, must provide access to basic necessities (markets, schools, health care centers), ease of travel to other places in the city (connectivity) and minimum recurring expenditure (good quality construction). Depending on the level of importance ascribed to each of these features, average prevalent market price may vary from locality to locality.

Within a range established thus, the actual transacted price is always a compromise of the buyer's preferences and the seller's expectations, arrived at through a series of negotiations. These negotiations tend to be based on each party's perceptions of the value of the property in question, the sale price of similar properties in the area in recent history and an intuitive appreciation of the other party's expectations. This system is therefore unreliable and carries a high element of risk considering that each property is distinctly unique and every

buyer's perception different. A rationalization of this process could help in arriving at a reasonable negotiable price for a property. From either party's point of view, this should reduce much of the vagueness and bring in some semblance of order.

This thesis attempts to create a model for arriving at an average negotiable price for a particular property and a particular buyer. It is generally understood that any price that covers the cost of land and construction and allows the developer a reasonable profit margin would be acceptable to him. It is only in the resale market that the question of what the asking price should be becomes critical. However, both the cases it is the buyer's willingness to pay that really cliches the issue. Hence, any attempt at rationalizing the price must consider the end user preferences and choices. This thesis looks at the issue in two stages:

- a) It evaluates the end user perceptions for making a purchase decision and quantifies the same in order to arrive at the amount a person with given set of perceptions would-be willing to spend.
- b) It determines the prices of a property given its qualities as evaluated from the user's perspective.

The thesis concentrates on residential apartment units of the Cooperative Group Housing Society and the developer built types catering to the middle income group category in and around Delhi.

The basis of the thesis is the hedonic theory that states that the price of any commodity may be decomposed into the implicitly prices of each of its component utilities. The first stage, therefore, has been to identify the utilities as are considered by purchasers today. These utilities or factors have then subdivided into their components and subcomponents. A preference structure has been arrived at through a user survey. The latter part of the thesis (model for price determination) has been arrived at through regression analysis of average property prices and their evaluation scores. Forty building have been surveyed, evaluated and assigned scores. A primary survey of 25 real estate agents and consultants has

resulted in average price values for individual properties as well as for different areas.

Finally, the thesis proposes a system by which property prices may be estimated from the user perceptions and how this could be put to use by users / developers / real estate managers / brokers for their individual interests.

# INTRODUCTION

## *1.1 Urban Property Prices*

The price of any commodity is governed by a combination of market forces, essentially demand and supply. In a perfectly competitive market, the price of a product will reach equilibrium where the buyer maximizes his utility and the "seller maximizes his profit. Prices are thus determined by a combination of these forces and are independent of the individual (either seller or buyer) action. Such a market can exist only when both the participants have perfect knowledge of the market and the product itself is perfectly homogenous and divisible.

Real Estate by its very character cannot be classified as a perfect market. It is localized in nature, transactions are private, there is little transparency, the market is unorganized and the commodity is not standardized. The market itself varies with affordability characteristics. Developmental policies and governmental regulations concerning purchase, development and sale of property also affect the real estate market behaviour. Thus, the prices fluctuate widely with changes in economic and political conditions of an area. They also depend on the willingness of the purchaser to spend and his perception of the usefulness (or value) of the property.

The price of a property when viewed from the point of view of the developer consists mainly of the cost of land and development, his overhead and profit margin. For a purchaser, it will have to be looked at in terms of benefits that he may get either from the property or from the direct utility of the property. (That is why residences adjoining commercial centers and roads command a higher price, as they are valued for their potential commercial use.) Thus it is factors like the location of the property, its surroundings, its design, the facilities provided with it and the infrastructure facilities available play an important part in determining the price of the property along with issues like the economic growth of the area, the investment opportunities and the available financing options.

One peculiarity of the property market is that real estate is permanent as compared to any other commodity and the value of a built property appreciates with time. Though its book value may decrease with time and depreciation, its market value may actually increase. Resale prices vary with the age of the property, its state of repair and even the situation of sale. Prices may actually reduce if it is known that the seller wishes to dispose the property in a hurry or is in urgent need of money or increase if the buyer needs to purchase in a hurry.

In commodity markets the prices are more or less stable and do not change unless they are revised through policy decisions. Real estate market prices on the other hand, are built on negotiation. Offers, counter offers and acceptances are necessary elements. The seller's and the buyer's perceptions of the price set the boundaries within which negotiations determine the actual transacted price.

Real estate prices are sensitive to issues linked to customer satisfaction. They can be arrived at in terms of the willingness of a purchaser to pay for the utilities he gains. Within a broad range determined by the city level economic and political situation, current supply/demand status, cost of construction etc., prices would still vary with the purchasers' perceptions. Issues such as location, travel distances and available physical and social infrastructure determine the prevailing market rates, it is the impact of users' perceptions and willingness to spend on a property on the price which if quantified can provide a valuable tool for estimating the price of properties in an area and a general trend for the future. Prices of individual transactions may vary depending on the circumstances of the sale but would still be very close to the value thus obtained. Therefore, the peculiar situations influencing such exceptional cases as distress sales are not studied here as they cannot be generalized.

## ***1.2 Need for Study***

Property prices are greatly dependent on micro and macro-level factors. Being highly sensitive to market forces, they fluctuate, making their prediction difficult. In the absence of a defined, regular market where information is available to all the participants equally, there is much speculation regarding property prices.

Property prices are often the indicators of economic growth of an area and hence are important for investment and planning considerations. Much of the determination of prices is done through a judgement based on the knowledge of past trends and of similar situations in other areas. Such a system is not very reliable and therefore, the actual sale or purchase carries a high element of risk considering that each property is distinctly unique and every buyer's perception different. Moreover, in the prevailing situation there is no reliable advice available for such transactions. There is growing concern about the lack of reliability in real estate transactions and a number of real estate management consultants who are recent entrants in the market, are alienating to bring in some semblance of order. Their efforts though, suffer due to a lack of organized information on properties and their sale prices, which is a basic requirement for any analysis. A systematized study of the influences on property prices, for a certain place and time, leading to quantification of the factors affecting the price would be helpful in the development of a model for price determination.

Such a model could help in reducing much of the speculation that exists today. It would help in understanding the price component of each utility that a property provides and thus, help in analyzing the market behaviour. It may be useful for the purchaser to estimate the price of a certain property with for its bundle of characteristics, It could also be the first step in developing a trend line for the future based on how the factors may themselves vary over time.

***This may help in:***

- Determining the impact of future development on the property prices in an area and thus, may prove useful for making policy decisions and planning policies for an area.
- Making large investment decisions as it may become possible to estimate the approximate sale price (as against its future value) after a period of years.
- Improving the sales and maximizing the returns on investment by a developer by simply concentrating on improving the factors that impact prices positively.



### ***1.3 Aim and Objective***

This study aims to rationalize the dependency of residential property prices on market dynamics as reflected in the user's perception of a property (i.e. on utility oriented demand characteristics) and to formulate a mathematical model for determination of an average negotiable price for a property.

#### **1.3.1 Objectives**

- i) To establish a user preference structure (housing demand characteristics) for the middle income category of Cooperative Housing Societies and developer built apartment units in and around Delhi.
- ii) To develop a baseline model for determining the average negotiable price of a property
  - a) of given characteristics, evaluate for user oriented factors.
  - b) for a buyer, given his profile (age, employment...), preferences and choice of type of flat.

### ***1.4 Scope***

#### **1.4.1 Property Market**

##### ***Scope -Residential Property Market***

Urban property markets in India may be classified into two broad categories - commercial and residential of these, it is the residential sector that concerns a large section of the populace, housing being one of the primary needs of a human being. It is also highly sensitive to changing perceptions and prone to fluctuations.

#### **1.4.2 Housing Category**

##### ***Scope - Apartment units in two distinct categories:***

- a) Co-operative Group Housing societies (CGHS)
- b) Developer built housing

Land being scarce in Delhi, an independent house is often the privilege of a chosen few. A vast cross section of people can aspire only for apartment units. Within Delhi, apart from the Delhi Development Authority (DDA) and an exceptional few in New Delhi that are really a high end market, these are mostly built by the Cooperative Group Housing Schemes (CGHS). On the outskirts of Delhi, especially in Gurgaon, Ghaziabad and Faridabad developers have also built apartments. Also, plotted development has not been targeted.

### **1.4.3 Income Category**

#### ***Scope - Middle Income category***

Housing for both the low and the high income group categories falls into marginalised segments. Houses in the lower income group category are few and built primarily by the Delhi Development Authority. In Delhi, the frenzied buying that took place a few years back saw a rise in demand for the high income segment with larger floor areas and better specifications. This was primarily because property was being looked at purely as an investment. Today, more and more purchases are being made for use rather than for speculation and hence, there is a rising demand in the middle income category.

### **1.4.4 Area Under Study**

#### ***Scope - Delhi and the surrounding areas***

CGHS apartments are mostly found in Noida, Gurgaon and within Delhi in Dwarka, Parpaganj and Rohini. Developer built housing for the middle income category can be found in Gurgaon, Ghaziabad and Faridabad.

### **1.4.5 Factors Under Study**

Scope - Study of factors that determine the buyer perceptions and may be perceived as utilities, other than those that influence exceptional cases such as distress sales.

## ***1.5 Limitations***

- One limitation of any such study is that the average market price as obtained from dealers and purchasers will always vary from the actual price of transaction since prices are fixed through negotiations. These differences are of the order of five percent and hence, not large enough to affect the accuracy of the model.
- The model will be applicable only for Delhi. In order to apply it to any other place, the prices and type of properties there will have to be studied and a supplementary index developed
- Since one part of the model is based on user perceptions, and since perceptions may vary with time, this model cannot be used for all times.

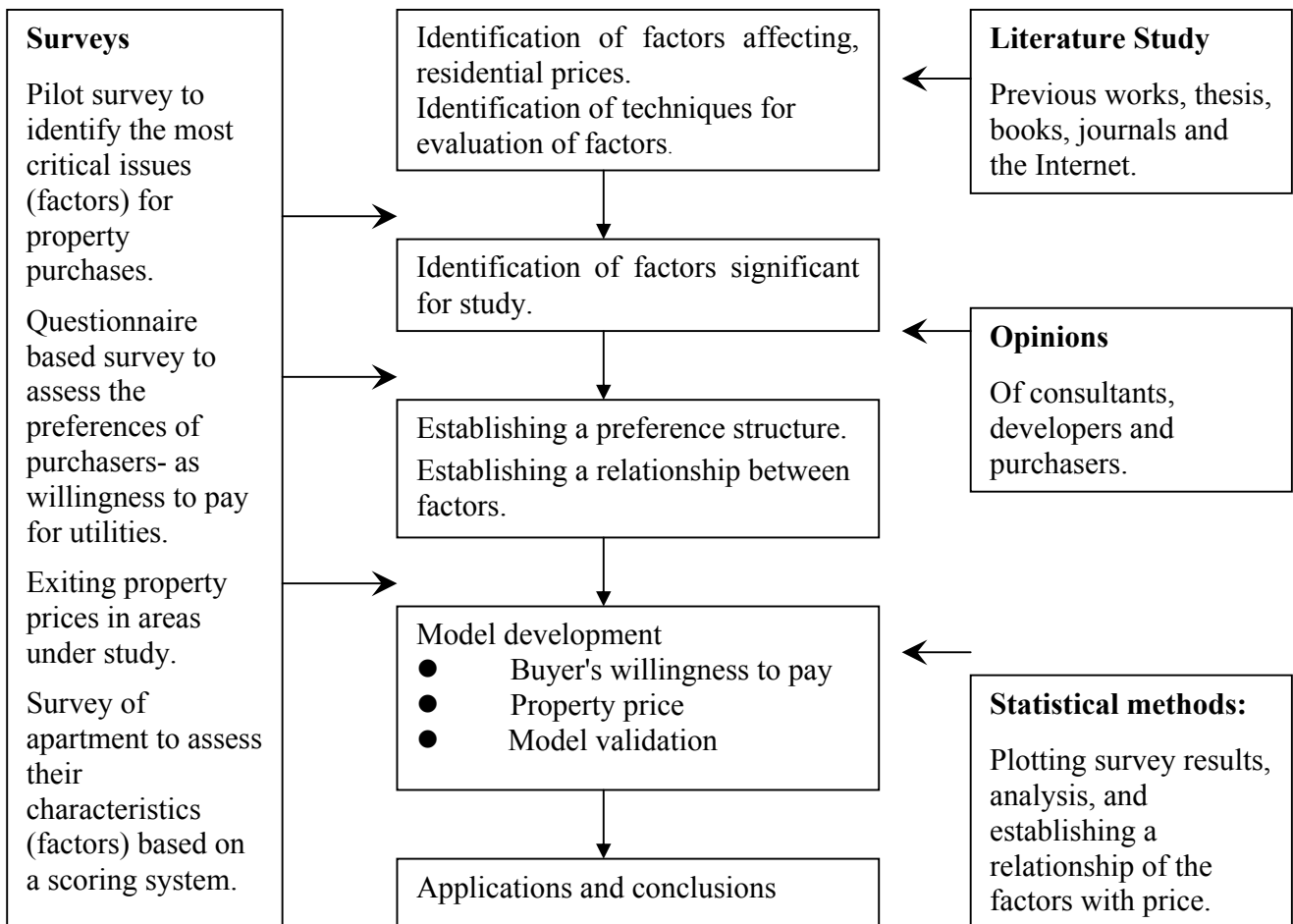
## ***1.6 Assumptions***

- For both initial and subsequent sales the developer/seller determines the lower end of the negotiable price range but it is the buyer's willingness to pay that really determines the price of the property.
- The buyer's willingness to pay is linked to the perceived benefits of purchasing the property.
- The final price will always fall within the range of existing market prices, it is but an element of a set of prevailing market prices of similar properties in a given area and time.
- The actual transacted price will still vary with each case. Only an average price and a range can be determined.

## 1.7 Methodology

The study has been accomplished in five steps as illustrated in the following flowchart.

### METHODOLOGY



### Literature Survey

The first step has been to understand the principles of real estate, the uniqueness of real estate market and issues concerning the pricing of properties. This has followed by the identification of factors affecting residential prices and analytical techniques for evaluation of the parameters defining the price.

## **Identification of Significant Factors**

The next step has been to identify the factors that are critical to the purchase decision and hence to the study. This has been done through a pilot survey conducted among fifteen purchases and additionally, through an opinion survey of real estate consultants and developers.

## **Establishing a Preference Structure**

A survey has been conducted among hundred and forty would be and recent property purchasers to assess the preferences of purchasers as willingness to pay for utilities/ benefits to be gained from the purchase. This questionnaire-based survey has used the methodology of rating factors in the order of importance. The results of this survey have been analyzed to arrive at a preference structure for Delhi.

## **Model Development**

Prices of properties at different locations across the city have been obtained through a primary survey of 25 brokers. These prices have been used to arrive at average prices for the areas under study. Existing property prices in areas under study. Simultaneously, an evaluation of forty residential apartments at different locations has been carried out based on a scoring system established for the evaluation of factors identified earlier. These have been used to analyze the impact of the factors on prices and to develop:

- A model to determine the willingness of a buyer to pay given his preferences, through multiple regression analysis of factor ratings with average prices in the area of choice of the respondent.
- A model to determine the basic price of a property through multiple regression analysis of factor scores assigned to each apartment with its average price.

The model has been validated through application to some selected cases.

## **Model Applications and Conclusions**

Finally, the different applications of the model have been explored and the findings elaborated upon.

# LITERATURE REVIEW

## **2.1 Preface**

This chapter defines real estate, the functioning of real estate markets and the terminology associated with it. In addition, it also covers the issue of property prices. It discusses the factors affecting property prices and in particular those that affect residential markets. Section 2.4 looks at the different methods used to value property and the drawbacks associated with them. Finally, Section 2.5 deals with some similar research done in India and their findings.

## **2.2 Real Estate**

Berens et. al. (2007) said that real estate is a resource and a commodity that affects the welfare of the people involved in buying, selling, improving/developing, leasing, managing, financing, appraising and/or dealing in it otherwise. Real estate may be viewed as a source of investment and profit and the transactions made with such intent may be categorized as business transactions. On the other hand real estate also includes those with interests solely for use e.g. construction and purchase of residences. Whatever it may be, real estate activity as a whole, is an important indicator of the rate of the economy.

### **2.2.1 Definition**

Weiss et. al. (2000, p4) mentioned that “*Real estate consists of land along with improvements and appurtenances that attach to and pass with land (including incidental rights and interest such as easements)*”. Palmer (2003, p3) state that, “*Real estate as a commodity is composed of physical components of land, as nature provided it, and all man made permanent or fixed improvements added on or below the surface of the earth or which have affected the utility of a given parcel of land*”.

Berens et. al. (2007) classify real estate in terms of its physical, legal or economic characteristics. From a physical standpoint, as already mentioned, a real estate property is made on of land and buildings or other improvements. From a legal point of view, it

represents certain legal rights in the property (ownership rights) and from an economic standpoint, it represents benefits that may accrue from it in terms of either monetary returns or direct use. The interest in real estate centers on the optimum use of real estate for greatest economic advantage- largest return in money or amenities over a period. Thus, its value is often judged by its income producing capacity, which guides the decisions of property owners, users, developers, investors and others. Their decisions are influenced by a variety of factors - market forces, business conditions, political trends, legal framework and governmental regulations.

### **2.2.2 Real Estate Markets**

D'Arcy and Keogh (1998, p34) defines, “*A market as a set of arrangements for bringing together buyers and sellers*”. The most fundamental of the general principles of market operation relates to the tendency, in a given market at a given time, inward uniformity of prices for like commodities. According to Berens et. al. (2007) other basic principles are:

- When demand exceeds supply at the current price, the price tends to advance and vice versa
- An advance in price tends to reduce demand and increase supply. Similarly, a decline in prices tends to increase demand and reduce supply.
- An increase in demand, or a decrease in supply, will tend to raise price at least temporarily and vice versa.
- Price tends to move to the level at which demand and supply are in balance.

Real estate is both a consumer good and an investment outlet and its behaviour in the market reflects its hybrid character commodity markets, there is no direct exchange of goods (D'Arcy and Keogh, 1998). An effective market would provide for the balancing of supply and demand forces that lead to the determination of prices that then reflect competitive values. Uniform pricing and trading terms evidence the existence of market controls. Real estate markets differ in that there is no organized exchange, instead there controls be a series of negotiations ranging from direct sales to complicated transactions involving real estate brokers and agents. There is no transparent exchange/dissemination of information and often opinions substitute facts. Hence, the market operates in distorted

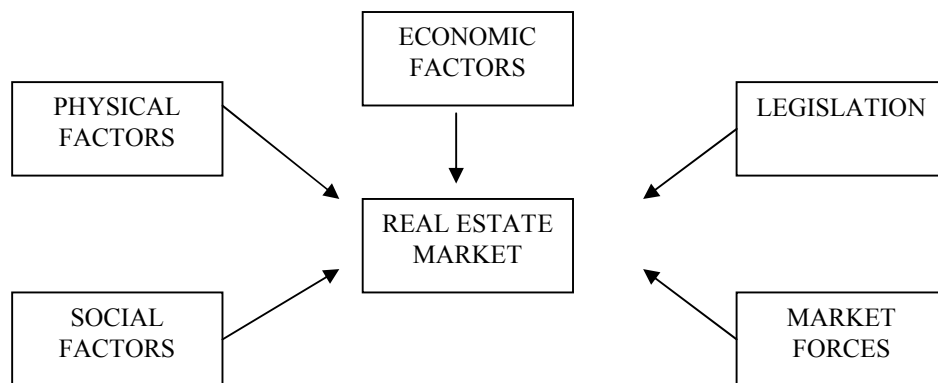


conditions that skew the balance of supply and demand forces resulting in ambiguous methods of determination of prices.

*According to Goodman and Thibodeau (2003, p67) the peculiarities of real estate markets are:*

- The market is local in character and local market forces play an important role in determining real estate activity. The value of a property may also be affected by the character of the locality and the economic base of the region.
- Transactions are private in nature; thus, there is title publicity. Therefore, information channels are not open and the participants remain largely uninformed.
- Commodity is not standardized and is fixed in nature; hence, making each transaction unique
- Market is unorganized.
- The exchange itself is legal and is complex and expensive.
- Prices are further affected by the terms and availability of financing.

Real estate depends on a variety of factors ranging from the political to the social and the economic as illustrated in Fig. 2.1.



*Fig. 2.1 Factors affecting real estate markets (Goodman and Thibodeau, 2003, p67)*

According to Weiss et. al. (2000, p4) the various factors affecting real estate are legislation, finance, physical factors, and market forces. These factors are briefly explained below:

### **Legislation**

- Legal issues - Laws regarding construction, sale and purchase of property and developmental regulations. Refer appendix A for a list a laws affecting real estate.
- Taxation - Laws regarding property tax, capital gains tax, wealth tax, income tax and gift tax etc.

### **Finance**

- Construction and housing finance (their availability and the laws relating to them), performance of the debt market, availability of foreign investment, inflation rates, interest rates and government subsidies.

### **Physical Factors**

- Locational factors - Amenities, crime rate, size of houses, pollution, noise, pollution levels, proximity to contaminated areas, traffic, employment opportunities, transport facilities, etc.
- Construction material and equipment - their availability, transportation, industry performance, subsidies and regulations, excise and sales tax and other import/export regulations.
- Labour-their availability, skill and productivity
- Demographic profile of the town - migration levels, death and birth rates.
- Developmental structure of a city - Infrastructure, presence of work centers and pollution levels.

### **Market Forces**

- Pricing policies, marketing strategies, etc.

### 2.2.2.1 Types of Property Markets

Goodman and Thibodeau (2003) said that real estate markets may be classified as residential, agricultural, commercial and industrial. Each of these in turn could be classified according to the intent of purchase - for use or for investment. The use of the property determines the market behaviour, demand and supply characteristics and the factors influencing them.

Irwin (2002) said that residential markets are more susceptible to fluctuations due to changes in user perceptions. Residences are still mainly viewed as one of the necessities of life. Even when they are purchased for the purpose of investment, there is a tendency to hold on to them. In most cases, specially in India, residential property does not change hands frequently. This may also be attributed to the fact that all properties in Delhi are on leasehold and therefore transfer may be possible only on power of attorney. Demand for residential units also change with population characteristics, expected development in a place, the average household income and the preferences of the people. Chasing demands along with the availability of housing stock (supply) determines the prices in the market.

### 2.2.3 Real Estate Participants

According to Irwin (2002) the primary decision-makers in the field of real estate are the owners. Owners themselves are guided in the process by the lawmakers, financiers, and the advice of consultants and the experience of the users. The principal functions of real estate may be divided into four categories - developing, financing, marketing and other specialized functions. Accordingly, the participants may be identified as those concerned with:

- **Development:** Owners, builders, promoters and contractors as well as government regulatory bodies such as State and Central Government Development Authorities and Municipal bodies that formulate norms and monitor their adherence. A developer may exercise control over the 6 cities provided with the property and the use it is put to. The government provides the regulatory framework within which development proceeds. For example, taxes are often controlling factors in real estate decisions and zoning laws define land use (Irwin, 2002).

- **Financing:** Financial and leading institutions, banks, corporate investors, mortgage companies and individual financiers play an important role in decision-making as a large proportion of funds in any development or even purchase usually comes from borrowings (Irwin, 2002).
- **Marketing:** Real estate brokers, marketers, agents, consultants and developers also contribute by providing market information (demand, availability and prices) to the participants and developing marketing strategies (Irwin, 2002).
- **Others:** Consultants such as architects, engineers, planners, project managers, appraisers, and market and financial analysts and legal experts, provide expert advice on development, use and investment or other transactions (Irwin, 2002).

## **2.3 Prices**

Prices and rents are the regulators of real estate markets and they interact with supply and demand forces. Most of the decisions regarding real estate are taken with a view to putting the property to its 'highest and best use. This reflects in terms of greatest net income, highest land value and the largest return in money or amenities over a period. Thus, a great deal depends on the income potential of a property at a fixed location.

### **2.3.1 Definitions**

#### ***Value***

Value is linked to the income producing capacity of the property. It is defined as the present value of an anticipated future income from a property (Ramabodu et al, 2007).

Ramabodu et al (2007) said that as real estate renders it utility far a large number of years, their value tends to be estimated in terms of the present worth of their future income producing abilities. Real estate has value in relation to its utility and scarcity. That is, people will pay for a property only if it satisfies their expectations of utility. Value also depends, fundamentally, on the service a property renders.

Rees (1998) said that value of property is linked to the purpose of valuation i.e. if the property is concerned with taxation then its value comparative to similar properties is

taken and if it is for mortgage then the value is concerned with its resale. Value may also be based on perception of a property and the sentiments associated with it.

### ***Price***

Ramabodu et al (2007, p8) defined price as, “*The numerical measure of value*”. Prices reflect the relative importance of real estate as compared to other investments. It may not be exactly equal to the estimated value as in the case of effective market competition. Real estate markets being uncertain, it could be either more or less than the value at that time. For example, if a property is to be sold quickly, a buyer must be found who can raise the required cash in a short time and therefore, the price will be lower than what is determined by its actual value.

### ***Cost***

Cost is defined as “*The cost incurred by the developer that includes the cost of land, of site development, construction, maintenance and other administrative expenses*” (Ramabodu et al, 2007, p8). Cost of the property would be relevant only while determining the initial price of the property i.e. when property costs are high as compared to the prices, very little construction or sale will actually take place. Costs affect value and price as much as they affect supply. For all subsequent sales, the cost does not contribute to the price.

## **2.3.2 Factors Affecting Property Prices**

Shimizu and Nishimura (2006) opined that the price of a property will vary with location, business and regulatory conditions, market value, operating expenses and economic conditions and will also with the perceptions of the purchaser. The influences on price will vary with the use the property is put to. Commercial centers are linked more to economic growth whereas the residential areas depend on the facilities and protection it can provide to the users. Real estate prices are affected by a balance of supply and demand forces in the area. They stabilize at equilibrium of these two macro- level forces.

***According to Rees (1998) the real estate supply is characterized by:***

- New construction and intense use of existing stock.

- Availability of loans for construction.
- Long term impact of governmental regulations and developmental norms.
- Construction costs and availability of vacant land for development.
- Demand for a particular type of property may give rise to an increase in supply.

Supply being rather inelastic, the demand factors often become important determinants of prices and rents.

***Rees (1998) further mentioned that real estate demand depends on:***

- Changes in population - The demand for shelter is rising due to an increase in the population of the country. Urban demand is on the rise due to Hue changes in family formation and increase in migrant population.
- Average salary levels - the demand for residential property increases as the personal incomes rise.
- Business prospects - Commercial and industrial markets experience a boom when trade and profit prospects are good and companies tend to buy in anticipation of increased business.
- Finance - Personal savings, availability of loans and interest rates are of importance as these facilitate the availability of funds fix- real estate purchases.
- Rentals - Rentals are of consideration as real estate is often looked upon as a source of income and as mentioned previously the main interest is to secure highest return on investment Rental levels may be dictated by rent control laws and the availability of property for purchase/lease.
- Consumer preferences- Demand for a certain type of property may be influenced by the consumer preferences that are dictated by the utilitarian value of the property and the satisfaction levels generated by its purchase.

*According to Rode's Report (2005) the main factors that influence residential prices are classified into building related factors, location related factors and others. These factors are explained in the following paragraphs. The factors could be further classified into subfactors.*

## **Building Related**

### ***I. Design related:***

- (i) Layout of the individual unit - This may matter in terms of provision of additional rooms or balconies and availability of ventilation and adequate natural light.
- ii) Layout of clusters - This may ensure greater privacy or greater community interaction. Depending on community structure and income group under study the preference of people and therefore its effect on prices may vary.
- iii) Density of development - This is variously viewed by people as provision of open spaces within the cluster or green areas and is related to the perception of a neighborhood being noisy or quiet. Denser developments also induce a perception of insecurity and similarly very sparsely built and populated areas may be perceived as low security areas.
- (iv) The location of the flat in the apartment - The ground floor flat often commands a higher price with respect to the others for the convenience it offers.
- (v) Quality of construction and state of repair - Quality is an important criterion for purchase. It is also strongly linked to people's perception of a builder/developer.

### ***II. Age of the building***

The age of a building may affect its value adversely if it is perceived as being ill - maintained and in a state of disrepair or conversely, if it is so old that it is perceived as a symbol of heritage and thereby acquires an antique value. E.g. a haveli

### ***III. Facilities***

- (i) Garages
- (ii) Parking

- (iii) Landscaping/greens
- (iv) Recreational facilities -pool, dub, playlots
- (v) Water storage tanks
- (vi) Provision of maintenance facilities
- (vii) Security arrangement
- (viii) Emergency electrical supply

Each of these facilities impact property prices differently depending on the market segment looked at. For example, in a lower income group category car parking facilities may not be significant whereas it may be a decisive factor for the higher income groups.

#### ***IV. View of***

- a) slums
- b) greens
- c) development

The view from an apartment is a very perceptive issue. Parks in the neighborhood impact prices positively whereas slums being undesirable may affect it adversely.

#### **Location Related**

Location related factors generally indicate the level of development as well as the future prospects for growth of the area. It is related to both the presence of physical and social infrastructure such as the availability or access to community conveniences such as educational, hospital and shopping centers. It also relates to the security requirements of the community.

#### ***V. Security***

- (i) Threat perception: This may be due to the neighborhood characteristics or simply the perception of the populace. It depends on the presence of antisocial elements in the neighborhood, past cases of extortion, thefts or murders and on the design of the individual units that may allow the ease of accessibility into a house. Threat perception may be enhanced if there is a presence of large tracts of uninhabited land adjoining the property.
- (ii) Physical security measures and presence of security personnel



## ***VI. Surroundings***

- (i) Presence of slums a) aiming the area b) visible from the property c) with direct access to the area.
- (ii) Presence of pollutants such as an industry that may lead to air, water or other kinds of pollution.
- (iii) Traffic
- (iv) Noise

The presence of all these would have a negative impact on prices.

## ***VII. Connectivity***

Connectivity is an important criterion that is viewed as a convenience. The presence of a reliable transport system and road network is important determinants in the property purchase decision

- (i) Presence of road network
- (ii) Availability of public transport

## ***VIII. Distance from***

- (i) Railway Stations a) Within 1/2 km. This may have a negative impact on the property prices, as it will affect other factors such as security and pollution, b) within 1-10 km. Within this kind of a range, this might be considered an advantage.
- (ii) Airports a) within 5km and b) within 5-10 km
- (iii) Shopping centers a) facing the property b) within 1/2km c) within 1/2-km d) >1 km Properties adjacent to shopping centers often have higher market values as they have a better commercial prospects.
- (iv) Schools a) < 1 km. Schools within walking distance may be an advantage to families with very young school going kids. b) within 1-5 km c) > 5 km

- (v) Workcenter - Government, Central Business District and/or District Centers -  
a) within 10 km b) 10-20 km c) >20km.

***IX. Physical Infrastructure***

- (i) Presence of sewage lines
- (ii) Presence of water supply
- (iii) Electricity connection

Absence of these can reduce the prices of properties in an area.

**Others**

**X. *Brand Image*** of the developer may also influence the decision to purchase. Therefore, large companies may charge a premium for their brand image.

**XI. *Legal Factors***

- (i) ownership / presence of a clear title
- (ii) leasehold/freehold

**XII. *Economic Factors***

- (i) Availability of finance/housing loans
- (ii) Interest rates
- (iii) Economic growth prospects for an area
- (iv) Planning considerations for an area

**XIII. *Presence of Competitors***

Increased competition tends to bring down the prices and improve the quality levels as it essentially increases the choice available to the buyer. A builder offering a good quality property along with a choice of financing options may be able to sell more units. A product priced lower initially might tend to increase demand and subsequently the price.

#### ***XIV. Pricing Policies***

- (i) one time payment
- (ii) payment in installments

### ***2.4 Valuation***

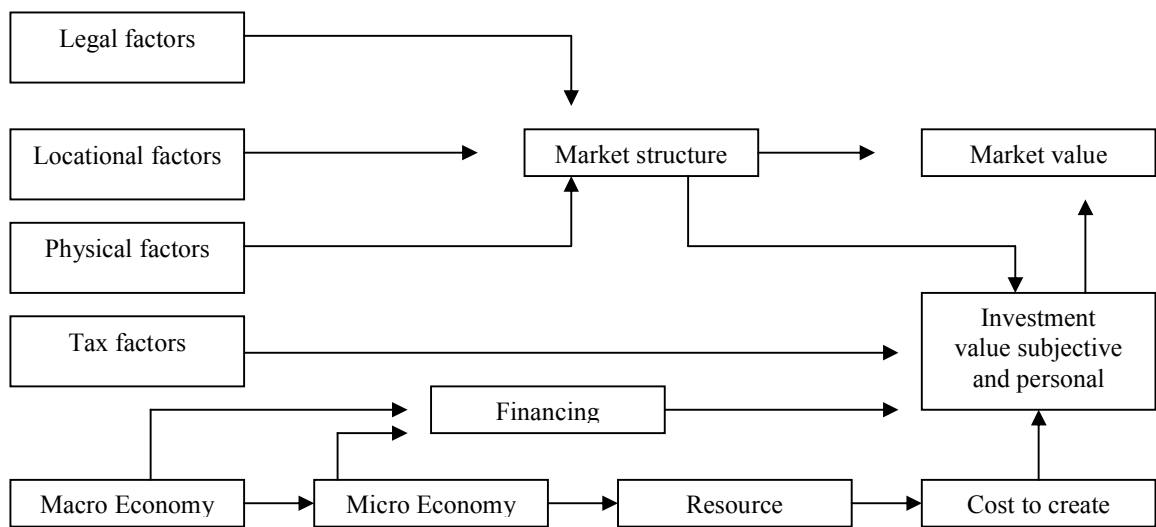
Value may be affected by a variety of reasons and therefore may be looked at from different viewpoints. The main concepts relating to value are:

#### **Market Value**

Rees (1998) defined market value as the highest price in terms of money which a property will bring in a competitive and open market under all conditions prerequisite to a fair sale, the buyer and seller, each acting prudently, knowledgeably and assuming the price is not affected by undue stimulus. In addition, in a truly fair market the number of participants and properties will be large enough to make the transaction truly representative of the market dynamics. Fair market value is also defined as the ability of an asset to command goods in exchange. That is to say that the value of a property is linked to its productivity.

#### **Investment Value**

According to Eldred and McLean (2005) the investment value is the subjective view of the market participant. For the seller, it is the least that they will accept given the personal investment constraints. For the buyers it is the most that they will pay given the amenities that the property affords them and constraints such as income tax rate and interest rates. Transaction as it taken place will ensure that the final price agreed on lies these two extremes and allows mutual benefits to the parties. The difference between the investment value as determined and the market value will be the contribution of personal considerations.



**Fig. 2.2 Factors affecting value (Eldred and McLean, 2005, 59))**

Valuation is the process of estimating what the market value of a property will be at some particular point in time. According to Sirota and Barrell (2003) the basic principals of valuation are:

- (1) Highest and Best use - it is that use, from among reasonably probable and legal alternative uses, found to be physically possible, appropriately supported and financially feasible, and which results in the highest land use. Therefore land is appraised as if put to its use.
- (2) Principle of Substitution - This says that the upper limit on the value of a property A is the cost of a acquiring an equally desirable property that provides similar services to the user as the other.
- (3) Principle of Contribution - This says that a property should not be improved unless the capitalized value of the income added be the improvement exceeds the cost of making the improvements.

There are three basic approaches to valuation - the market approach, the cost approach and the income approach. A comparison of these three is given in Table 2.1.

### **2.4.1 Market Comparison Approach**

The basic assumption underlying the market approach is that similar properties tend to sell for similar prices in the market at a given time (Sirota and Barrell, 2003). The property to be appraised is called the subject and the similar properties that it is compared with as the comparable. First, the subject property is identified and described in detail i.e. all its characteristics are listed. Then this property is compared with a list of comparable that have been sold recently. These must be as similar to the subject as possible in terms of the key characteristics identified. The more the number of comparable the higher the degree of confidence in the valuation. Finally, the differences between the comparable and the subject property are evaluated and adjustments are made for the dissimilarities. If the comparable one has a feature that is more valuable than that of the subject then the price of the comparable is adjusted downward for the estimated value of the difference and if the subject is more valuable then the price is adjusted upward. This estimation of the value of the difference is made through experience and by keeping in mind the cost of the additional constructed feature (Sirota and Barrell, 2003).

According to Weiss (2004) the characteristics for which the properties are compared for are location, time of sale, size of the site and building, characteristics of the improvements and financial factors (pending assessments etc.). This approach comes as close to determining the transacted price of a property as possible (as against the intrinsic value of a property that the other approaches aim at). However, the inherent problem with the market approach is that the estimates of the differences in value are not easy to make. Those of the physical amenities may be calculated but those of perceptive issues such as design and location may not be exactly quantifiable. These are then often approximated based on qualitative judgements. It also requires a large amount of data in order to be accurate. This method is mainly used for evaluation of residential property and of land and for any property that is found in large numbers and is comparable.

### **2.4.2 Cost Approach**

According to Bowles et al (2001) the cost approach is based on the assumption that the value of a property equals the cost of replacing it. Therefore, the value of a property is

determined by assessing the cost of construction of a similar property at the present date adding the land value to it and then, deducting the amount of depreciation.

Using the straight-line method of computing depreciation, the value of a property after deducting depreciation,  $V$  is

$$V = c ( r + s )$$

Where,

- $c$  is the cost of replacing a property
- $r$  is the ratio of the future economic life to the total economic life
- $s$  is the ratio of the salvage value of the property to its replacement cost.

The component  $s$  is considered only if the depreciated value of the property at the end of its economic life is nearly equal to its salvage value and the owner has no choice but to pull down the building.

The cost of replacement (or construction) may be determined by the use of a generalized cost model, or detailed calculations based on the actual specifications and quantities of materials used in the building. These estimates must take into account both the direct and indirect costs incurred by the developer while constructing.

The cost approach is used to appraise older structures and unique buildings such as commercial and public buildings. It is particularly useful for buildings whose income earning capacity cannot be estimated.

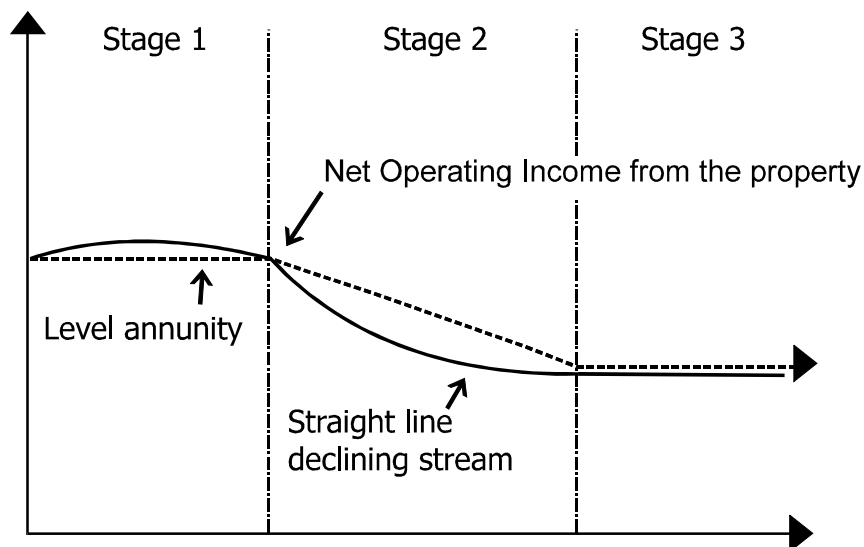
The basic flaw in this approach is that it does not take into account the effect of market dynamics. Though depreciation may account for loss in value due to physical deterioration, the method cannot account for changes in economic value (income potential) due to external factors such as the change in the surroundings or development in the locality. For example, a building might have deteriorated through the course of time but its current market value might have increased due to increased economic growth of the area. This increase in value cannot be estimated with the cost method of valuation. Thus, it does not indicate the price at which a property is sold (Bowles et al, 2001).

### 2.4.3 Income Approach to Appraisal

Bowles et al (2001) said that the income approach is based on the idea that a property should be valued as a function of the income it can produce i.e. a property is valued at the present value of its future returns.

Income of a property may be derived from the rentals generated by the building or as in the case of theater, through the profits accrued from the property. The effective gross income less the operating expenses and fixed expenses including the reserves for replacements is termed as the Net Operating Income (NOI). Where the income is derived from the profits, this approach is termed as the Profit Method and is otherwise called the Rent Capitalization method (Bowles et al, 2001).

According to Bowles et al (2001) the income is then capitalized either through a straight line declining method or as the present value of a level annuity, as present value of perpetuity or through a combination of two or all of these. Each method may be employed for different stages in the life of a property as shown in the Fig 2.3 below.



Stage 1: increase in occupancy leads to increase in income.

Stage 2: income levels decline with age.

Stage 3: income levels stabilizes as property near the end of life.

Fraser (1993) said that the Residual Valuation Technique is an income approach that is based on the premise that the value of the property is in two components - the land and

the building component. If one is known, the other can be estimated. The capitalized income of the property is called the GDV or the Gross Development Value. The GDV is equivalent to the sum of the land value and the building value. The building value of a new construction for instance, shall be taken as the cost of construction plus the profits. Therefore, the Economic Use Value of land, the EUV is equal to the GDV less the cost of building anew and the profit margin. The income approach is used for commercial and office buildings where the income can be defined. Again, the rate of return is market determined i.e. derived from the actual returns for similar properties in the market. This income factor thus, is only an approximation based on the market situation.

	<b>Market Comparison</b>	<b>Cost Approach</b>	<b>Income Approach</b>
Premise	Similar properties sell for similar prices in the market at a given time	Value of a property equal to the cost of replacing it.	Value of a property is a function of the income it can generate.
Approach	The subject property and the comparables are compared on a list of key characterized the differences are adjustments made in the price.	The cost of replacing the property is calculated added to the land value and depreciation is deducted from the sum.	Annual income less the operating expenses is calculated and capitalized. This is the value of the property. In the residual methods, either the value of the building or the land of the subtracted from the GDV to arrive at the other.
Use	Residential property and any other found in the large numbers e.g. petrol pumps.	Old and unique structure e.g. public buildings.	Commercial and office buildings.
Advantages	It is the closest to the transacted value.	Useful where market comparison is not possible.	Useful where income is easily defined.
Shortfall	Differences in terms of perceptive issues cannot be evaluated.	It cannot account for changes in economic value.	An appropriate rate of return has to be assumed for capitalization.

**Table 2.1 Comparison of different approaches to valuation**



Of all the valuation techniques discussed, the market comparison approach gives the most realistic result that would be closest to the market price of a property. This approach is therefore most widely followed. It depends on prices of comparable properties in the neighborhood. Since there is a lack of authentic information on the prices of properties, the value arrived at by this method may not always be accurate. Hence, there is a need to arrive at another approach to estimating the price of a property.

## **2.5 *Real Estate Research***

Research in the field of real estate is undertaken by research institutions, universities, consulting firms, government agencies and other non-government organizations dealing with development. The main areas of research are market dynamics, real estate investment, development policy making and real estate as an economic indicator. The study of demand and supply of housing units and the market for housing is defined as housing economics. This includes not only the characteristics of the houses but also neighborhoods, communities, financial markets and many other factors. The areas of research as conducted in India and elsewhere and the agencies involved in these have been given in Table 2.2.

	<b>Market Dynamics Worldwide</b>	<b>Investment</b>	<b>Policy</b>	<b>Economic indicator</b>
Focus	Price fluctuations Income elasticity Price elasticity Performance Indices Influences	Comparative assessment of real estate with shares Profitability Price trends Influence on prices Real estate investment and return.	Demand studies Forecasting Effects of legislation, taxes and other factors on real estate.	Market trends price and demand forecasting. Market growth patterns Policy implications.
Agencies	Research institutes, universities, professional real estate bodies	Real estate management consultants	Government agencies	World Bank USAID, UNDP and other organisations dealing with development.
Examples	Benefits of amenity improvements through hedonic price models Journal of Land Economics	Real estate price vs stock market returns Real Estate Research Institute	Effects of income tax and land use regulations Center for Urban Land Economic Research	Theory and Estimation in the Economics of Housing Demand
	Land market research	Demand assessment Market feasibility	Population studies for housing demand analysis Land use	
	Center for development studies, JNU	Real estate management consultants	Planning Commission	

***Table 2.2 Areas of Real Estate Research***

Two researches in the past on real estate demand and prices using a similar user oriented approach have been reviewed in the following sections.

### **2.5.1 Metropolitan Housing Market - A Study of Ahmedabad**

Meera and Dinesh Mehta, School of Planning, CEPT, Ahmedabad

This study of the housing market dynamics was done in 1984 under the sponsorship of the Planning Commission

**Aim:** The research study has aimed to make a comprehensive analysis of the processes of housing demand and supply in Ahmedabad and their implications for the formulation of policy guidelines.

**Approach:** The study has examined the supply process and demand choice behaviour separately. The supply side study has been done through a study of the population, economy of the city and housing growth and development patterns, it has also taken into account the number and type of developers, developmental guidelines and laws and their effect on the housing market.

The demand side analysis involved a study of the people's preferences, priorities, constraints and expenditure. A city-wide analysis of the housing situation has also been done. The study has been conducted across different income groups and housing categories such as chawls, apartments and platted development. Different housing attributes and their share in determining prices have been analyzed. In addition, the preference structure for different income groups and their mobility within the city have also been looked into. Finally, the study has suggested policy guidelines for housing development in the city of Ahmedabad.

**Methodology:** The base data for the analysis of the demand characteristics has been collected through an extensive questionnaire based survey. Apart from preference and mobility related information, prices of the individual houses has also been collected. Generally, prices as quoted by the own the neighbours have been averaged out to give a reliable figure.

**Analysis** has been done through correlation of housing characteristics and the prices. Sale price of properties has been taken as the dependent variable. The factors inducted in the study are:

- Shelter related: size, number of rooms, age and outdoor space
- Location related: distance from the CBD and an employment accessibility index calculated from the average distance from one ward to the other wards containing commercial areas.
- House type: chawl, plot, apartment, row type house and bungalows

- Services and quality: structural and surface quality defined on a scale of 1-10, presence of basic civic amenities - water and electricity
- Neighbourhood quality: social composition, site quality (topography, density and organization of spaces), access quality (roads)
- Tenure legal and quasi legal tenure

**Result:** The regression and correlation analysis fix the preference structure has revealed that shelter size explains 60% of the variation of price and other factors that produce significant variations are the number of norms and tenure rights. Location has very little effect and the others produce only marginal variations. These have been further qualified by the house type and the income group.

The study has revealed that housing densities and amount of outside space are not very relevant contributors to the price of a property. Also, the physical infrastructure was viewed merely in terms of its presence or absence and was found to be of low level of significance. Accordingly, in this thesis factors such as presence of physical infrastructure and housing densities have not been included for a user survey; it is assumed that these shall be built into the existing prices in an area

### **2.5.2 Urban Land Pricing Model - Kolkotta**

Masters in Urban Planning Thesis, SPA, 1999, Sudeshna Mitra

**Aim:** The study has aimed to identify different factors that operate in the land market and the degree of their influence on the final market price of land.

**Methodology:** The study has been undertaken at two distinct levels - one at the city scale and the other at specific area level at the city level analysis factors such as infrastructure status, percentage of available vacant land, rate of developmental activity, percentage area under commercial land use and slum etc. have been studied for each of the 32 wards identified. Average land prices as obtained from real estate agents have been correlated with these factors to establish their level of influence. At the area level studies only two specific projects have been looked at - one by the Bengal Ambuja and the other by the Bengal Metropolitan Development Authority. Here the supply side has been looked at,

specifically the timely completion, cost overruns etc. That is the sub processes involved in development have been identified and their effect on the final sale price evaluated.

**Result:** The regression analysis shows that the rate of development affects prices most and the percentage of land under commercial use is significant. Other factors have been found insignificant.

The study has been done at a city level and hence local influences on price have not been considered. Since housing sector has been targeted, issues directly relevant to end users e.g. travel distances should have been considered. One finding that is in common with the earlier study is that the status of infrastructure development is not significant.

## **2.6 Summary**

This chapter has dealt with the description of real estate, real estate market, its characteristics and influences. Real estate is classified in terms of its physical, legal or economic characteristics. Some peculiarities of real estate markets are that it is local in character, is fixed and is unorganized. It suffers for the want of information. Also, local market forces play an important role in determining real estate activity. The main factors affecting real estate markets are legal issues, taxation finance, physical factors and other market forces.

Real estate markets may be classified as residential, agricultural, commercial and industrial. The use of the property determines the market behaviour, the demand and supply characteristics and the factors influencing them. Changing demands along with the availability of housing stock (supply) determines the prices in the market.

Prices and rents are the regulators of real estate markets and they interact with supply and demand forces. Value is linked to the income producing capacity of the property. It is defined as the present value of an anticipated future income from a property. Value of property is also linked to the purpose of valuation. Price is defined as the numerical measure of value. Prices reflect the relative importance of real estate as compared to other investments.

The price of a property will vary with location, business and regulatory conditions, market value, operating expenses and economic conditions and with the perceptions of

the purchaser. The influences on price will vary with the use the property is put to. Real estate prices are affected by a balance of supply and demand forces in the area. The main factors that influence residential prices are:

- Building related e.g. facilities
- Location related e.g. physical infrastructure
- Legal Factors
- Brand Image
- Economic factors
- Presence of complicates and pricing policies

Valuation is the prices of estimating what the market value of a property will be at some particular point in time. There are three basic approaches to valuation - the market approach, the cost approach and the income approach have been discussed. However, even the most reliable of the approaches may not give accurate results because it depends on information on prices of comparable properties in the neighbourhood, which may not be available.

Finally, two similar studies have been reviewed. The study has revealed that housing densities, status of infrastructure development and the amount of outside space are not very relevant contributors to the price of a property. The local factors that are of immediate concern to the users would affect prices more significantly. Therefore, a user survey to identify the relevant factors might be the right methodology to adopt.

The next chapter deals with the methodology for analysis, statistical techniques that may be employed for such analysis and their use in the thesis.

# RESEARCH METHODOLOGY

## *3.1 Preface*

This chapter presents an exploratory study of the various techniques that may be utilized for the evaluation of the actors and thereafter for the development of a model. It begins with an overview of the requirements of this study and the characteristics of the factors under review. This is followed by the methodology for data collection including notes on survey patterns and questionnaire preparation. Sections 3.6, 3.7 and 3.8 deals with techniques for evaluation including those for identification of significant factors, determining influences on the dependent variable and establishing relationship between the factors. These techniques are followed by a brief description of their application in the study. The final section, 3.9, defines the Hedonic Theory of pricing and describes in brief its relevance for the present study.

## *3.2 Introduction*

The intent of this thesis is not to either predict or project but to arrive at the value of a property as dependent on its characteristics. This process of arriving at the value of the property has always been very arbitrary. Generally, one can arrive at an estimate by comparing it with similar sales in the recent past. However, due to a lack of sufficient recorded data on sales, such estimates are not very reliable. Most estimates thus, have to rely on human perception and judgement.

Judgmental methods will always be open to biases and are only useful when sufficient data is not available. Experience, foresight and intuition help in arriving at a decision. Judgmental methods also rely on perceptions of past trends and interaction with real estate players for their opinions.

Statistical methods on the other hand, use an objective process of arriving at a value, whether through the past trends or that of comparative sales. For this purpose, either extrapolation or causal statistical methods could be employed. Extrapolation methods assume that historical data contain a stable pattern, such as

a trend or a seasonal cycle, which will continue in the future. While estimating the influence of the factor on the dependent, it must be kept in mind that patterns of the past may not hold indefinitely and hence have to be reviewed every 2-3 years. Causal methods attempt to find relationship between the variable to be forecast and one or more other variables. For example for this study, the price may be forecast as a function of its characteristics. These techniques shall be described in detail in the forthcoming sections.

### ***3.3 Study Methodology***

The study starts with the identification of factor, followed by data collection in terms of the purchaser’s determination of the influence of the factors on price and the establishment of a relationship between price and the factors as identified. The various techniques that may be employed for the purpose are given in Table 3.1.

<b><i>Overview of techniques for study and analysis of factors</i></b>	
<b><i>Process</i></b>	<b><i>Techniques</i></b>
Data collection	<ul style="list-style-type: none"> <li>• Observational studies</li> <li>• Primary survey</li> <li>• Secondary survey</li> </ul>
Identification of the significant factors	<ul style="list-style-type: none"> <li>• Kruskal Wallis test</li> <li>• Factor analysis</li> <li>• Principal component analysis, cluster analysis</li> </ul>
Determine of the influence of factors on price	<ul style="list-style-type: none"> <li>• Delphi technique</li> <li>• Correlation of variables</li> </ul>
Establishing a relationship between the factors and price / modeling	<ul style="list-style-type: none"> <li>• Regression</li> <li>• Linear / non - linear regression</li> <li>• Trend forecasting and time series</li> <li>• Trend forecasting and time series</li> </ul>

***Table 3.1 Overview of techniques for study and analysis of factors***



### ***3.4 Characteristics Of Factors***

The factors that affect real estate prices, as enumerated in Chapter 2, have their own peculiarities that may have to be dealt with separately. Their basic characteristics are:

- The factors may not be termed as being completely independent. They may be influenced by other factors. Two factors, each influencing price, may also be correlated. Such correlation may be studied if sufficient data is available.
- Moreover, a number of components any together constitute an individual factor. These sub factors may have to be identified separately and studied individually to estimate their effect on the price.
- The factors shall not be constant over different income groups and type of residences under study. For example, they will be different for individual plots, where it being in a comer or facing a road may affect its price considerably as against apartment dwellings where other issues such as its presence on a particular floor may be more relevant, similarly, for people who own vehicles, distances may not matter.
- The factors are dynamic i.e. their influence may vary with time or with other issues.
  - Variation with time: The imposition of a certain developmental control law may adversely affect housing supply and therefore property prices may go up in the beginning. However, with time as this be is established, it would no longer affect prices as severely. Such sudden changes any not be possible to study but on the other hand, a steady quantifiable variation may be analyzed as a time series.
  - Variation with people's perceptions: The perceptions of people over what is an important criterion for property purchase

decision may change. For example, a pollution free environment may not have been such an important issue some years back.

- Variation with the intent of purpose: If a property is locked at as purely an investment, then factors e.g. value appreciation in future, gain greater weightage than if it were purchased purely for use.
- These factors may be broadly classified as locational / preferential (macro and micro level) variables and economic/legal (macro variables) issues. The micro level locational issues e.g. the presence of a garbage dump near the property can only be detailed out for a specific location whereas the macro level issues may be studied across the city. Economic and legal factors may be studied over period using time series methodology.

### ***3.5 Techniques for Evaluation of Factors***

#### **3.5.1 Data Collection**

Observational studies are those that are independent of the researcher as against experimental techniques where results may be modified by the researcher's actions. The parameters of the situation are left unaltered. The study often takes the form of a questionnaire-type survey and inferences are drawn on the interrelationships between the various factors depending on the observations. The methods of analysis must be borne in mind before designing the survey questionnaire. There are two basic forms of surveys - primary and secondary. The primary survey consists of original data collected by the researcher for the purpose of the study. Secondary survey on the other hand involves collection of data already present in some or the other form and which may have been gathered in some similar study in the past.

Here, two types of primary surveys shall have to be done. One shall be a questionnaire based opinion survey to evaluate the preferences of the consumer- in this case both the recent purchaser and the intending buyer of property. The survey shall be conducted on a cross section of purchasers from various locations in Delhi

and the surrounding areas. The other survey has been conducted to find the property prices as existing in Delhi and has been done across real estate agents, consultants and recent property purchasers. The secondary survey has involved study of property prices as published in journals, newspaper reports and as gathered from consultants.

#### ***3.5.1.1 Features of a Questionnaire***

- A questionnaire must be short and to the point.
- Each question should be limited to a single idea.
- The questionnaire should have clarity. Questions must be relevant to the purpose of the study and must have no ambiguity.
- The questions must not be biased or leading.
- Questions requiring long answers must be avoided.
- In order to help the respondents with the answers, choices may be provided.

#### ***3.5.1.2 Methodology of Questionnaire Preparation***

The final questionnaire has been arrived at in three stages. Stage one involves the preparation of a listing questionnaire. This is a basic format of the questionnaire and gives a detailed list of the Factors under study. The second stage involves conducting a pilot study on a group of 10- 15 people, representative of the final target group. These people may be purchasers, residents or even experts - researchers, consultants and developers. In the final stage, the questionnaire has been modified based on the feedback received from the pilot study. Questions have been added, deleted or changed according to the final analysis that has to be performed.

#### ***3.5.1.3 Format of the Survey***

The questionnaire has three distinct parts. The first one is introductory in nature and gives basic information on the intent and structure of the survey. Next, the questions are designed to elicit information about the respondent - this may

include the respondent's name, family size and income etc. This may be helpful for classification of data and its subsequent analysis. The final portion has the questions for the study on the factors affecting the residential property prices and purchase decisions.

### ***3.6 Determining Influences***

#### **3.6.1 Assigning Weightages**

The influence of the various factors on price of residential properties can be quantified and assigned weightages. This may be possible through surveys and opinion polls as may be attempted in this thesis. However, it is equally possible to achieve the same through the Delphi technique. The Delphi technique uses discussions to arrive at a consensus on an uncertain issue within a group of qualified individuals. This method minimizes the biases arising from a single group opinion. A number of developer, real estate brokers, consultants and purchasers could be brought together for a consensus view on what may affect property prices. This technique would still have the short fall that the result would not be truly representative of the market situation. That can only be assessed from a detailed market survey of the purchaser' views and preferences and by relating it to the market rates.

#### **3.6.2. Strength of Association**

The correlation coefficient is an index number that is used to indicate whether two paired variables in a given set of data are associated and if they are then what is their level of association. The value of the coefficient ranges from -1 to +1. A correlation near +1 means little scatter i.e. one variable is directly proportional to the other. A value near zero implies little correlation between the two variables - they may behave in tandem or they may not. A negative correlation exists only when there is an inverse relationship. A general limitation of the correlation coefficient is that it does not indicate the relationship between the variables; it only indicates whether the relationship exists or not. That is, it is difficult to interpret it quantitatively. The correlation coefficients of two sets of data may be numerically the same although the relationship between the variables may be quite

different. Also, although two variables may be perfectly correlated, there may actually be no direct causal link between the two.

The formula :

$$r = \frac{\text{covariance of x and y}}{\text{Variance x} \cdot \text{variance y}}$$

$$r = \frac{\text{sum } (x - \bar{x})(y - \bar{y})}{\text{sum } (x - \bar{x})^2 \cdot \text{sum } (y - \bar{y})^2}$$

Sometimes, data on two variables may be in the form of ranks instead of quantitative measurements. This means that the n items are not measured, but rated in order from 1 to n on each variable. For the case under study, the characteristics of each property may be ranked on a scale of one to ten based on a pre-established set of criteria. Then the price of each property may be correlated to its properties using either the Spearman's ranks correlation coefficient that uses the ranks as measurements or with Kendall's rank correlation coefficient. The Kendall's ranks correlation coefficient can also be used to establish the correlation between two characteristics / factors under study for a given set of residential properties.

### ***3.7 Identification of Significant Factors***

Frequently, there are a large number of independent factors that appear to affect the dependent variable but at the same time would be very time consuming and complex to analyse. Besides, the effect of each of these on the dependent variable may be very small. It is therefore useful to be able to reduce this large set of variables to a smaller set on which regression or discriminant analysis may be carried out.

#### **3.7.1 Technique for Analysis of Ranked Data**

The data received from the survey is the form of scores against each of the factors/variables whose influence on the property purchase decision (and

ultimately, on the price of a property) is to be analysed. It may not be certain at the outset whether such data would fall within a normal distribution.

Therefore, a nonparametric method of analysis is used for the analysis. The first part of the analysis involves the determination of the influence of the factors on the property purchase decision (table 3.1). Firstly, it shall be determined through the Chi Square test that whether all factors have equal influence or that one or more factors may in fact be dominant over the others. In case all the factors have equal influence, it may indicate that there is no customer preference for any particular factor for the purchase of a property. This shall be followed by determination of the level of their influence or contribution on the purchase decision.

The rank sum procedure is used for the analysis of rankable data or for analyzing two categories of variables. For a data set to be rankable it must have a gradation of values or it must lend itself to comparative evaluation (e.g. anything that can be graded as good, better, best). Here for the Chi-square test, the Kruskal - Wallis method is used.

### ***3.7.1.1 Kruskal - Wallis Test***

#### ***Main features of this test are:***

1. It is a nonparametric method of analysis i.e. can be used in situations where the normality assumption is unjustified.
2. It converts all data to ranks.
3. It gives an approximate indication of level of influence.
4. It is a quicker and easier method of analysis.

It is used to test the Null Hypothesis that all factors have an identical influence on purchase decision against the alternate hypothesis that some factors may be more dominant. It may be used for situations with data sets greater than or equal to five.

### ***Methodology :***

- (i) All data are ranked in ascending order where the lowest value is given the first rank.
- (ii) Ties are resolved i.e all tied values are given an equal average rank.
- (iii) The block is indicated by i.  
Individual ranks are indicated by j. a = no. of blocks, n = no. of ranks per block,  
N = total no. of values.
- (iv) Variance =  $s = \frac{1}{N-1} \left[ \sum_{i=1}^a R_{ij}^2 - \frac{N(N+1)^2}{4} \right]$
- (v)  $H = \frac{1}{N-1} \left[ \sum_{i=1}^a R_{ij}^2 - \frac{N(N+1)^2}{4} \right]$
- (vi) H is tested for significant at the desired level of significance for a - 1 degrees of freedom. If H is greater than the Chi-sq. value then the Null hypothesis is rejected i.e. one or more factors are dominant/significant.
- (vii) The R /n gives the mean rank sum as an indicator of influence. Therefore, the factor with the highest mean rank sum value is removed and the test performed for the others. If this test also proves significant then it proves that another factor may be dominant. The factor with the next highest mean rank sum is then removed and the test is performed again until all remaining factors may prove to be insignificant.

## ***3.8 Establishing Relationship Between Variables***

### **3.8.1 Regression**

A regression model is used to determine the relationship between the dependent variable and the predictor or independent variable/s. Let y be the dependent variable and x be the predictor variable. Y could depend on a series of x variables that may or may not be interdependent. Relationships may be linear or nonlinear. In both cases, the data is plotted and a line of best fit is drawn to represent the

relationship. In case of nonlinear relationships, a curve may represent the relationship best. It may be guessed at by looking at the data set. It could be an exponential relationship in which case it may be described by converting the variables to their logarithmic values and applying linear regression. That is, instead of simply plotting y against x it may also be plotted against a function of y such as  $y^2$  or  $\log y$  etc. This might give a linear relationship between the new forms of the variables used. Regression models are widely used to forecast variables. They are for this purpose, used in conjunction with time series data for trend analysis.

### ***3.8.1.1 Linear regression***

The linear regression model is used to determine the relationship between one predictor and one dependent variable and assumes that a series of values for the two variables when plotted fall on a straight line.

The line may be given by the equation

$$Y = a + bx_i + e_i$$

Where, a is the intercept coefficient, b is the slope of the line and e is the error term. The line chosen to represent the relationship should have the least amount of scatter. This line of best fit is determined through the least squares criterion. The sum of squared distances of the values from the plotted line should be minimum.

Sum of squared errors,  $S = \text{sum of } (y_i - a - bx_i)^2$  should be minimum

$$a = \frac{1}{n} (\Sigma y - b \Sigma x) = \bar{y} - b\bar{x}$$

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

b is also called the regression coefficient

### ***3.8.1.2 Multiple Regression Analysis***

Multiple regression is used where there is a new data set with a number of variables and one is regarded as of particular interest which is then related to the



rest. This is relevant only in situations where the factory is given numerical values. This method may be more relevant for the present study where the variation of price with various factors such as location, facilities or security is to be analyzed.

An equation of the form :

$$Y = a + b_1x_1 + b_2x_2 + \dots + b_ax_a$$

where,  $x_1, x_2, \dots$  are the factors affecting residential property prices and  $y$  is the price of a property and  $b$  is the weightage assigned to each factor, can be determined. The method of least squares can be used for arriving at the best fit. A multiple correlation coefficient,  $R$  is calculated similar to the linear regression coefficient.

### ***3.9 Hedonic Theory***

The Hedonic Theory of price determination state that the price of any property is a function of the various component utilities that it offers the purchaser. Thus, the price is determined by may be valued in terms of the pleasures it offers.

The study of a residential market itself to such a theory, as it very user oriented. A residence may be purchased in a particular locality because of the amenities it offers or because it is situated near the CBD thereby decreasing the travel time and cost. Similarly, a good quality house may mean lesser recurring expenditure on maintenance and repairs. Each additional facility affords a convenience and a cost component may be ascribed to it. Therefore, the price of a property is the sum total of the implicit prices of the components determined by the willingness of the purchaser to pay for the utilities he gets. Thus, a survey aimed at determining the user / purchaser requirements and perceptions of the property has been used as it is expected to give a sufficiently fair indication of what affects the prices and how much. For further information on the usage of hedonic principles in housing economic studies.

### ***3.10 Summary***

The study starts with the identification of factors, followed by data collection in terms of the purchaser's opinions and finally, data analysis. Analysis involves identification of significant factors, determination of the influence of the factors on price and the establishment of a relationship between price and the factors as identified.

The factors studies have certain peculiarities. The factors may not be termed as being completely independent. They may be influenced by other factors. Two factors, each influencing price, may also be correlated. Moreover, a number of components may together constitute an individual factor. The factors are not constant over different income groups and type of residences under study. The factors are dynamic i.e. their influence may vary with time. Macro issues such as economic and legal factors, unlike micro level issues such as locational / preferential issues, may be studied over a period using time series methodology.

Observational studies such as this one, depend on questionnaire-type surveys and inferences are drawn on the interrelationships between the various factors depending on the observations. The methods of analysis must be borne in mind before designing the survey questionnaire. The primary survey consists of original data collected by the researcher for the purpose of the study. Such a survey has been conducted to find the property prices as existing in Delhi and has been conducted across real estate agents, consultants and recent property purchasers. The secondary survey involves study of property prices as may be published in journals, newspaper reports and from consultants. Similarly, users' preferences and property characteristics have been evaluated through primary surveys.

The first part of the analysis involves the determination of the influence of the factors on the property purchase decision. In case all the factors have equal influence, it may indicate that there is no customer preference for any particular factor for the purchase of a property. The Kruskal Wallis test is used to determine the influence of the factors on the property purchases decision. This test is

particularly useful for nonparametric data. This test may be used to identify the significant factors in the study.

The influence of the various factors on price of residential properties can be quantified and assigned weightages. The level of association between two variables may be arrived at through the correlation coefficient. The value of the coefficient ranges from -1 to +1. A coefficient of Zero indicates that there is no relationship between the two variables. For the analysis of ranked data as used in this thesis, the price of each property may be correlated to the ranks of its properties using either the Spearman's rank correlation coefficient or with Kendall's rank correlation coefficient.

A regression model is used to determine the relationship between the dependent variable and the predictor or independent variable/s. Relationships may be linear or nonlinear and curve fitting techniques are applied to arrive at the curve that may represent the relationship best. A multiple regression analysis is used for finding the relationship between one dependent variable and a number of independent variables. The contribution of different factors to price of property is best estimated using this technique.

The thesis has used the Hedonic Theory as a basic approach to determining the price of a property. A property is viewed in terms of the benefits that may be gained out of it and its price is thereby an addition of the implicit value of the utility oriented characteristics of the property. The next chapter gives an introduction to the study areas both in terms of market segments and locations. It describes the methods of study and gives a format for the survey.

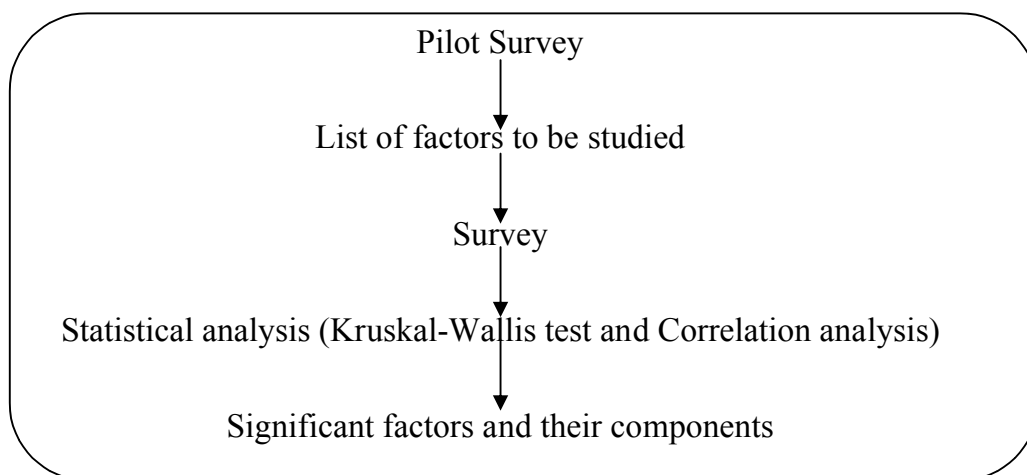
# PREFERENCE STRUCTURE

## 4.1 Preface

This chapter, as a first step in the model, explores the buyers' preferences as existent in Delhi today and establishes a preference structure for an apartment purchase decision. This has been achieved through identification of the factors under study, followed by a user survey across different locations in Delhi and analysis of the survey results. Section 4.1 details the approach followed. Sections 4.3 and 4.4 explain the survey, its analysis and the results. Apart from establishing the preferences of like people, it also helps arrive at the constituents of each of these factors and at those that should be included for further study.

## 4.2 Methodology

All utility oriented factors have been short listed from the detailed list arrived at earlier. These have been put to test through a pilot survey subsequently. Only the factors (user oriented) that dominated in the pilot survey have been used further in the main survey. The survey results have been analyzed to arrive at the comparative importance of various factors and the contribution of their various components.



*Fig. 4.1 Methodology for arriving at a preference structure*

### 4.3 Pilot Survey

The pilot survey was conducted amongst a group of 15 select people in order to arrive at a shorter and more relevant list of factors that may be studied. The survey consisted of open-ended questions that allowed the respondent to reveal his/her preferences and factors that he/she would consider most important for making the purchase decision. The questionnaire has asked for both a comparative ranking for each factor as well as rating score on a scale of 1 to 10 where 10 is the maximum score. Refer Annexure A.

#### 4.3.1 Results of the Pilot Survey

Sixteen factors were identified through the pilot survey. Depending on the ranks given to each of them, their relative importance for a house purchase decision was analyzed. Inferences have been drawn based on the number of times a factor had been given a number one rank or a rank higher than five and its mean rating. Refer table 4. 1.

Results of the pilot Survey

S. No.	Factor	Results			Inference
		Most important factor	No. of times ranked higher than 5	Mean rating	
1.	Location	8/15	1	9.5	Location is the most important criterion for house purchase decision.
2.	Security	3/15	4	8.5	Security is of high significance.
3.	Quality of construction	2/15	3	8.5	Quality is of some concern as it figure amongst the 5 most important factors.
4.	Facilities	1/15	6	8.2	Facilities offered with the flat also seem to be significant.
5.	Image		7	7.5	Image of the promoter will be of concern to those who are purchasing developer built flats.

S. No.	Factor	Results			Inference
6.	Parks		2	8.6	Presence of parks near the apartment seems to be an important criterion for flat purchase.
7.	Connectivity		5	7.5	Connectivity may be studied as one of the factors as its average rating as well as rank is high.
8.	Markets		8	7.5	Proximity to markets may be studied as a subject of location.
9.	Quiet environment		9	5.0	This may not be relevant as a distinct issue.
10.	Recreational club		10	8.1	Recreational facilities may be clubbed together with other facilities.
11.	Payment policy		11	7.1	Payment policy may not be relevant to resale situations.
12.	Parking space		12	5.1	Parking space has low individual score and may be studied as part of facilities.
13.	View		12	3.7	View may not be have any significance at all.
14.	Privacy		14	6.1	Privacy is not significant for the purchase decision.
15.	Neighborhood		15	2.0	This is of low concern.
16.	Layout		16	5.4	Layout is of low concern.

***Table 4.1. Results of Pilot Survey***

Factors with a high mean rating as well as a high ranking have been considered important enough for inclusion in the questionnaire for the main survey. A number of factors that have been rated highly but are really connected to other factors were clubbed together under a single head. For example, location gets " rating of 9.5 and appears to be the most important factor (is ranked at the top eight times out of ten) and has been included in the final list of factors. On the other hand, neighborhood and design issues such as view, layout and privacy have received low ranks and mean ratings and therefore have not been included for further study. Refer table 4.1.

#### ***4.3.1.1 Final list of Factors***

A final list of factors was arrived at through the results of the pilot survey and further discussions with real estate consultants and developers for incorporation in the main survey questionnaire. The factors have been classified under seven main heads each with its sub - components and are as under :

##### ***(i) Location***

- Surrounding
- Proximity to greens
- Proximity to workplace
- Security
- Proximity to market
- Proximity to schools
- Resale value
- Connectivity

##### ***(ii) Security***

##### ***(iii) Facilities***

- Recreational facilities
- Parking facilities
- Security facilities
- Emergency electrical supply
- Maintenance facilities

##### ***(iv) Quality***

##### ***(v) Promoter's image***

##### ***(vi) Proximity to parks***

##### ***(vii) Connectivity***

#### ***4.4 Main survey***

A hundred and forty households have been surveyed across Delhi and the surrounding areas under study i.e. Gurgaon, Dwarka, Ghaziabad, Faridabad and Noida. Again only people who were planning to purchase within the next couple of months (of the survey that was carried out in the month of April 2007) and those who had purchased flats recently were targeted. The questionnaire has been designed to elicit unbiased answers from the respondents. They have been asked to

give scores to the factors depending on the importance they attached to each while making hire purchase decision. The scoring of the factors has been done on a scale of 1 to 10 where 1 is least and 10 the most important. Through subsequent questions, the factors have been further broken down to their subcomponents and the level of importance attached to each of the subcomponents has been analysed through a similar scoring system. For the questionnaire for main survey, refer Annexure- B.

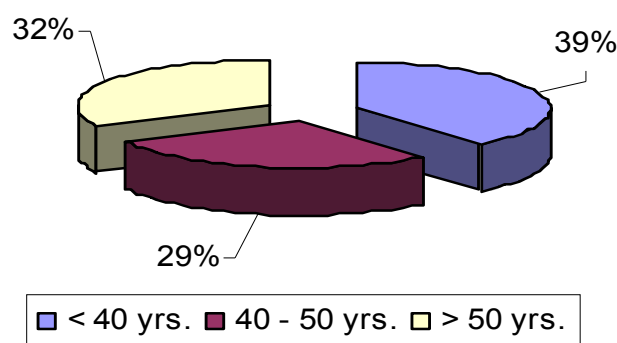
#### 4.4.1 Data Characteristics

The section on respondent profile included questions seeking information on age, educational qualifications, employment characteristics and ownership characteristics such as whether the person is planning to purchase a property in the near future, or already owns a flat and if so, where.

##### 4.4.1.1 Age Group Characteristics

- Data is divided into 3 age groups <40 years, 40-50 and >50 years.
- Data has even composition in terms of age.
- Age group wise analysis may provide insight on the changing perceptions of people with age.

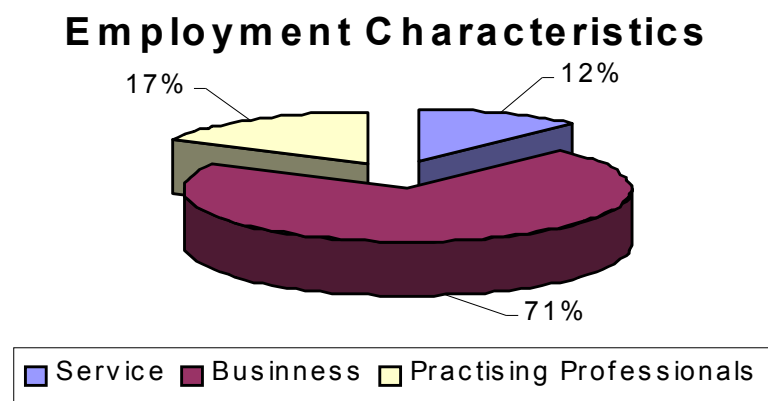
### Age Group Characteristics





#### 4.4.1.2 Employment Characteristics

- The data was analyzed as three categories - the service, private practice and business categories.
- Of the fifty people surveyed, fifteen respondents, i.e. 30% of the total, belonged to the non- service category.
- Thirty-five respondents were of the service category. This being the majority category the results may be representative of this category.
- The results when analyzed according to the employment characteristics may reveal such a bias if it exists. It is expected that a large percentage of the non-service category may show a preference for the location of the property over other things.

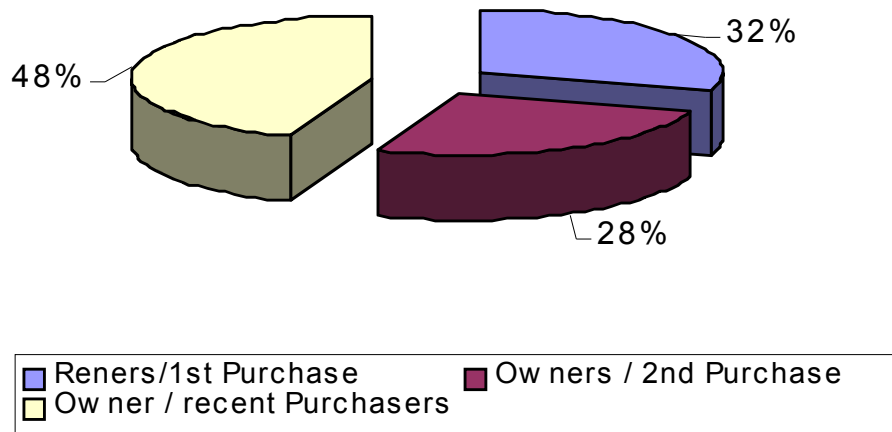


#### 4.4.1.3 Ownership Characteristics

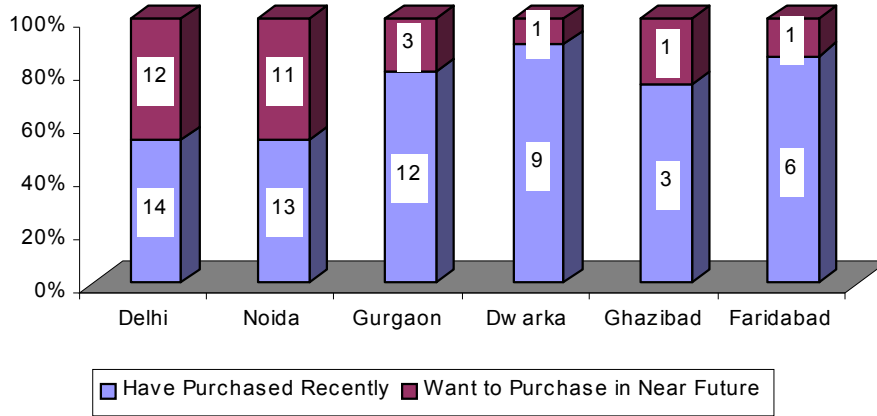
- A very large number of the respondents are flat owners-about 68%.
- 20% are owners intending to purchase their second fiat, whereas the others are all intending buyers.
- Since most of the respondents have gone through the decision making process once, one can expect clarity in the data.

- 66% of the respondents owning a flat have purchased it recently. The rest are planning to purchase their second house.
- A large percentage of second time purchased seem to be concentrated in the Delhi (47%) and Noida (31%) regions.
- The flat owners are well spread across different areas.
- 55% of the respondents planning to purchase are house owners and 34% of those are planning a flat in Delhi, 25% in NOIDA and 23% in Gurgaon. The rest are planning a house in Dwarka.
- Of the respondents planning to purchase their first flat, 29% choose Delhi, 21% Noida and 19% choose Gurgaon.
- Ghaziabad seems to be an unpopular choice.

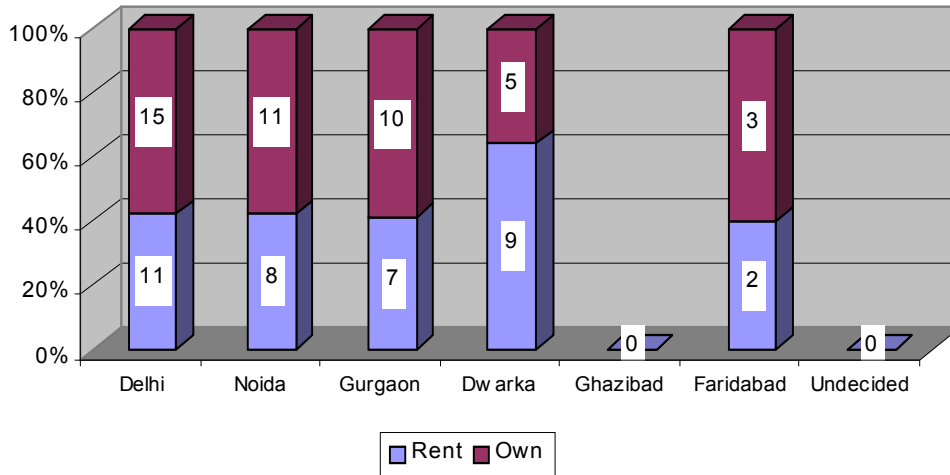
### Ownership Characteristics



### Ownership - Area



### Choice - Area



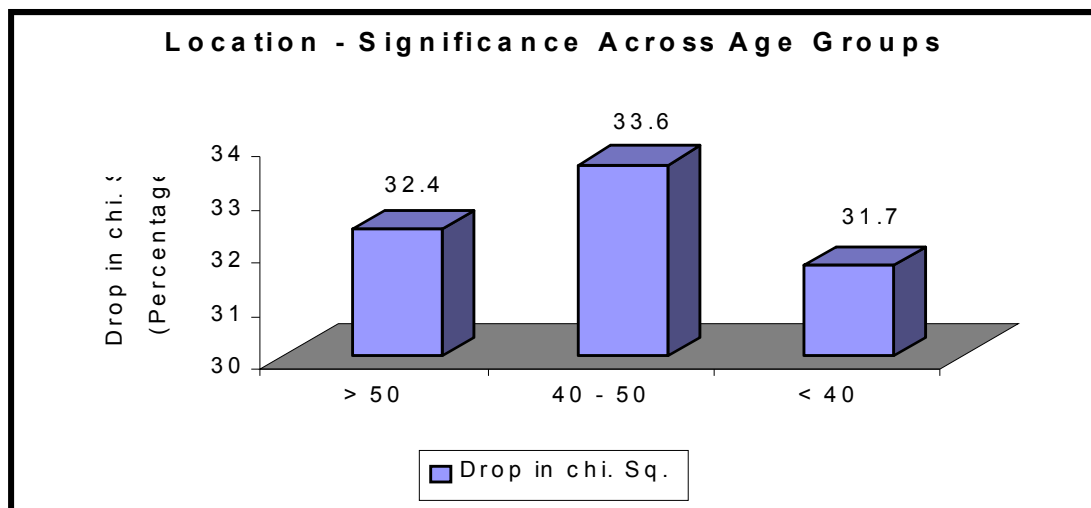
## 4.5 Results of the Main Survey

Factors significant for the purchase decision have been identified using the Kruskal--Wallis test. The mean square ranks of all the factors was calculated. The highest mean square rating was of location and the least of proximity to parks. The test has been first performed for all the factors. Subsequently, one factor has been removed, and the rest put through the test. The factors have been removed in the

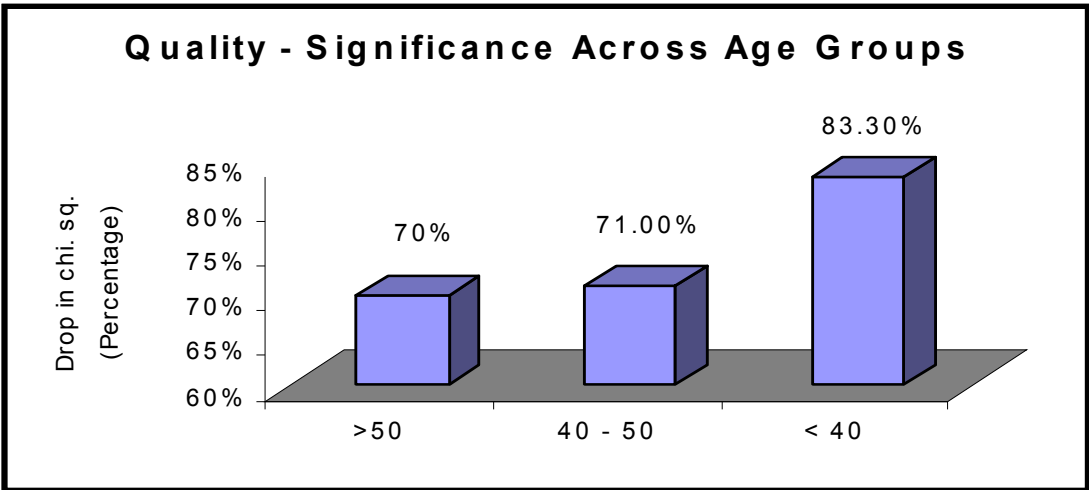
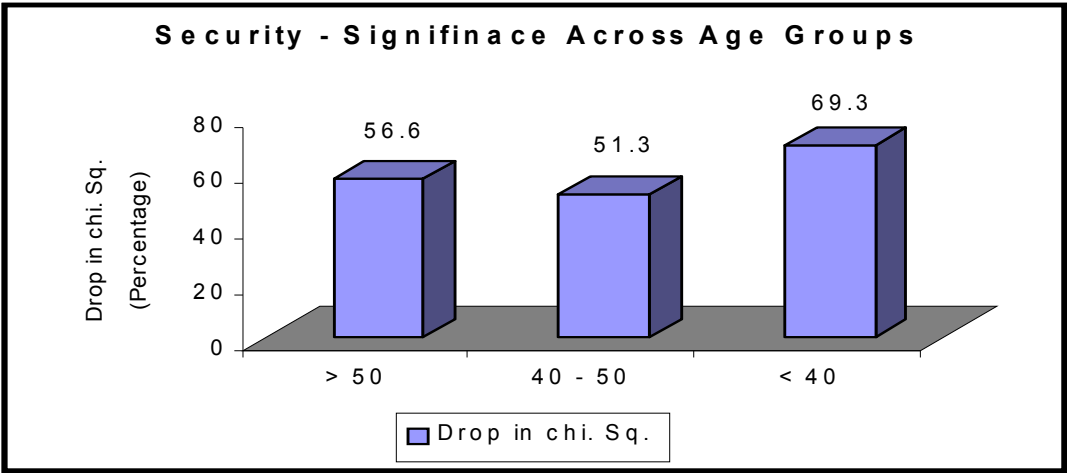
order of their mean square ranks and the test repeated five times. The importance of these factors has also been analyzed according to the age groups and employment categories.

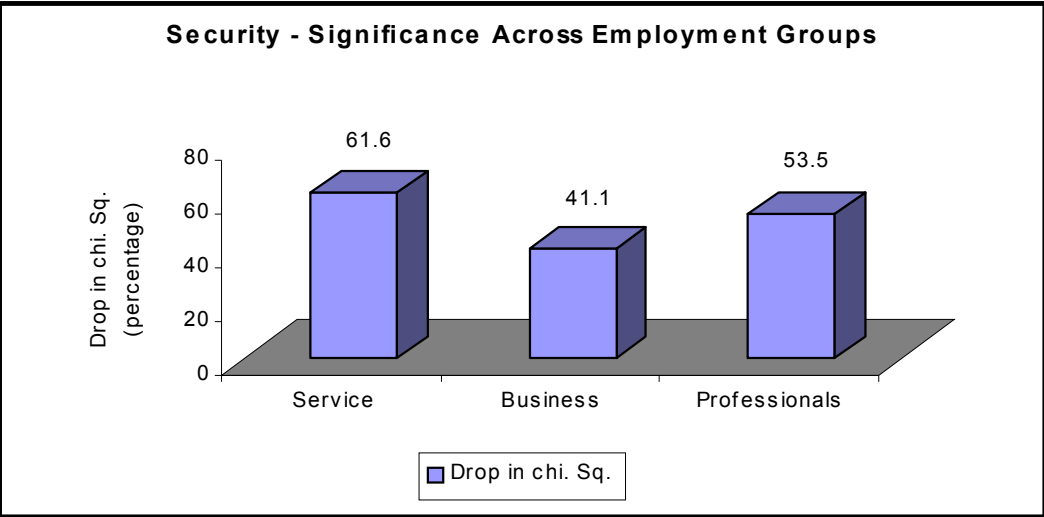
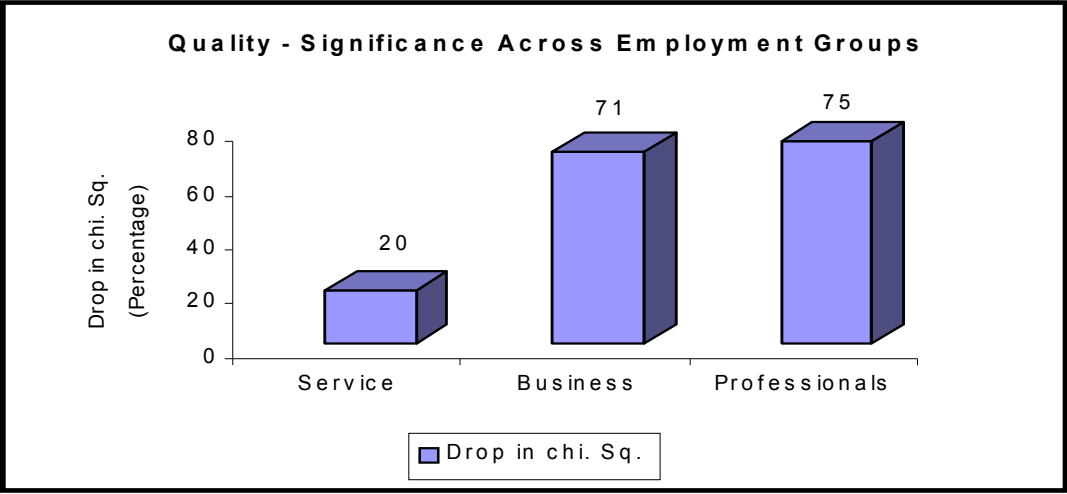
#### 4.5.1 Significant Factors

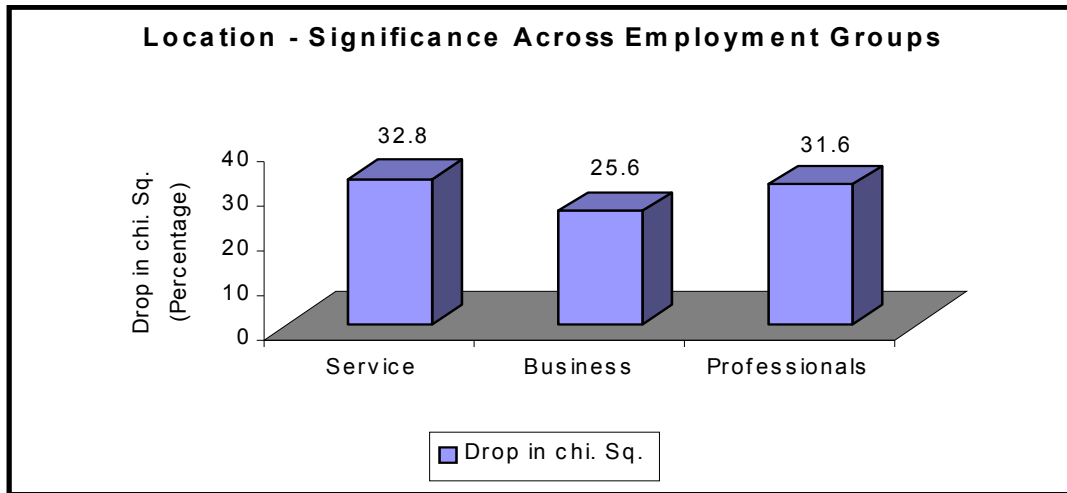
- Location, security, quality, facilities and connectivity are significant to the purchase decision. After connectivity is removed from the group, the chi sq. value falls below the required level, as seen in fig. 4.6.
- Proximity to parks is not important enough.



- Location is of equal concern to all, across all age and employment groups. Refer fig.4.8.
- Security is significance enough to be analyzed separately. Contrary to the expectation it is of greater concern to the less than 40 years age group than to the older age group as seen in fig. 4.9.
- Quality is of average importance for making a purchase decision. It prominent only in the age group of less than 40 years, especially the practicing professionals regard quality of construction as an important factor for decision. Refer fig. 4.10.







#### 4.5.2 Levels of Association

The factor and their sub-components have been analyzed to find the levels of association between them. This been done through the correlation test. The regression coefficient (regression has been performed for the components with the main factor) for each of these also given an indication of the importance of each to the purchase decision.

<b>Factor</b>	<b>Component</b>	<b>Coeff.</b>	<b>Remarks</b>
Location	Security	0.9	Security is viewed, as a perceptual issue and is associated with the location and surroundings of a property.
	Connectivity	0.24	Connectivity is viewed as being distinct from location and may be studied as a separate factor.
	Surroundings		Surroundings are by themselves important.
	Resale value	0.5	Resale value is linked to the surroundings of a property. A study surroundings will therefore incorporate the resale value component.
	Proximity to markets		This is an important and distinct contributor to the location.
	Proximity to work place	0.54	This is an important issue.
	Proximity to parks		Parks are not a significant contributor to the location component.
	Proximity to schools		This is not significant either.
Facilities	Emergency electrical supply	0.68	This is considered to be essential facility. This is probably a reflection of the power situation in Delhi.
	Maintenance facilities		Maintenance is not a significant factor.
	Recreational systems	0.9	Recreational facilities are considered important, especially by the older age group.
	Security systems		These would impact the perception component of security but do not otherwise have little impact as a facility.
	Transport facilities		These are not significant
	Parking	0.45	Parking is regarded as an important facility by the self-employed category.
Promoter's image	Quality		These are important in the assessment of a Promoter's image. Quality of construction  And the reliability of the Promoter are of concern to the purchaser.
	Timely completion		
	No cost escalation		
	Customer service-before and after sales.		

***Table 4. 2 Levels of Association***



## **4.6 Inferences**

Based on the analysis of the perception ratings for different factor, the most significant factors have been identified. Parks do not carry any significance and are not of much importance and therefore have been excluded from the list of factors to be studied further. All others have been included and their components identified and included too.

- Location - It is the most dominant issue surroundings, proximity or markets and the work place, resale value of the property and security. Though presence of green areas is desirable, it is not a deciding factor in the purchase of a house. Resale value may be replaced by surroundings.
- Connectivity is seen to be a distinct issue not entirely linked to location and may therefore be studied as such.
- Promoters images - It is associated with quality (correlation coefficient = 0.5) For the developer built apartment category quality may be replaced by promoter's image.
- Security is associated with location perhaps as the presence/absence of a threat perception (correlation coefficient 0.6) . It may be studied as an individual factor with a perceptual component and a security system (physical measures) component.
- The most important facilities are emergency electricity supply, recreations facilities and parking Maintenance, security systems and transport are not transport are not in themselves significant.

## **4.7 Summary**

A pilot survey was conducted and seven factor that influence the purchase decision were identified. These were then included for the main survey that was carried out among 140 respondents. The ratings given to these factors and their components were analyzed to identify the most significant ones. These are security, location, facilities, quality, connectivity and promoter's image.

Promoter's image is linked to the quality of construction. Connectivity is considered as an important issue. Location is viewed mainly as a complex of surroundings, resale value, and proximity to markets and the workplace. Security is an important issue especially among the younger age group and is viewed mainly as a threat perception that is linked to location as well.

# DEVELOPMENT OF MODEL

## *5.1 Preface*

A preference structure was established in the last chapter. In this one, using two different approaches, a model for determining

- a) the willingness of people to pay
- b) the basic price of a property

has been developed. In order to achieve this, the preference structure given in chapter 4 has been utilized to determine the factors that may be considered for evaluating properties. Section 5.2 describes the study areas and sections 5.3 and 5.4 deal with the model. This is followed by their validation with appropriate examples.

## *5.2 Areas Under Study*

Two kinds of apartment buildings have been studied. The apartments studied within Delhi are built by the Cooperative Group Housing Schemes. CGHS apartments are situated within Delhi in Dwarka, Patparganj, Mayur Vihar, Vasundhra Enclave and Rohini and in Noida and Gurgaon. On the outskirts of Delhi, especially in Gurgaon, Ghaziabad and Faridabad, developers have also built apartments. These have been studied as a separate category.

### **5.2.1 Cooperative Group Housing Societies**

These are either 4 or 8 storied mostly with open or stilted parking. The facilities commonly provided are emergency electricity backup for essential services and green areas within the apartment complex. Maintenance is done through a residents association that charges a nominal Rs.300 to 600 per month per unit. The entry to the complex is controlled by employing security staff. These are located in:

### **5.2.1.1 Delhi**

The CGHS apartment units are spread across the extreme ends of the city. The work-centers are concentrated in central and south Delhi and hence any assessment of the connectivity is related to the presence of road and transport network linking any area to the south and the center. Connaught Place being the CBD and the presence of government offices in the Central Delhi and of private offices in Nehru Place and other areas in the south, make accessibility to this area important.

**Patparganj:** This area of east Delhi is one of the earliest CGHS developments. It has around 120 apartments. The extreme ends of this area benefit from easy access to public transport, which does not operate within the colony. There are security problems especially in areas adjoining villages and the vast undeveloped area on the eastern end. The prevailing property price ranges from Rs. 1800 to 2200 per sq.ft.

**Mayur Vihar Phase 1:** Apartments have developed along the main road leading to Noida. It benefits due to accessibility to good transport service, road network and markets and other social infrastructure. Prices are comparable to those in Patpaiganj. At the higher end, certain units of about 1500sq.ft. area are available at Rs. 35 lakhs.

**Rohini:** CGHS apartments have come up in two sectors - 9 and 13. It is well connected but suffers due to the fact that heavy traffic in the roads leading from Rohini increase travel time to the work centers. Price ranges from Rs. 1300 to 1500 per sq.ft.

**Vasundhra Enclave:** It borders the south eastern end of Delhi and adjoins Noida. Connectivity to Delhi is poor. There is no direct bus service and roads to Vasundhra Enclave lead via Noida. Residents depend on Noida for shopping and other requirements, it benefits from being close to Noida and prices range from Rs. 1200 to Rs. 1500/ sq.ft.

**Dwarka:** A large number of CGHS apartments have come up but only very few are occupied, as infrastructure is virtually nonexistent. There is no electricity supply in some parts of Dwarka and there is no good transport system. The price range is around Rs.1000/sq.ft. and some flat of about 1000 sq.ft. area are available even for Rs. 8 lakhs.

#### ***5.2.1.2 Noida***

Residential development in Noida consists of plotted development and some public sector housing for their employees. Multistory apartments built by the AWHO exist in sector 21 and 30. These have all the facilities seen in CGHS apartments and their prices are around Rs.1700/sq.ft. Some apartments are now coming up in sectors 61 and 62 and in Greater Noida. These are priced at around Rs.1000/sq.ft.

### **5.2.2 Developer Built Houses**

These are mostly eight storied or more. Some apartments, essentially the luxury category or those built long ago are of the four storied, walk-up type. Many have basement parking, electronic security systems and common recreational facilities such as a club.

#### ***5.2.2.1 Gurgaon***

The area along the Mehrauli-Gurgaon road was one of the first areas to be developed by private developers and therefore benefits from better connectivity and access to convenience shopping. The whole area through, suffers from lack of public transport. Prices range from between Rs.1700-1900/sq.ft. The prices of properties in air-flung areas such as South City are still lower at around Rs. 1200/sq.ft.

#### ***5.2.2.2 Ghaziabad***

Kaushambi and Vaishali adjoining Delhi, have been developed by Ghaziabad Development Authority as residential centers. Many private developers have built apartments in Vaishali. Though these constructions are of a quality comparable to

those in Gurgaon, their market prices are much lower as the area suffers from a lack of good roads and transport. There is also a feeling of insecurity and a sense of lawlessness about the area. Most units, even in apartments constructed 4-5 years ago, lie vacant.

### **5.2.2.3 Faridabad**

The Eros group has constructed developed the Charmwood Village next to Surajkund near the Faridabad-Delhi border. The area is closer to offices in south Delhi but commuting to C.P. can take nearly an hour. Prices are we of the highest m the developer category and are an average of Rs-1750/sq.ft.

### **5.2.3 Zones**

The study area has been divided into zones based on the prevailing market price of properties. This has been done in view of the fact that a certain amount of premium is attached to some locations irrespective of its characteristics and depending solely on a notional prestige value'. Such a perception is reflected in terms of the market price of a property. It may have a relation to the quality of the existing buildings and the connectivity of that area as is seen in table 5.1.

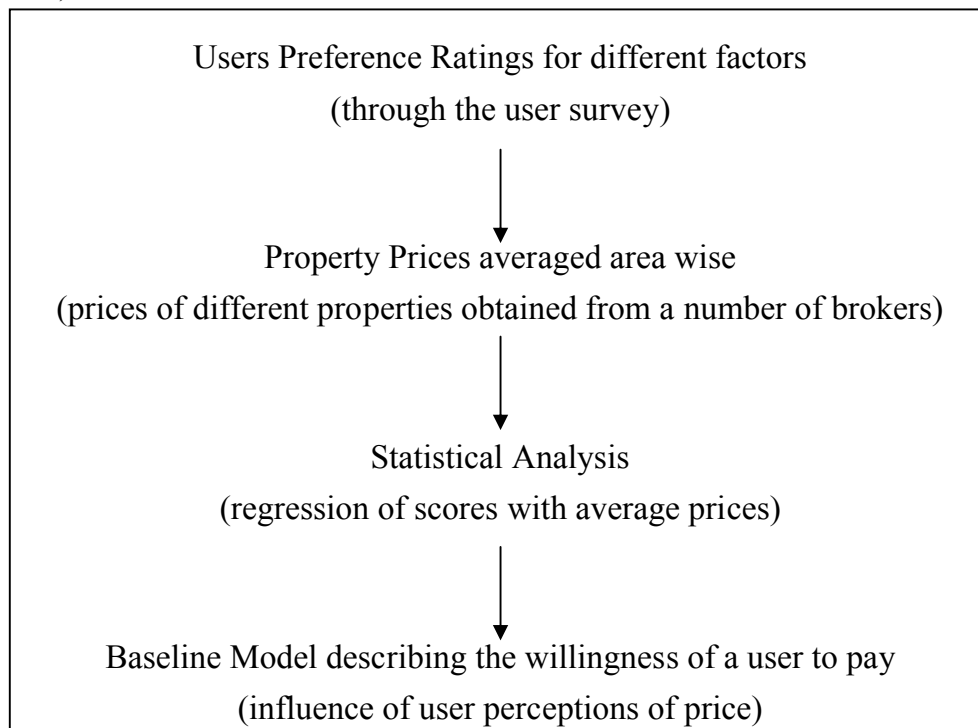
<b>Zone</b>	<b>Location</b>	<b>Average price (in Rs./sq.ft)</b>		<b>Average connectivity score</b>
L1	Patparganj	1900	1850	70
	Mayur vihar	1800		
L2	Noida	1700	1700	60
	Gurgaon	1650		
	Faridabad	1760		
L3	Vasundhra	1500	1500	50
	Enclave			
L4	Rohini	1450	1450	62
L5	Dwarka	1000	1050	42.5
	Ghaziabad	1100		

**Table 5.1 Average price values for the various locations**

### 5.3 Model 1 - Willingness

#### 5.3.1 Methodology

This model seeks to quantify the level of importance given to each of the factors as influencing the price of a property. It uses the average price of properties in an area and relates it to the perception of respondents willing to purchase in that area, thereby arriving at a baseline model that can on the basis of the buyers characteristics and preferences predict the price he/she might be willing to pay. Property prices were obtained from 25 sources (real estate brokers and consultants) for properties in various parts of Delhi and these were then averaged area wise. Prices have been computed per sq.ft. to maintain uniformity. Refer Table 5.1. Multiple regression analysis was then performed on the ratings and the corresponding price values (for each individual response depending on the area of purchase).



**Fig. 5.1 Methodology for Development of Model 1**

### 5.3.2 Results

Regression analysis of the complete data set with the respective price values indicated resulted in a  $R^2$  value of 0.12 and factor coefficients with negative signs. This indicated that the data has a large amount of diversity. The study revealed also that the people who bought flats in the CGHS category viewed the utilities of a property differently and their willingness to pay for the same were different from those who purchased in the developer built apartments. Therefore, the data was analyzed in separate calories. In addition, within these two categories, the willingness to pay differed with respect to employment and age groups. Dummy variable analysis has been used to arrive at separate equations for the different groups within each property category.

#### Model for CGHS

Base model for the >40 years age group

$$\text{Log } p = -6.5 + 0.04x_s + 0.028x_{\text{quality}} + 0.0327x_c$$

Equation for the <40 years age group

$$\text{Log } p = 6.5517 + 0.04x_s + 0.028x_{\text{quality}} + 0.0327x_c$$

*Additive component (intercept) for < 40 years age group = + 0.0517*

Where,

P = Price

$x_s$  = preference rating on a scale of 1 - 10 for security

$x_{\text{quality}}$  = preference rating for quality

$x_c$  = preference rating for connectivity



<b>MODEL FOR CGHS CATEGORY (BASE FOR &gt;40YRS. AGE GROUP)</b>			
R <sup>2</sup> = 0.42		Error margin - log p 1.96 x 0.17	
Intercept for <40 years age group =+0.0517			
<i>Factor</i>	<i>Coefficient</i>	<i>T stat</i>	<i>P value</i>
Security	0.04	1.76	0.087
Quality	0.028	1.297	0.202
Connectivity	0.0327	2.07	0.045

**Table 5.2 Model for the CGHS category** (showing only the significant factors). Surprisingly, this reveals that the people in the < 40 years age group are willing to pay more for the same set of benefits (property characteristics). This may be attributed to a predominance of MNC employees and self-employed category in the younger age group (and presuming that an ability to make large investments at an early stage in life is possible only with higher income levels).

The resulting R<sup>2</sup> value shows a relatively low level of homogeneity in the data but the coefficients are statistically significant and distinct. Security gets the highest coefficient of 0.04, followed by connectivity and then quality. This is an indication of the perceived importance of these factors. The t stat value indicates the significance of the factor. At t stat value of the order of 2 and above indicates that the factor is very significant. Any value above 1 is acceptable. The p value is an indication of the degree of confidence with which the factor can be predicted i.e. a p value of 0.087 indicates that the confidence of prediction is 91.3%.

### **Model for Developer Built Apartments**

Base model for the service category:

$$\text{Log } p = 6.9346 + 0.0154x_f + 0.0102x_s + 0.38 x_{\log p.e}$$

Equation for the practicing professionals/self employed group:

$$\text{Log } p = 6.9596 + 0.0154x_f + 0.0102x_s + 0.38x_{\log p.i}$$

Equation for the business group :

$$\text{Log } p = 6.9736 + 0.0154 x_f + 0.0102x_s + 0.38x_{\log p.i}$$

*Additive component (intercept) for practicing professionals = +0.025*

*Additive component (intercept) for business category = +0.039*

Where,

$x_f$  = preference rating for facilities on a scale of 1-10

$x_{\log p.i}$  = preference rating for promoter's image on a scale of 1-10 converted to its logarithmic form

<b>Model for Developer built apartment category (base for service category)</b>			
R <sup>2</sup> = 0.55		Error margin = log p 1.96 x 0.44	
Intercept for professional group = +0.025		Intercept for business group =+0.039	
<i>Factor</i>	<i>Coefficient</i>	<i>T stat value</i>	<i>P value</i>
Security	0.0154	2.61	0.015
Quality	0.0102	1.61	0.119
Connectivity	0.38	1.64	0.113

*Table 5.3 Model for developer built apartment category (showing only the significant factors).*

### 5.3.3 Inferences

- In the CGHS category security, connectivity and quality of construction are significant whereas for the other group facilities and promoter's image are significant.
- Security is twice as important for the CGHS category as for the developer built apartment category.
- Provision of facilities is significant only for the Developer built apartment category.

- Quality is replaced by promoter's image in this category as quality is probably associated with it. (correlation coefficient = 0.67)

<i>Factor</i>	<i>CGHS</i>	<i>Developer built units</i>
Security	1	0.5
Connectivity	0.41	-
Quality	0.46	Associated with promoter's image
Facilities	-	0.31

***Table 5.4 Comparative Importance of Factors***

#### **5.2.4 Model Validation**

The model has been tested for the average scores in the data set assuming that the average respondent score of the predominant age group in the CGHS category must correspond with the average property price in the same category.

##### **Avg. scores :**

Security = 8

Quality = 7

Connectivity = 5

Price (willingness to pay of the >40 category) =Rs. 1485.00/ sq.ft.

Actual average price is Rs. 1550.00 / sq.ft.

The error in predicted value is 4.8% that is well within the error margin of the model.

#### **5.4 Model 2 - Property Price**

The model seeks to predict the average value of the property once its location and other characteristics are known. Such an average value may be used as a baseline for further negotiations.

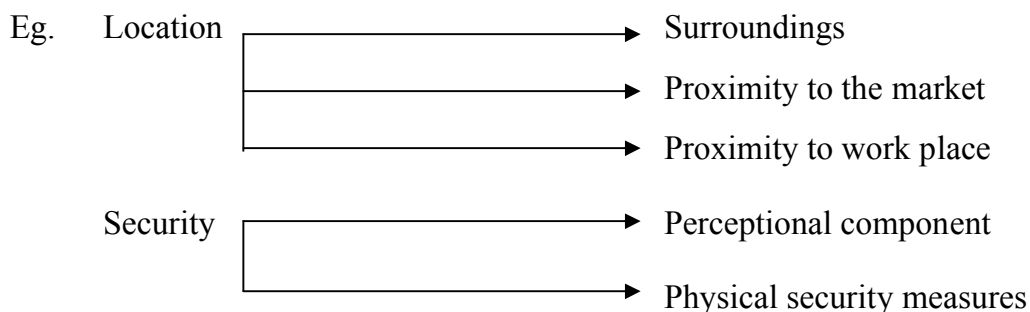
### 5.4.1 Methodology

Based on the characteristics / preferences identified in chapter 4, a list of factors and their components was established for evaluating properties. A scoring system was developed, based on which 40 different properties were surveyed and their characteristics quantified. Refer table 5.5. These properties were chosen from the different areas under study (approximately 5 from each area). Refer fig. 5.2. Prices of properties were obtained from two different sources - property dealers and recent purchases and then averaged. Multiple regression analysis was performed between property prices and the property characteristics to arrive at a model that quantifies the contribution of all the factors in the determination of price.

#### 5.4.1.1. Scoring System for Property Evaluation

##### Rationale:

- Factors studied are the same as before, their components have been established through the earlier survey and further discussions with purchasers.



- The components have been divided further into desirable aspects and highest score given to most desirable aspects.

E.g. Proximity to Markets

- When property is adjacent to the market (resale value increases because of commercial prospects).

Score 10

- Within ½ km from the market (conveniences)

Score 6

- Between ½ - 1 km from the market

Score 4

- Beyond 1 km

Score 0

<b>SCORING SYSTEM FOR PROPERTY EVALUATION</b>				
<b>Factor</b>	<b>Component</b>	<b>Sub-component</b>	<b>Score</b>	<b>Total factor score</b>
Security	Perception		10.0	
	Security Measures	Compound wall	2.5	
		Ext. lighting	2.5	
		Security staff	2.5	
		Elec. System	2.5	
				10
Facilities	Emergency electricity service	Essential services	5.0	
		All services, points	5.0	
	Recreational	Parks & outdoor sports	5.0	
		Indoor sports, club, library.....	5.0	
	Parking	None	0.0	
		Open	4.0	
		Stilt	6.0	
		Basement	10.0	
				30
Location	Prox-mkts	Beyond 1.5 km	0.0	
		½ - 1.5 km	4.0	
		<1/2 km	6.0	
		Adjacent	10.0	
	Prox. – wk pl.	>40 min.	4.0	
		20-40 min	6.0	
		<20 min	10.0	
	Surroundings	No air pollution	2.0	
		Quiet	2.0	

Factor	Component	Sub-component	Score	Total factor score
		No nallah	2.0	
		No slums	2.0	
		Greenery	2.0	
				30
Connectivity		Roads	10.00	
		Transport network	10.0	
				20
Quality	Walls	Straightness/plumb	2.5	
		Even surface	2.5	
		No cracks	2.5	
		No dampness	2.5	
	Floor	Consistency	5.0	
		Proper slope	5.0	
	Doors and windows	Proper alignment	3.0	
		No gaps, proper operation	3.0	
		No termite prob.	4.0	
	Plumbing	No leakage	3.0	
		No breakage/cracks	3.0	
		No choking (manholes.....)	4.0	
	Electricity	No loose contacts	3.0	
		Proper wiring	4.0	
		No case of tripping	3.0	

***Table 5.5 Scoring system for evaluation of properties.***

- Otherwise, all aspects are marked equally as for components surroundings.
- Some other factors / components like promoter's image and perceptible security component have been assessed through a user survey. The users have assessed their properties on a scale of 10 where 0 signifies the worst/most undesirable situation and 10 signifies the best case. Promoter's image has been analysed once through a survey. The sub-component for these factor are :
  - Timely completion
  - No cost escalation
  - Quality
  - Customer service

<b>SCORES FOR PROMOTER'S IMAGE</b>					
<i>Sub-component</i>	<i>Unitech</i>	<i>DLF</i>	<i>Ansals</i>	<i>Eros</i>	<i>Superior/ Shipra/others</i>
Timely completion	8	7	6.5	6	6
Cost escalation	8	6	6	6	5.5
Quality	8	7	6	7	5.5
Customer service	9	8	7	5	5
<b>Average</b>	<b>8.7</b>	<b>7</b>	<b>6.5</b>	<b>6</b>	<b>5.5</b>

*Table 5.6 Scores for Promoter's Image*

- The scores have been incorporated into the model as percentage values.

## **5.4.2. Results**

### **Model for CGHS category**

$$\text{Log } p = 5.749 + .0044x_l + 0.0073x_s + 0.0039x_q + 0.0072x_c + 0.0023x_f$$

Where,

- $x_l$  = score for location
- $x_s$  = score for security
- $x_q$  = score for quality
- $x_c$  = score for connectivity
- $x_f$  = score for facilities

<b>MODEL FOR CGHS CATEGORY</b>				
R <sup>2</sup> = 0.89			Error margin = log p = 1.96 x 0.04	
<i>Factor</i>	<b>Coefficient</b>	<i>T stat</i>	<i>P value</i>	<i>% confidence of prediction</i>
Security	0.0073	2.835	0.011	98.89
Location	0.0044	2.72	0.010	98.95
Quality	0.0039	2.662	0.018	98.2
Connectivity	0.0072	2.37	0.030	97.0
Facilities	0.0023	1.57	0.013	86.60

**Table 5.7 Model for CGHS category**

**Model for developer built apartment category :**

$$\text{Log } p = 5.33 + 0.0065x_1 + 0.0034x_s + 0.023x_c + 0.0062x_{pi}$$

Where,

$x_{pi}$  = score for promoters image

<b>MODEL FOR DEVELOPER BUILT APARTMENT CATEGORY</b>				
R <sup>2</sup> = 0.99			Error margin = log p = 1.96 x 0.008	
<i>Factor</i>	<i>Coefficient</i>	<i>T stat</i>	<i>P value</i>	<i>% confidence of prediction</i>
Location	0.0065	10.08	0.0001	99.99
Security	0.0034	8.001	0.0001	99.99
Promoter's image	0.0062	20.91	0.0001	99.99
Connectivity	0.023	41.36	0.0001	99.99

**Table 5.8 Model for Developer built apartment category**



**Model (overall) :**

$$\text{Log } p = 5.6087 + 0.00352x_l + 0.0050x_q + 0.012x_c$$

<b>OVERALL MODEL</b>				
R <sup>2</sup> = 0.87			Error margin = log p = 1.96 x 0.04	
<i>Factor</i>	<i>Coefficient</i>	<i>T stat</i>	<i>P value</i>	<i>% confidence of prediction</i>
Location	0.0035	2.28	0.029	97.10
Security	0.0057	3.15	0.0013	99.87
Quality	0.005	4.44	0.001	99.90
Connectivity	0.012	6.9	0.009	99.10

**Table 5.9 Overall model for predication of price**

**Model (zone wise) :**

Base model for zone 1

$$\text{Log } p = 6.6372 + 0.0032x_a + 0.0042x_q + 0.0045x_e$$

<b>OVERALL MODEL – ZONE WISE</b>				
R <sup>2</sup> = 0.92			Error margin = log p = 1.96 x 0.03	
Intercept for zone 2 = 0.0944			Intercept for zone 3 = -0.1165	
Intercept for zone 4 = -0.2215			Intercept for zone 5 = -0.3882	
<i>Factor</i>	<i>Coefficient</i>	<i>T stat</i>	<i>P value</i>	<i>% confidence of prediction</i>
Facilities	0.0045	1.27	0.20	80.0
Security	0.0032	1.66	0.10	90.0
Promoter's image	0.0042	4.31	0.01	99.0

**Table 5. 10 Overall model - zone wise - for price prediction**

### **5.4.3 Model Validation**

The model has been validated by comparing the existing prices with the predicted prices of properties evaluated using the scoring system. Five different properties in different zones have been used for validation (Refer table 5.11). The model has been tested, for two apartments that are yet to be completed - Millennium apartment (CGHS) and Maple Heights (developer built) also. For these, the predicted price has been compared with the quoted sale price of the developer. In all the cases, the predicted values does not deviate more than 8% of the actual price, which is well within the statistical error margin of the model.

For Mapel Heights, that is yet to be constructed, the quality characteristics as promised by the developer is 90, the connectivity is 42.5 and facilities is 86.67 and corresponding to zone L5 due to a low connectivity value the price has been computed using equation 5.10

Predicted price is Rs. 1187.00 per sq. ft.

Actual price is Rs. 1200.00 per sq. ft.

Error = 2% (90% confidence of prediction)

PREDICTED AND ACTUAL PRICES OF PROPERTIES								
Zone	Area	Scores					Predicted price Rs./sq.ft	Actual price Rs./sq.ft
		Location	Security	Quality/ Promoter's Image	Facility	Connectivity		
<b>ILA APARTMENT</b>		<b>Category – CGHS</b>			<b>Status – completed in 1995</b>		<b>eq. – 5.9</b>	
L3	Vasundhra Encl.	53.34	67.5	90	53.34	45	1520	1500
<b>MILLENIUM APARTMENT</b>		<b>Category – CGHS</b>			<b>Status – yet to be completed</b>		<b>eq. – 5.9</b>	
L5	Sec 61 Noida	33.33	57.5	90	86.67	42.5	1131	1200
<b>MAPLE HEIGHTS</b>		<b>Category – developer built</b>			<b>Status – yet to be completed</b>		<b>eq. – 5.9</b>	
L5	Sushant Lok	33.33	57.5	90	86.67	42.5	1131	1200
<b>TAKSHILA APARTMENT</b>		<b>Category – CGHS</b>			<b>Status – completed in 1990</b>		<b>eq. – 5.6</b>	
L1	Patparganj	60	77.5	90	46.67	67.5	1884	2000
<b>SOUTHEND APARTMENT</b>		<b>Category – Developer built</b>			<b>Status – completed</b>		<b>eq. – 5.7</b>	
L2	Faridabad	53.34	85.0	90	83.34	60.0	1806	1760

*Table 5.11 Model validation - predicted and actual prices of properties*

## 5.5 Summary

The apartment market behaves in two distinct categories - the CGHS and the Developer built units. The differences are apparent both in terms of preferences of the buyers and in terms how the prices depend on the property characteristics. The basic inferences that may be drawn from this study are:

- In the CGHS category security, connectivity and quality of construction are significant whereas for the other group facilities and promoter's image are significant.
- Provision of facilities is significant only for the Developer built apartment category.
- Security is twice as important for the CGHS category as for the developer built apartment category

Model 1 predicts the price a purchaser with a certain set of preferences would be willing to pay. It has also brought forth the difference in the 'willingness to pay' of

different categories of purchasers, analyzed as separate age and employment groups.

Model 2 predicts the average value of the property once its location and other characteristics are known. It quantifies the contribution of all the factors in the determination of price. Different areas in the city have some particular notional value attached to them, which can at best be termed as a prestige value. This is reflected in the price and therefore the city has been classified into five zones based on the prevailing prices. Each of these would have some homogeneity in characteristics. Such a zone-wise analysis has shown results that are more accurate.

The model validation has shown that the error in the predicted values is not more than 8-10% which translates into a variation of about Rs.100 on a property costing Rs.1000/sq.ft. This amount of variation is in any case bound to occur when the actual transaction takes place.

# MODEL APPLICATIONS AND CONCLUSIONS

## ***6.1 Preface***

During the course of the thesis, some basic assumptions were disproved and some were reinforced. Many new aspects were brought forth. This final chapter summarizes the findings of the thesis. It illustrates ways in which this model could be used, its limitations and the possible extensions to the work.

## ***6.2 Model Applications***

The intent of this thesis was to develop a model to arrive at a basic negotiable price for a property. It is therefore, a tool for assessing the price of a property depending on its characteristics, (e.g. ILA apartments, Vasundhra Enclave) This could be used by both the buyer and the seller as a guideline. The price thus derived forms the baseline on which further negotiations could be built upon for each deal. This would be particularly useful where there is a lack of sufficient information on previous sales and prices, making it difficult to estimate the market price of a property otherwise.

It could also be used for arriving at the price of a new construction. E.g. Millennium Apartments, Noida may be assessed based on the proposals of the developer and may be taken as belonging to zone 5 due to its low connectivity score. The predicted price for this proposed construction is Rs. 1087.00 per sq.ft as against Rs.1000 per sq.ft. Actually quoted by the promoters. Thus, for a 90% accuracy level, this prediction has an error of the order of 8.7%

In the example, the characteristics of ILA apartments have been assessed based on the scoring system given in table 5.4. The factors scores have been used in equation 5.9 (overall model - zonewise). The price predicted using the model (Rs. 1520.00 per sq.ft.) falls within the error margin of the model. The actual average market price of the property is Rs. 1500.00 per sq.ft. and the error in prediction is about 1.3%

The model may also be utilized for a few other applications that may be beneficial for the brokers, the developers and the marketing agents.

### **6.2.1 Applications for the Marketing Agents**

Any marketing agent can, knowing the user preferences in Delhi, develop strategies for advertising and sale. The basic preferences are as outlined in section 6.3. The survey and its subsequent analysis have helped establish a preference structure for a house purchase in Delhi. This has been classified according to age groups, employment characteristics and the category of apartments. The study elaborates on the significance of each of the factors and their behaviour across different segments. Knowledge of preferences of the buyer's could contribute to the development decision and could aid in developing strategies for niche marketing.

If a promoter wishes to target only the older age group (as in an apartment complex currently being developed in Greater Noida for people above sixty years in age), the preference structure could help identify the more relevant issues. In such a case provision of security-systems and appropriate recreational facilities could be highlighted for marketing the product. Such preferences may be used for taking design decisions. Similarly, if a company decides to promote a development for the professionals in the younger age group, then their preferences and their willingness to pay for select amenities may be exploited for niche marketing.

### **6.2.2 Applications for Brokers**

If a user knows his preferences, then the amount of money he would be willing to pay for a property may be established through the model 1. A broker could then suggest a suitable property and location. E.g. A person intending to purchase a property in the CGHS category, and with the following preference ratings

Security - 8

Quality - 7

Connectivity - 5

would be willing to pay about Rs. 1485.00 per sq.ft. for a flat (as calculated from equation 5.1, model for CGHS category) and therefore may be offered a flat in zones L3 (Vasundhra Enclave) or L4 (Rohini) where the average market price of apartments is in the range of Rs. 1200.00 to Rs. 1650.00 per sq.ft.

Such an application becomes more useful in the form of a user-friendly package where an area for purchase is suggested on the basis of the preference ratings inputted by the user. A program to estimate the willingness to pay of a purchaser depending on his preferences and using model I (equation 5.1 and 5.2) could be designed in C language. The program could automatically correlate the estimated price to the average prices in the five zones identified and suggests an appropriate location for property purchase.

### **6.2.3 Applications for Developers**

➤ Effect of improvements on market price:

It may also be possible for like developer to gauge how much the basic shell with the bare minimum facilities would fetch in the market and also how much in terms of price the buyer would be willing to pay for each additional improvement for a particular zone.

Sensitivity analysis has been performed for Southend Apartments, Faridabad. The actual market price of the property is Rs. 1760.00 per sq.ft. and its are as given in table 6.1. The scores for one characteristic keeping the order factor scores constant and the corresponding predicted price values resulting from the equation 5.9 have been plotted.

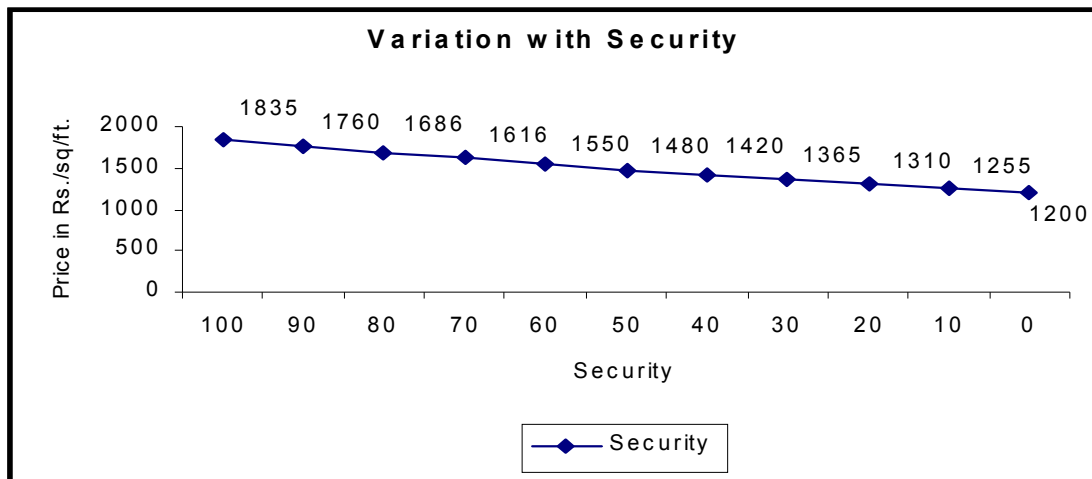
Characteristics of Southend apartments, Faridabad

Zone	Score								
	Quality					Security		Connectivity	
	Walls	Floor	D/W	Plumbing	Electrical Connectivity	System	Perception	Transport	Roads
L2	10	10	10	5	10	10	5	7	5
					Total – 90		Total – 85		Total - 60

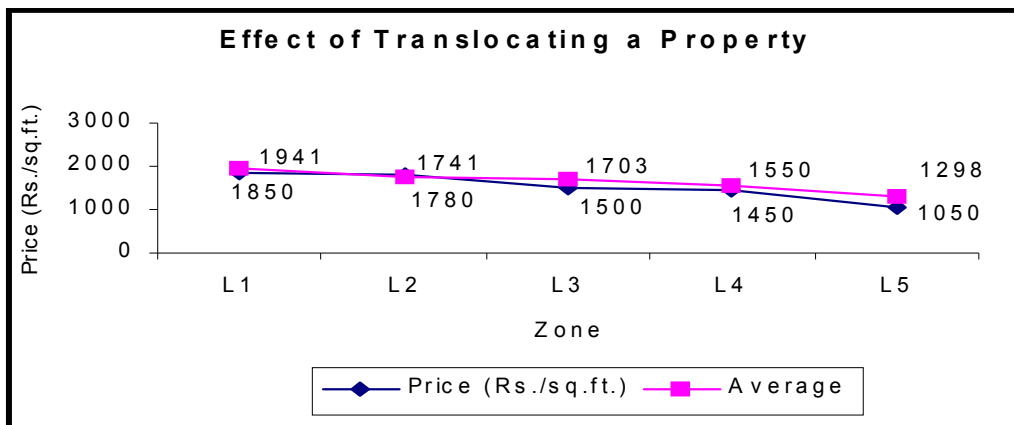
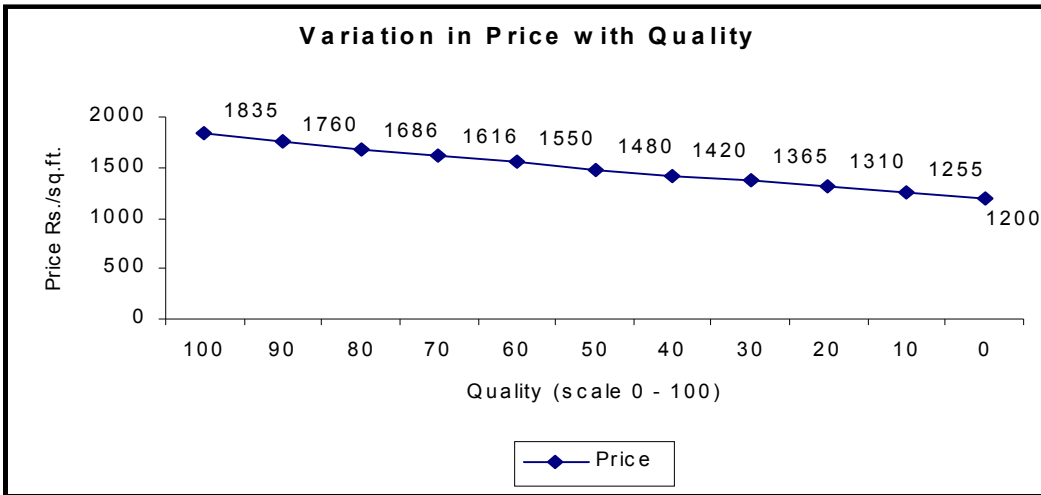
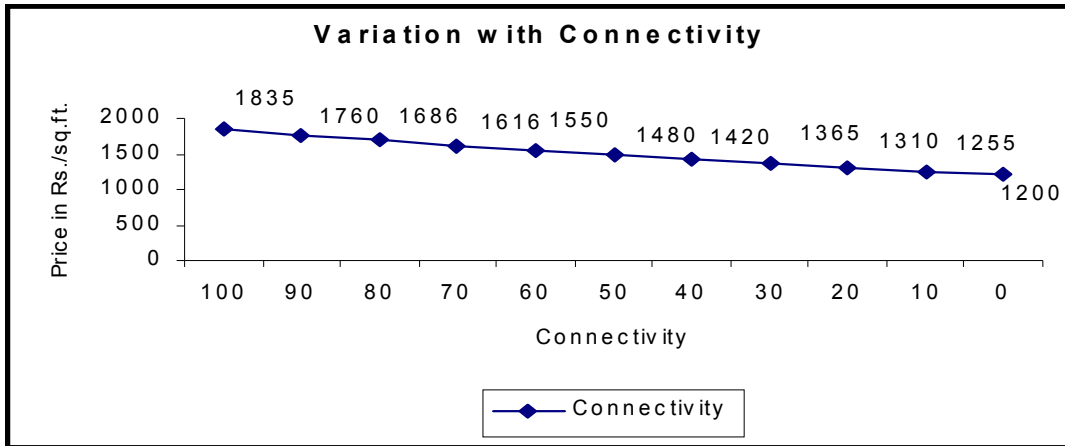
**Table 6.1 Characteristics of Southend Apartments, Faridabad**

Refer fig. 6.1. 6.2 and 6.3 for variation of price with security, connectivity and quality respectively. This may, also be interpreted to estimate the effect of adding improvements in terms of security, connectivity and quality.

For an apartment, such & this one, with low connectivity scores, the score could be increased by providing better transport facilities. Even an increase in rating of transport by 2 points could increase the connectivity score by 10 and therefore the market price by Rs.70 - 80 per sft & the price of Southend Apartments could increase from Rs. 1760 to Rs.1830 per sq.ft. The most commonly occurring defects in apartments are leaking pipes and dampness in walls. The rectification of these defects would increase the score by 12 points and increase the price effectively by Rs. 66 per sq.ft. Refer fig. 6.2







Similarly, for an apartment that has only security staff to guard the premises, providing electronic security systems would increase the security score by 20

points. The corresponding increase in the perceptual value of the property as estimated from the model equation 5.9 is approximately Rs.100 per sq.ft. (Each 10-point increase in the security score results in a Rs. 50 per sq.ft. increase in the market price of a property Refer fig. 6.1)

It might be possible to enhance the market value of a property by selectively improving some characteristics that may have greater perceptual value at a lower capital cost. Also, the effect of some negative factors such as lower connectivity score may be mitigated by introducing a shuttle service (that might improve the transport ratings). The current price of Sushant Apartments is Rs. 1200 per sq.ft. and a 10 point increase in the connectivity score could increase the price to Rs. 1270 per sq.ft.

➤ Enhancing the value of a property

If the cost of providing a certain facility (e.g. basement parking) is known, then the developer may gauge the actual increase in perceptual value and hence in the price it would effect. Thus, it may be possible to check the viability of such options. In many cases, adding a facility may not really be as viable an option as thought initially. E.g. in Silver Oaks, DLF, the basement parking provided at the cost of Rs-30,000 per resident is lying unused as no one is willing to pay that amount.

Again in Sushant Apartments, the security perception is also poor. Provision of a security system would increase the value of the property by Rs. 100 per sq.ft. the cost of providing an electronic security system may be compared with its returns to estimate if this may be financially advantageous to the developer.

➤ Also, a developer with multiple pockets of land to be developed may estimate the approximate returns per unit from each locality for a particular type of apartment building from model 2 part 4. E.g. Press apartments, currently located in zone LI (Patpaiganj) has been translocated into various other zones and its changed price plotted

A price higher than the average value in zone LI, indicates that Press apartments enjoys higher quality, connectivity and security scores than the average in that zone. Ideally, this difference between the predicted and average prices, as the property is translocated, should be the same for all the zones. But, fig. 6.4 shows that this difference is much higher for zones L3 and L5 indicating that the average quality and security scores in these zones are lower. Therefore, the developer might create a niche by providing a property of standards similar to those of other zones in Ghaziabad (zone L5). On the other hand, investing a similar amount in Noida or Gurgaon (zone L2) could provide better returns.

### **6.3 Conclusions**

The survey and its subsequent analysis have helped establish a preference structure for a house purchase in Delhi. This has been classified according to age groups, employment characteristics and the category of apartments. Knowledge of preferences of the buyers would contribute to the development decision and aid in developing strategies for niche marketing. The study elaborates on the significance of each of the factors and their behaviour across different segments.

#### **6.3.1 Factor Based**

Of the seven factors initially studied the most important factors, as identified during the thesis, for a house purchase decision are security, location, connectivity, quality, facilities and promoter's image, in that order. Across different age groups and employment categories and different areas in Delhi these factors are viewed differently.

##### **(i) Security**

Security is of overriding concern. It is viewed mainly as a perceptible issue, which is linked to the locational characteristics. The presence of antisocial elements in the neighbourhood, or presence of uninhabited areas adjoining the property and previous cases of theft or murder may add to the threat perception and hence reduce the sense of security in a place. Additional security facilities do influence the perception of safety but in themselves add little to the price as is evident from

the user survey (table 4.1). For e.g. Sunbreeze apartments, Ghaziabad has an electronic security system installed but its security perception score is very low and hence its price remains one of the lowest at Rs.1100/sq-ft.

**(ii) Location**

Location is a major deciding factor for property purchase and is actually a complex of many other components which are:

- Surroundings of a property is an important indicator for location and most people prefer locales that offer less pollution (both air & noise or any other), a quiet neighbourhood and plenty of greenery. The surroundings also, contribute significantly to the resale value (correlation coefficient = 0.67) such that resale value may be replaced by a score for surroundings.
- Proximity to markets plays an important role in the purchase of a property not only because of the convenience. It affords but also because it adds to the resale value of the property. This is due to the presence of a possibility of commercializing it in case the market adjoins the property.
- Proximity to parks is not a contributor to the purchase decision although greenery is considered important.

**(iii) Connectivity**

Connectivity is an issue that is viewed more in terms of accessibility rather than travel time as was initially thought. Traffic and distances being what they are in Delhi, people are willing to travel about 40 minutes - 1 hour to reach their work place. What is of greater concern to people is that their homes must be well connected in terms of a good road network and availability of transport. Connectivity and accessibility have higher significance to the people purchasing from developers because these apartments are generally situated in the suburbs and hence suffer from a lack of effective transport.

***(iv) Facilities***

Most people only look for the basic facilities - minimum parking facilities for the residents, emergency power backup for the essential services and maintenance facilities. This is true for both the categories. In the developer built units, most people feel that extra facilities are a premium one gets for buying from a reputed developer and hence are often hesitant about paying for them. Additional facilities they look for are recreational facilities, transport facilities, additional covered parking and a complete power backup.

***(v) Quality***

Quality is not looked at as merely better specifications but more as non-existence of defects that minimizes rework and therefore the recurring expenditure. Bad quality construction with visible defects lowers the price of a property. For e.g. in the case of Una apartments, Mayur Vihar, it has a high connectivity and security ratings, but very low score for quality and therefore its price is much lower than the other properties in the vicinity.

***(vi) Promoter's Image***

It is very much linked to the quality of construction (correlation coefficient = 0.6). It is also seen in terms of on time delivery of the flats, reliability or minimum cost escalation and good customer service both before and after sales.

### **6.3.2 Apartment Category**

The apartment (housing) market in Delhi is distinctly divided into two different groups - the CGHS category and the privately built apartments. The segment of population that looks for a property in these two areas has slightly different perceptions and preferences. The most significant of these is perhaps that the CGHS category is more concerned about security whereas the other group is most concerned about the kind of location the purchase is made in audits connectivity. (Refer table 6.2)

The location is viewed as a function of the surroundings, i.e. external environment and the neighbourhood characteristics. Proximity to markets and other conveniences are not as important probably because most of the people living in these areas own vehicles and/or have servants. Connectivity to this category is more significant as all the developer built units are located in distant places from where commuting is not easy. For e.g. Sushant Lok II and South City are lower than DLF because of poor accessibility and therefore these areas behave as Zone L5 instead of L2. For a description of the zones, refer to section 5.2.

<b>COMPARATIVE IMPORTANCE OF THE FACTORS</b>			
<b><i>S.No.</i></b>	<b><i>Factors</i></b>	<b><i>CGHS</i></b>	<b><i>Developer built units</i></b>
1	Security	1	0.46
2	Connectivity	1	3.25
3	Location	1	1.41
4	Quality		Linked to promoter's image

***Table 6.2 Comparative analysis of the factors across the two apartment categories***

#### ***6.4 Summary***

The model developed helps arrive at a basic negotiable price for a property. Both property sellers and buyers could use it as a tool for assessing the price of a property depending on its characteristics. It has other applications as well and could be useful for marketing agents, brokers and developers. The thesis also illustrates the preferences of the purchasers. There are some limitations of the thesis that arise out of its scope and the very nature of the subject under study. These provide opportunity for further research.

This thesis has looked at the issue of property prices from the user's point of view. This approach (though apt for the residential market) may not hold good for other

property markets - industrial or retail - and therefore, further studies can adopt different approaches and methodologies to the issue of predicting prices.

This research has been done at a time when a crash in the real estate market has lead the real estate sector to introspect and bring in some change. The traditional method of transacting is giving way to a system where there is greater transparency. Many brokers conduct transactions through the Internet where the prices and property characteristics are listed. With the coming of a number of multinational real estate management consultants and research associations (e.g. REALM, Real Estate and Land Management Institute), organized and systematized research is picking up. Agencies like ICRA (Investment and Information and Credit Rating Agency) along with CIDC (Construction Industry Development Council) and Crisil (Credit Rating and Information Services of India) along with Naredco (National Real Estate Development Council) have begun rating real estate projects. In the years to come, these efforts would result in greater transparency and reliability and easily accessible information on transactions. These would lead to greater requirement as well as opportunities for research in real estate. In that context, this thesis is a small step in documenting and analyzing the behaviour of residential property prices.

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**APPENDIX A**  
**Questionnaire for the Pilot Study**

Respondent's name - .....

Address .....

.....

Age - <40 yrs.  40 - 50 yrs.  > 50 yrs.

Occupation Salaried  Self employed  Business

Education Graduate  Post graduate  Professionally qualified

Q1. List three factors other than price that you would consider most important for purchasing a house?

Q2. What other criteria would you consider apart from the ones given below?

List all of them in the order of priority.

- Location
- Connectivity
- Facilities offered
- Promoter's image
- Quality of construction
- Security
- Payment policy
- Any other

Q3. How would you rate the factors (as listed by you above) on a ten point scale where

10 - extremely important    5 - of average important    0 - not important

- Location
- Connectivity
- Facilities offered
- Promoter's image
- Quality of construction
- Security
- Payment policy
- Any other

**APPENDIX B**  
**Final Survey Questionnaire**

*Final Survey Questionnaire*

*Respondent Profile*

1 Name ..... Address .....

2 Occupation: Serviceself  Employed  Businessman

3 Age <40 yrs.  40-50 yrs.  >50 yrs

4 Educational Qualifications: graduate  post graduate  professional

5 Do you own a flat ? Y / N If yes, then where? .....

Type of flat 2 bedroom / 3 BR / 4 BR

b) Plan to buy one in the near future? Y/N If yes, then where?

.....

Type of flat 2 bedroom / 3 BR / 4 BR

Choice of location Rohini / Patparganj / Dwarka / Ghaziabad / Gurgaon / Noida / Faridabad

Q1. What factors other than price would you consider most important for the purchase of a flat?

\* ..... \* ..... \*

\* ..... \* ..... \*

Q2. Ideally, what are the 5 most important facilities that you would like offered with your flat?

\* ..... \* ..... \*

\* ..... \* ..... \*

Q3. What are the five things that according to you would make an ideal location?

\* ..... \* ..... \*

\* ..... \* ..... \*

Q4. What would you consider as the benefits of purchasing from a reputed developer? List them in the order of preference.

\* ..... \* ..... \*

\* ..... \* ..... \*

Q5. How would you mark the following factors out of a maximum of 10 marks?

<b><i>Factor</i></b>	<b><i>Marks (out of 10)</i></b>
Location	.....
Facilities offered	.....
Promoter's image	.....
Security	.....
Quality of construction	.....
Parks	.....
Connectivity	.....

Q6. We feel the following factors contribute towards making a good location. How would you mark them out of a maximum of 10?

<b><i>Factor</i></b>	<b><i>Marks (out of 10)</i></b>
Security	.....
Connectivity - ease of commuting	.....
Proximity to schools	.....
Proximity to markets	.....
Proximity to parks	.....
Proximity to workplace	.....
Surroundings	.....
Resale value of the flats in the vicinity	.....

Q7. How would you mark the following facilities out of a maximum of 10 marks to indicate their importance in making a house purchase decision ?

<b><i>Factor</i></b>	<b><i>Marks (out of 10)</i></b>
Emergency electricity supply	.....
Covered parking	.....
Recreational facilities	.....
Maintenance facilities	.....
Transportation facilities	.....
Security system	.....

Q8. For purchase of a flat at a fixed price, which combination of two factors would you prefer over the others? Please indicate your choice of combination in the order of their importance.

1. Connectivity
2. Surroundings
3. Proximity to markets and school
4. Promoter's image
5. Recreational facilities
6. Emergency elec. supply
7. Security

1. .... & .....
2. .... & .....
3. .... & .....

## **APPENDIX C**

### **DISSERTATIONAL PROPOSAL**

#### TITLE OF THE RESEARCH

A RESEARCH TO EVALUATE A USER ORIENTED APPROACH FOR  
DETERMINING RESIDENTIAL PROPERTY PRICES

#### INTRODUCTION TO THE STUDY

The price of any commodity is governed by a combination of market forces, essentially demand and supply. In a perfectly competitive market, the price of a product will reach an equilibrium where the buyer maximizes his utility and the seller maximizes his profit. Prices are thus determined by a combination of these forces and are independent of the individual (either seller or buyer) action. Such a market can exist only when both the participants have perfect knowledge of the market and the product itself is perfectly homogenous and divisible.

Real Estate by its very character cannot be classified as a perfect market. It is localized in nature, transactions are private, there is little transparency, the market is unorganized and the commodity is not standardized. Urban property prices are dependent on and vary with legal requirements within a city, availability of construction finance, the construction scenario, availability of vacant land, demand (further defined by population and migration characteristics), etc. In real estate as in other sectors, the commodity is valued for the benefits/ profits that may arise from it. Therefore, it is inevitable that within a city, prices vary from area to area depending on the development characteristics of the area.

Residential property prices are very sensitive to what users perceive to be benefits that may be accrued from the flat. From purely the user's point of view a house must provide security/safety, good comfortable living conditions that may mean well ventilated homes and a pollution free environment, must provide access to basic



necessities (markets, schools, health care centers), ease of travel to other places in the city (connectivity) and minimum recurring expenditure (good quality construction). Depending on the level of importance ascribed to each of these features, average prevalent market price may vary from locality to locality.

Within a range established thus, the actual transacted price is always a compromise of the buyer's preferences and the seller's expectations, arrived at through a series of negotiations. These negotiations tend to be based on each party's perceptions of the value of the property in question, the sale price of similar properties in the area in recent history and in intuitive appreciation of the other party's expectations. This system is therefore unreliable and carries a high element of risk considering that each property is distinctly unique and every buyer's perception different. A rationalization of this process could help in arriving at a reasonable negotiable price for a property. From either party's point of view, this should reduce much of the vagueness and bring in some semblance of order.

This research attempts to create a model for arriving at an average negotiable price for a particular property and a particular buyer. It is generally understood that any price that covers the cost of land and construction and allows the developer a reasonable profit margin would be acceptable to him. It is only in the resale market that the question of what the asking price should be becomes critical. However, in both the cases it is the buyer's willingness to pay that really clinches the issue. Hence, any attempt at rationalizing the price must consider the end user preferences and choices.

#### BRIEF LITERATURE REVIEW

Berens et. al. (2007) said that real estate is a resource and a commodity that affects the welfare of the people involved in buying, selling, improving/developing, leasing, managing, financing, appraising and/or dealing in it otherwise. Real estate may be viewed as a source of investment and profit and the transactions made with such intent may be categorized as business transactions. On the other hand real estate also includes

those with interests solely for use e.g. construction and purchase of residences. Whatever it may be, real estate activity as a whole, is an important indicator of the rate of the economy.

#### Definition

Weiss et. al. (2000, p4) mentioned that “*Real estate consists of land along with improvements and appurtenances that attach to and pass with land (including incidental rights and interest such as easements)*”. Palmer (2003, p3) state that, “*Real estate as a commodity is composed of physical components of land, as nature provided it, and all man made permanent or fixed improvements added on or below the surface of the earth or which have affected the utility of a given parcel of land*”.

Berens et. al. (2007) classify real estate in terms of its physical, legal or economic characteristics. From a physical standpoint, as already mentioned, a real estate property is made on of land and buildings or other improvements. From a legal point of view, it represents certain legal rights in the property (ownership rights) and from an economic standpoint, it represents benefits that may accrue from it in terms of either monetary returns or direct use. The interest in real estate centers on the optimum use of real estate for greatest economic advantage- largest return in money or amenities over a period. Thus, its value is often judged by its income producing capacity, which guides the decisions of property owners, users, developers, investors and others. Their decisions are influenced by a variety of factors - market forces, business conditions, political trends, legal framework and governmental regulations.

#### Real Estate Markets

D'Arcy and Keogh (1998, p34) defines, “*A market as a set of arrangements for bringing together buyers and sellers*”. The most fundamental of the general principles of market operation relates to the tendency, in a given market at a given time, inward uniformity of prices for like commodities. According to Berens et. al. (2007) other basic principles are:

- When demand exceeds supply at the current price, the price tends to advance and vice versa
- An advance in price tends to reduce demand and increase supply. Similarly, a decline in prices tends to increase demand and reduce supply.
- An increase in demand, or a decrease in supply, will tend to raise price at least temporarily and vice versa.
- Price tends to move to the level at which demand and supply are in balance.

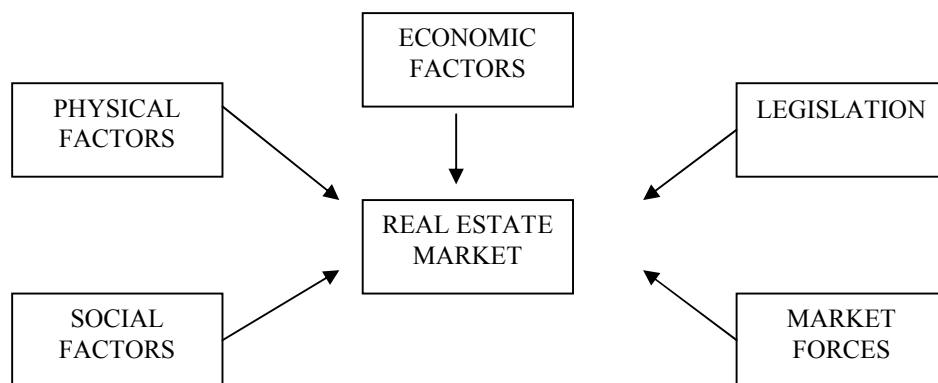
Real estate is both a consumer good and an investment outlet and its behaviour in the market reflects its hybrid character commodity markets, there is no direct exchange of goods (D'Arcy and Keogh, 1998). An effective market would provide for the balancing of supply and demand forces that lead to the determination of prices that then reflect competitive values. Uniform pricing and trading terms evidence the existence of market controls. Real estate markets differ in that there is no organized exchange, instead there controls be a series of negotiations ranging from direct sales to complicated transactions involving real estate brokers and agents. There is no transparent exchange/dissemination of information and often opinions substitute facts. Hence, the market operates in distorted conditions that skew the balance of supply and demand forces resulting in ambiguous methods of determination of prices.

*According to Goodman and Thibodeau (2003, p67) the peculiarities of real estate markets are:*

- The market is local in character and local market forces play an important role in determining real estate activity. The value of a property may also be affected by the character of the locality and the economic base of the region.

- Transactions are private in nature; thus, there is title publicity. Therefore, information channels are not open and the participants remain largely uninformed.
- Commodity is not standardized and is fixed in nature; hence, making each transaction unique
- Market is unorganized.
- The exchange itself is legal and is complex and expensive.
- Prices are further affected by the terms and availability of financing.

Real estate depends on a variety of factors ranging from the political to the social and the economic as illustrated in Fig. 2.1.



*Fig. 2.1 Factors affecting real estate markets (Goodman and Thibodeau, 2003, p67)*

### Factors Affecting Property Prices

According to Weiss et. al. (2000, p4) the various factors affecting real estate are legislation, finance, physical factors, and market forces. Shimizu and Nishimura (2006) opined that the price of a property will vary with location, business and regulatory conditions, market value, operating expenses and economic conditions and will also with the perceptions of the purchaser. The influences on price will vary with the use the property is put to. Commercial centers are inked more to economic growth whereas the

residential areas depend on the facilities and protection it can provide to the users. Real estate prices are affected by a balance of supply and demand forces in the area. They stabilize at equilibrium of these two macro- level forces.

According to Rees (1998) the real estate supply is characterized by:

- New construction and intense use of existing stock.
- Availability of loans for construction.
- Long term impact of governmental regulations and developmental norms.
- Construction costs and availability of vacant land for development.
- Demand for a particular type of property may give rise to an increase in supply.

Supply being rather inelastic, the demand factors often become important determinants of prices and rents.

### AIM OF THE STUDY

This study aims to rationalize the dependency of residential property prices on market dynamics as reflected in the user's perception of a property (i.e. on utility oriented demand characteristics) and to formulate a mathematical model for determination of an average negotiable price for a property.

### OBJECTIVES OF THE STUDY

*The main objectives of the study are:*

- i) To establish a user preference structure (housing demand characteristics) for the middle income category of Cooperative Group Housing Societies and developer built apartment units in and around Delhi.

- ii) To develop a baseline model for determining the average negotiable price of a property
  - a) of given characteristics, evaluated for user oriented factors
  - b) for a buyer, given his profile (age, employment, etc.), preferences and choice of type of flat.

## RESEARCH METHOD

The study will be accomplished in five steps elaborated below:

### Literature Survey

The first step will be to understand the principles of real estate, the uniqueness of real estate markets and issues concerning the pricing of properties. This will be followed by the identification of factors affecting residential prices and also finding out the analytical techniques required for evaluation of the parameters defining the price.

### Identification of Significant Factors

The next step will be to identify the factors that are critical to the purchase decision and hence to the study. This will be done through a pilot survey conducted among ten to fifteen purchasers and additionally, through an opinion survey of real estate consultants and developers.

### Establishing a Preferences Structure

A survey will be conducted among one hundred would be and recent property purchases to access the preferences of purchasers as willingness to pay for utilities / benefits to be gained from the purchases. This questionnaire-based survey will use the methodology of rating factors in the order of importance. The results of this survey will be analysed to arrive at a preference structure for Delhi.

## Model Development

Prices of properties at different locations across the city will be obtained through a primary survey of 25 brokers. These prices will be used to arrive at an average prices for the areas under study. Simultaneously, an evaluation of thirty to forty residential apartments at different locations will be carried out based on a scoring system established for the evaluation of factors identified earlier. These will be used to analyse the impact of the factors on prices and to develop:

- A model to determine the willingness of a buyer to pay given his preferences, through multiple regression analysis of factor ratings with average prices in the area of choice of the respondent.
- A model to determine the basic price of a property through multiple regression analysis of factor scores assigned to each apartment with its average price.

The model has been validated through application to some selected cases.

## Model Applications and Conclusions

Finally, the different applications of the model will be explored and the findings will be elaborate upon.

## SAMPLING

i. Real Estate Market	Residential Market
ii. Housing Category	Co-operative Group Housing Societies and Developer built Homes
iii. Area	Delhi and Surrounding areas.
iv. Income Category	Middle income category
v. Method of Data Collection	Survey
vi. Means of Data Collection	Structured Questionnaire

vii. Sample Size	100 (Purchasers or would be purchasers)
	25 Brokers
viii. Sampling Method	Convenient Sampling

### METHOD OF ANALYSIS

For the case under study, the characteristics of each property may be ranked on a scale of one to ten based on a pre-established set of criteria. Then, the price of each property may be correlated to its properties using either the Spearman's ranks correlation coefficient that uses the ranks as measurements or with Kendall's rank correlation coefficient. The Kendall's ranks correlation coefficient can also be used to establish the correlation between two characteristics / factors under study for a given set of residential properties. The data received from the survey will be in the form of scores against each of the factors/variables whose influence on the property purchase decision (and ultimately, on the price of a property) is to be analysed. It may not be certain at the outset whether such data would fall within a normal distribution. Therefore, a nonparametric method of analysis will be used for the analysis.

### PRESENTATION OF THE DISSERTATION

The dissertation is presented in the specified format suggested by the research handbook and supervisor.



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