REAL ESTATE APPRAISAL METHODS AND THEIR APPLICATION IN ANKARA

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I hereby declare that all information in this document has been obtained and presented in accordance with academic rules and ethical conduct. I also declare that, as required by these rules and conduct, I have fully cited and referenced all material and results that are not original to this work.

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ABSTRACT

REAL ESTATE APPRAISAL METHODS AND THEIR APPLICATION IN ANKARA

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Real estate is one of the reliable and important investment types for individuals and institutions. Interest in the price appraisal of real estate has increased with rapid development of real estate sector and its legal infrastructure in recent years. Conducting planned urbanization, choosing settlement areas and estimating their inner or outer transport costs, improving capital markets transparency, and reliability require a reliable price valuation of real estate assets. Appraisal in real estate is also important for the tax income of the national budget. In this thesis, it is investigated appraisal methods that are used in various countries and valuation approaches and methods that are used in Turkey are reviewed. The value, in the appraisal reports, is estimated with three traditional approaches: Sales Comparison, Cost, and Income Capitalization. In this thesis, Hedonic Price Approach and the availability of the application of this method in practice are investigated within the framework of seeking an alternative method for appraisal beyond three traditional approaches.

Keywords: real estate, appraisal, sales comparison, cost, income capitalization, hedonic price.

ÖZ

GAYRİMENKUL DEĞERLEME YÖNTEMLERİ VE ANKARA'DA UYGULANMASI

Bulut, Zeynep

Yüksek Lisans, Şehir ve Bölge Planlama Bölümü, Şehir Planlama

Tez Yöneticisi: Prof. Dr. Ali Türel

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Gayrimenkul; kişi ve kuruluşların tasarruflarını değerlendirdikleri en önemli ve güvenilir yatırım araçlarından birisidir. Gayrimenkul değerlemeye olan ilgi gayrimenkul sektörünün ve hukuki altyapının son yıllarda hızla gelişmesiyle birlikte hızla artmıştır. Planlı şehirleşmenin yürütülmesi, yerleşme bölgelerinin seçimi, bu bölgelerin arasında iç ve dış bağlantı maliyetlerinin belirlenmesi, imar planlarının ekonomik olarak değerlendirilebilmeleri, gayrimenkul piyasalarının açıklık ve güvene kavuşturulabilmesi, piyasalardaki fiyat değişiminin izlenebilmesi açısından da gayrimenkul değerlemesi büyük önem taşımaktadır. Gayrimenkullerin gerçek değerlerinin saptanarak vergilendirilmesi vergi gelirleri açısından da önemlidir. Bu tezde; dünyada bu konuda uygulanan yaklaşımlar, yöntem ve metodlar ile Türkiye'deki gayrimenkul değerleme piyasasında kullanılan yaklaşımlar incelenecektir. Ekspertiz raporlarında hesaplanan değer, üç geleneksel yöntemle hesaplanmaktadır: Emsal Karşılaştırma, Maliyet ve Gelir Yöntemi. Bu tezde, değerleme sürecinde geleneksel yöntemlere bir alternatif yöntem arayışı çerçevesinde; Hedonik Fiyat Yaklaşımı ve pratikte yöntemin değerleme sürecinde kullanılabilirliği incelenmiştir.

Anahtar Kelimeler: gayrimenkul, değerleme, emsal karşılaştırma, maliyet, gelir, hedonik fiyat.

To my sister;
Gülşen Bulut Öncü

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CHAPTER 1

INTRODUCTION

1.1. Aim and Scope of The Study

Real estate is one of the reliable and important investment types for individuals and institutions. Interest in the appraisal of real estate has increased with rapid development of real estate sector and its legal infrastructure in recent years.

Conducting planned urbanization, choosing settlement areas and estimating their inner or outer transport costs, improving capital markets transparency, and reliability require a reliable price valuation of real estate asset. Appraisal in real estate is also important for the tax income of the national budget.

Appraisal is, in simplest explanation, the determination of the amount for which the property will be sold on a particular date. (French, 2005:1) There is a wide range of purposes that appraisals are needed. These range from appraisals for transfer of ownership, financing and credit to litigation, tax matters, investment counselling, decision-making, accounting, etc.

The appraisal of real estate is a main principle for all businesses. Land and property are factors of production and the value of land is dependent on the demand and supply for the product that is produced.

The development of the real estate sector has been the cause of the importance of real estate in the economy. Decisions on buying, selling, and exchanging require price

analysis according to objective criterias. Neutral, trustable appraisal experts prepare reports showing the estimated value of the real estate assets.

The aim of this thesis is to provide a brief overview of the methods used in real estate appraisal according to international valuation standards, to research the position of appraisal practice in Turkey, and to make a study of hedonic price analysis with appraised values in the framework of seeking an alternative or a completementary appraisal approach.

For this purpose, a case study is prepared with the data, which are extracted from appraisal reports. Data contain information about the main features of real estate assets and the appraised values of them. The value, in the appraisal reports, is investigated with three traditional approaches: Sales Comparison, Income Capitalization, and Cost Approach. In this case, the data is examined with the hedonic price approach to investigate the price of the attributes of the real estate. The case study tries to give an answer to the question of whether Hedonic Price Analysis can be used in practice and gives efficient results as the Sales Comparison Approach or not.

In the reviewed literature, several definitions of appraisal and appraisal methods are used. Sales comparison method has been investigated by related studies mostly than other methods, because this method is used more than others in appraisal practice. However, there is no detailed study to add another appraisal instrument to the appraisal process. This thesis focuses on Hedonic Price Approach as an appraisal instrument.

1.2. Method of the Study

Over the past decade, there has been a significant growth in real estate appraisal research throughout the world. There are several books, articles, doctoral or master thesis that are written about real estate appraisal.

This thesis has been prepared by using the following methods;

- Library & resource search,
- Research the appraisal practice in several countries and Turkey,
- Research any organizations and associations about appraisal in world and in Turkey.

The major question of this research is the valuation approaches and methods that are used in Turkey and the comparison of valuation techniques.

Which valuation technique should be used for valuation and how it should be used?

In this study, it is investigated the advantages and disadvantages of valuation techniques by using hedonic price approach. For reaching to that major aim, these sub-questions are asked;

What is real estate appraisal?

What are the appraisal techniques and methods that are used in several countries and in Turkey?

How does the appraisal process work?

How can hedonic price approach be used in appraisal practice as a completementery or an alternative method?

In relation to these questions and the case study, hypothesis of the thesis is as follows:

Using hedonic price analysis in appraisal practice gives efficient results both as an alternative and a completementary appraisal method.

This thesis comprises five parts. The first part of this thesis includes conceptual description and principles of real estate appraisal. In this stage, library & resource search is made to review the methods used in the appraisal practice in several countries and Turkey. There are many associations and organizations about appraisal all over the world, such as Appraisal Institute (AI), International Valuation Standards Committee (IVSC), The European Group of Valuers (TEGoVA), American Society of Appraiser (ASA), Councelors of Real Estate (CRE), etc. Publications of these institutions are reviewed.

The second part of this thesis includes description of the valuation methods and valuation processes systematically. This stage includes library, resource and e-sources search about evaluation studies, reviewing the journals such as The Appraisal Journal, Journal of Real Estate Literature, Real Estate Review, etc. In addition, publications of the appraisal institutions are reviewed.

The third part of this thesis includes the situation investigation of the Real Estate Appraisal in Turkey and the case study. For this purpose, library & resource search is used as a method while data are gathered about the appraisal practice in Turkey. This section of this thesis also includes the investigation of associations -like Capital Boards of Turkey- and committees for their roles, and purposes in the appraisal sector. In the case study, hedonic price approach is used to evaluate the implicit price of components of the real estate assets. For this examination, very detailed data are

needed that contain information about the main characteristics of real estate and appraised values. The data, used in this study, are extracted from the appraisal reports that are gathered from an appraisal company and prepared by several appraisers in 2008 in several districts in Ankara.

Finally, the conclusion part of this thesis includes a summary and certain concluding remarks determined under the light of case study questions and hypothesis.

CHAPTER 2

THEORETICAL FRAMEWORK

2.1. Real Estate and Real Property

In this section, the two terms that are used commonly in real estate appraisal process will be clarified. Karvel and Unger defined real estate as an integration of many specializations and an aggregation of disciplines resulting in a unique field of study (Karvel and Unger, 1991: 419). Fisher and Martin also defined real estate as an identified parcel of land, including improvements and all building attachments (Fisher and Martin, 1994:3). Real estate, as a tangible economic good, is a physical piece of land with all improvements related to it and all rights to the air above and earth below the property.

In real estate appraisal, there is a distinction between real estate and real property. Pagourtzi and Assimakopoulos defined real property as all the interests, benefits, rights, and encumbrances inherent in the ownership of physical real estate, where real estate is the land together with all improvements (Pagourtzi and Assimakopoulos, 2003: 385). Fisher and Martin also defined real property as the interests, benefits, and rights inherent in the ownership of real estate (Fisher and Martin, 1994:3). Real property is a combination of the structure and the usufructuary rights.

2.2. The Term: Value

Real estate appraisal methods must have the validity to produce an approximate calculation of the market value. The methods should reflect the market conditions and the underlying fundamentals of the market at the time of appraisal process. This process of valuation ends with the value.

In reviewed literature, it is observed that all the researchers apprehend to clarify the process of determining the value. The concept of value is defined in many ways for different disciplines such as economy, architecture, law, etc.

In common parlance, value is a word of many meanings. All these meanings are expressed by several usages, such as market value, use value, leasehold value, investment value, tax value, insurance value and other types of value. Each term has a different meaning and each of them will be explained in this section.

In the Dictionary of Real Estate Appraisal, value is indicated as the present worth of future benefits that accumulate to real property ownership. Value is divided into two types as objective value and subjective value. Objective value is concerned with the factors outside the property. It gives answer to the question that asks the property's value according to other people. It can also be called as present value. Subjective value includes the factors inside the property itself. It gives answer to the question that asks what the value of property is for the owner. It can also be called use value.

Value is the final determination of the appraisal process. In this thesis, value will be analyzed by its types and its relation with the appraisal process.

As mentioned before with having many different definitions; value has several type of usage. Market value estimation of a property is the aim of most appraisals. As the term value, market value has several different definitions in the literature. There is one internationally accepted definition of market value by Appraisal Institute (AI).

According to AI; market value is “the most probable price, as of a specified date, for which the specified property rights should sell after reasonable exposure in a competitive market under all conditions requisite to a fair sale, with the buyer and seller each acting prudently, knowledgeably, and for self-interest, and assuming that neither is under undue duress” (AI, 1993:384).

Market value supposes competitive conditions. There should be various sellers and buyers who compete with each other in the market. Both the sellers and buyers are anticipated to act rationally and there must be no time compression for transaction in market period. In payment arrangements, it is observed from the side of buyer. The maximum price is paid by an informed buyer, who acts rationally, under the market conditions. According to this implication, International Valuation Standards Committee (IVSC) defines market value as the estimated amount for which a property should exchange on the date of the valuation between a willing buyer and a willing seller (IVSC, 2003:96).

In appraisal process, an appraiser estimates one or more values for a real estate asset’s actual price. Market value, as mentioned before, is the most wanted value type in appraisal of a real estate. Other types of value can be estimated according to the aim of the appraisal, such as use value, investment value, going-concern value, assessed value, insurable value, etc.

To understand the basic meanings of value, the definitions of value types and their relation with the market value of the subject property should be reviewed.

Use value is the value of a specific property that is used for a specific purpose. This value based on the productivity of the property as an economic good. It may also be described as the value of the utility to its user. It may correspond to the market value of the asset.

Investment value is defined as the value of a specific property to a particular investor. It is based on that entity's investment requirements (AI, 2001:26). Investment value is a subjective reflection of the relation between an investor and an investment. When the investor's demand is equal to the market value, the investment value is the same as the market value of the property.

Going-concern value is the value of a company as an operating investment. It is the total value of the real estate asset, which includes real property and intangible personal property. Assessed value is the value of a real estate asset as a basis for its taxation. It is usually estimated in relation to a market value base. Insurable value is the cost of total replacement of destructible improvements to a property. It is used to estimate extended damage coverage insurance for a property.

These types of values may be estimated to reach the final value of the property. It depends on what purpose the client wants to use the final value estimation.

2.3. Appraisal of Real Estate

Appraisal of a real estate is a professional appraiser's opinion of value and the task of estimating the potential price of property in case of sale, lease etc. It is also important for investment decisions, for real estate funds and project developments.

The preparation of an appraisal includes market research; analysis of information relevant to a property; and the knowledge, experience, and professional judgment of the appraiser. Professional appraiser is someone who is fully educated and has experience in the sector. He also must be licensed and certificated. Professional appraiser must be fully aware of external factors that may affect the value of real estate. These external factors can be political, economic, social, etc. He must analyze all conditions with the appraisal methods as tools to evaluate the value of real estate. At the end of the appraisal process, objective appraisals with regard to the same property on the same day evaluate the value of the property in a range of %5 or less.

According to The Uniform Standards of Professional Appraisal Practice, appraisal is an analyses, opinion, or conclusion relating to the nature, quality, value, or utility of specified interests in, or aspects of, identified real estate. In this usage, appraisal covers a variety of assignments, including valuation, appraisal consulting, and appraisal reviews (USPAP, 2009: U1).

The Table 1, from the 12th edition of Appraisal of Real Estate by Appraisal Institute, explains the aasignments of appraisal.

Table 1 Comparison of the Terms: Appraisal, Consulting, Review

APPRAISAL

Definition	The act or process of developing an opinion of value.
Characteristics	Appraisal involves selective research into appropriate market areas, the Assemblage of pertinent data, the use of appropriate analytical techniques, and the application of knowledge, experience, and professional judgment to develop an appropriate solution to an appraisal problem. The appraiser provides the client with an opinion of real property value that reflects all pertinent market evidence.
Examples	An opinion of market value for a fee simple estate, leasehold estate, reservation easement, or other estate (to assist in mortgage lending decisions, to assist in purchase or sale decisions, etc.)An opinion of investment value or some other properly defined value of an identified interest in real estate as of a given date (for insurance purposes, for relocation purposes, for property tax appeals, etc.)

APPRAISAL CONSULTING

Definition	The act or process of developing an analysis, recommendation, or opinion to solve a problem, where an opinion of value is a component of the analysis leading to the assignment results.
Characteristics	Current market activity and evidence are studied to form a conclusion that may not focus on a specific value indication. An appraiser develops a value opinion in an appraisal consulting assignment as part of the process of answering some other question about real estate, such as whether a proposed use of a given property is economically feasible.
Examples	Economic feasibility studies Marketability or investment considerations that relate to proposed or existing developments Land utilization studies Supply and demand studies Absorption analyses

APPRAISAL REVIEW

Definition	The act or process of developing and communicating an opinion about the quality of another appraiser's work.
Characteristics	Appraisal review procedures may be likened to a quality control or auditing function. A review appraiser examines the reports of other appraiser to determine whether their conclusions are consistent with the data reported and other generally known information.
Examples	Field review, desk review

Source: Appraisal of Real Estate, 12th Edition, 2001:12

Appraisals may be required for any type of real property, such as single-family homes, office buildings, apartment buildings malls, industrial sites, and farms. There are several reasons for performing a real property appraisal whenever real property is sold, mortgaged, taxed, insured, or developed. In the Table 2 in section 2.3.1, the usages of appraisals are illustrated.

Real estate appraisals result in a market value estimate that is both provident and rational in relation to the physical and legal characteristics of the real estate asset. The sales comparison, income capitalisation, and cost analysis approaches are traditional methods mostly used to calculate the market value of real estate as in the study of Calvin Lin (2007). Beyond these three approaches, hedonic price approach will be considered in this thesis to be able to find the implicit values of the real estate assets' components. In section 2.4, these approaches will be explained.

2.3.1. The Purpose of Appraisal

Real estate appraisal approximates the value. Appraisal is a professionally deduced result about the present worth or value of specified rights in a particular parcel of real estate under specified market conditions. (Kinnard, 1971: 9) The real estate appraisal process should be based on the professional judgment and acquirement of a well-trained appraiser. At the end of this process, results should be represented to a client in a logical and persuasive way to help the client make a decision.

An appraisal assignment should contain these necessary components;

- the specification and legal description of real estate asset,
- the type of value that is estimated,
- the interest being appraised,
- the market conditions at the effective date for the appraisal,
- the value.

Moreover, the appraisal report should contain any special or limiting factors about the real estate asset. The concept of the appraisal reports will be discussed in detail in section 2.3.4.

The purpose of appraising real estate is to estimate the value and it is defined by the client as what value is wanted. The appraiser must clearly identify the client's purpose in seeking an appraisal before the purpose of that appraisal is established. When the purpose of this appraisal is discovered, it has no interest from now on for the appraiser where value conclusion will be used by client. It is so important that the appraiser should act responsibly and use his profession while estimating the final value.

An appraisal may be requested in very circumstances that are shown in the Table 2.

Table 2 Uses of Appraisal

TRANSFER OF OWNERSHIP • To help prospective buyers set offering prices. • To help prospective sellers determine acceptable selling prices. • To establish a basis for real property exchanges. • To establish a basis for reorganizing or merging the ownership of multiple properties. • To determine the terms of a sale price for a proposed transaction.
FINANCING AND CREDIT • To develop an opinion of the value of the security offered for a proposed mortgage loan. • To provide an investor with a sound basis for deciding whether to purchase real estate mortgages, bonds, or other types of securities. • To establish a basis for a decision to insure or underwrite a loan on real property.
LITIGATION Eminent domain proceedings • To develop an opinion of the market value of a property as a whole-i.e., before a taking. • To develop an opinion of the market value of the remainder after a taking. • To estimate the damages to a property created by a taking. Property divisions • To develop an opinion of the market value of a property in contract disputes. • To develop an opinion of the market value of real estate as part of a portfolio. • To develop an opinion of the market value of partnership interests. Environmental litigation • To estimate damages created by violations of environmental laws. • To estimate damages created by environmental accidents.
TAX MATTERS • To develop an opinion of assessed value. • To separate assets into depreciable (or capital recapture) items such as buildings and nondepreciable items such as land, and to estimate applicable depreciation (or capital recapture) ratesTo develop an opinion of the value of the real estate component of an estate plan that represents the foundation for future capital gains and inheritance taxes. • To determine gift or inheritance taxes.
INVESTMENT COUNSELLING, DESICION MAKING, AND ACCOUNTING • To set rent schedules and lease provisions. • To determine the feasibility of a construction or renovation program. • To help corporations or third parties purchase homes for transferred employees. • To serve the needs of insurers, adjusters, and policyholders. • To facilitate corporate mergers, the issuance of stock, or the revision of book value. • To develop an opinion of liquidation value for forced sale or auction proceedings. • To counsel clients by considering their investment goals, alternatives, resources, and constraints and the timing of their activities. • To advise zoning boards, courts, and planners, among others, on the probable effects of proposed actions • To assist in arbitrating valuation issues.. • To analyze supply and demand trends in a market. • To ascertain the status of real estate markets. • To value fixed assests and assist in asset value allocations.

Source: Appraisal of Real Estate, 12th Edition, 2001:15

2.3.2. Principles of Appraisal

The main principles of real estate appraisal are suitable to all appraisal problems and important to understand the dynamics of value.

Supply and Demand: Value is estimated by the interaction of the forces by supply and demand. Supply is the amount of a type of real estate asset ready to sale, lease at a specific time, at a specific price and in a specific place that reveals the real estate's scarcity, which is a basic factor of value. (Özçelik, 2004:17)

Demand is the amount of a type of real estate asset wanted for sell or rent at different prices in a particular market for a particular period. Values are influenced by the condition of demand, less or more. Less demand means higher price and more demand means lower price.

Anticipation and Change: The anticipation of benefits generates the value. The expectations of market participants about market conditions and future benefits influence the estimate of the value.

Market dynamics, which determine the value, are constantly changing. Changes in these dynamics influence the demand for and supply of the property values. Appraisals tend to identify the changes in the market that may affect the actual real estate value. (Kinnard, 1971:41)

Substitution (Opportunity Cost): Due to this principle, when various comparable properties are available in an open market, the buyer would pay no more for a specific property for another that is equally desirable. This principle is applicable to real estate assets such as houses, which are purchased for their facility attributes, and properties purchased for their income producing capabilities.

Balance: The principle of balance is important in Highest and Best Use analyses and estimation of value. The point of maximum productivity and maximum value is reached when all factors of production are in balance with one another. (Kinnard, 1971: 43) It organize the basis for making adjustments in the sales comparison approach, calculating the depreciation in the cost approach, and estimating future earnings in the income capitalization approach.

Contribution (Marginal Productivity): The value of any improvements of a real estate is measured in terms of its contribution to the value of the whole asset. The value of the component is estimated how much its absence reduces the value of the whole property.

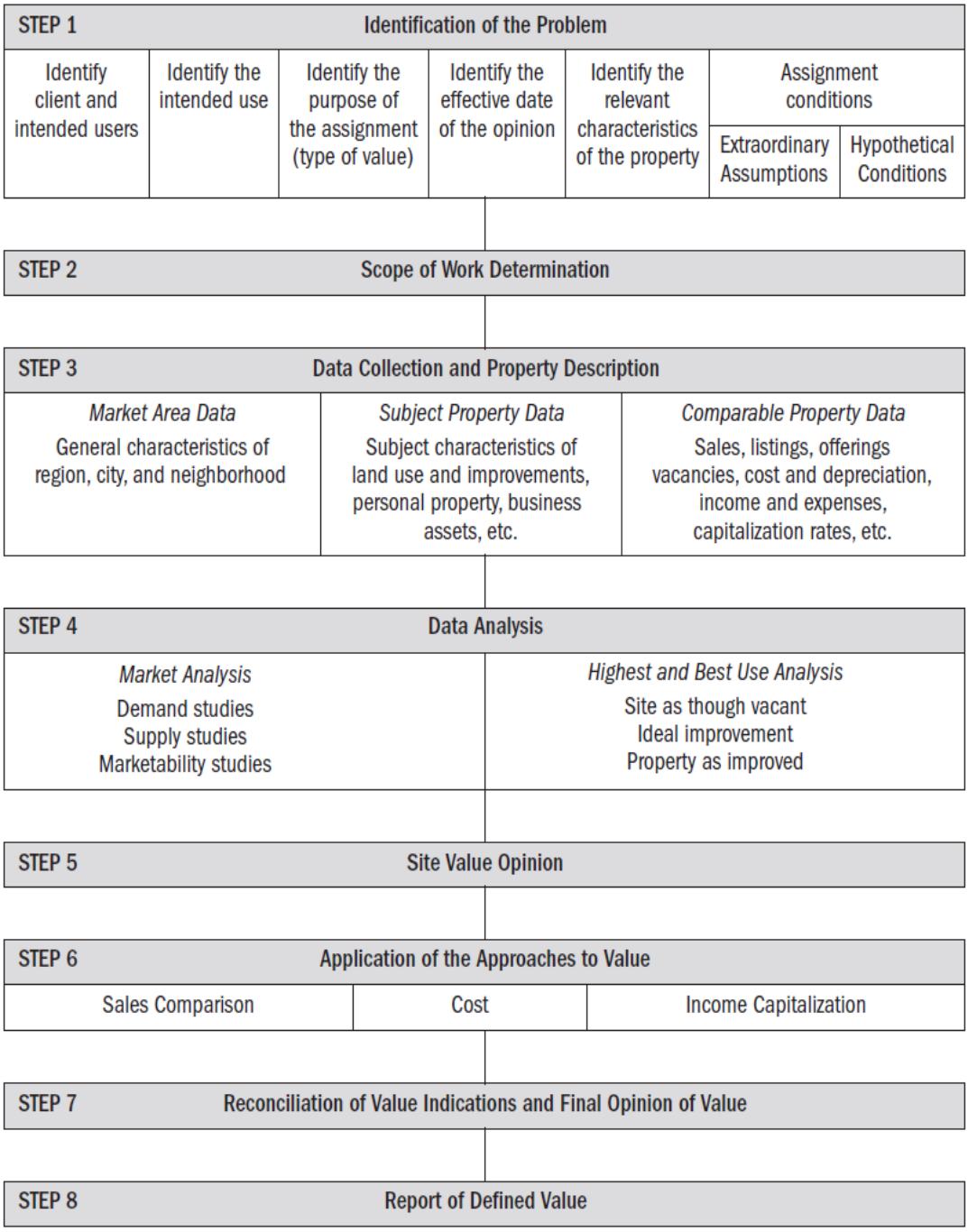
Externalities: The value of real estate is influenced by the external factors. These factors have positive or negative influence on the value of real estate. As an example, essential services such as public buildings, bridges, highways influence the value in a positive way. Factory premises, gas stations do it opposite way as decreasing the value of the real estate. In sales comparison approach, this principle is used when comparing the subject property and the comparisons with their environmental and spatial characteristics. With hedonic price approach, the value of each external component can be calculated. This calculation shows the share of each component in the subject property's appraised value.

2.3.3. The Appraisal Process

Appraisal process is a systematic procedure that appraisers use to estimate the final value of the property. This process begins with identification of the appraisal problem and ends with the report of the defined value. Uniform Standards of Professional Appraisal Practice states that as Standard 1, "in developing a real property appraisal, an appraiser must identify the problem to be solved and the scope

of the work necessary to solve the problem, and correctly complete research and analysis necessary to produce credible appraisal" (USPAP, 2009: U15).

Appraisal process is illustrated as following figure:



Source: McKinley, 2008:275.

Figure 1 Appraisal Process

As shown in the previous figure, appraisal process has several steps. This process can be adopted to match the conditions of a specific appraisal assignment (Floyd and Allen, 1987: 228).

Firstly, the appraisal problem is identified and the scope of the work is clarified by the appraiser. According to Floyd and Allen, an appraiser should certainly obtain following data to clarify the appraisal problem:

- the type of the value to be estimated (market value, insurance value, leasehold value,and etc.),
- the property involved,
- the spesific property rights being appraised,
- the use of the appraisal,
- the effective date of the appraisal.

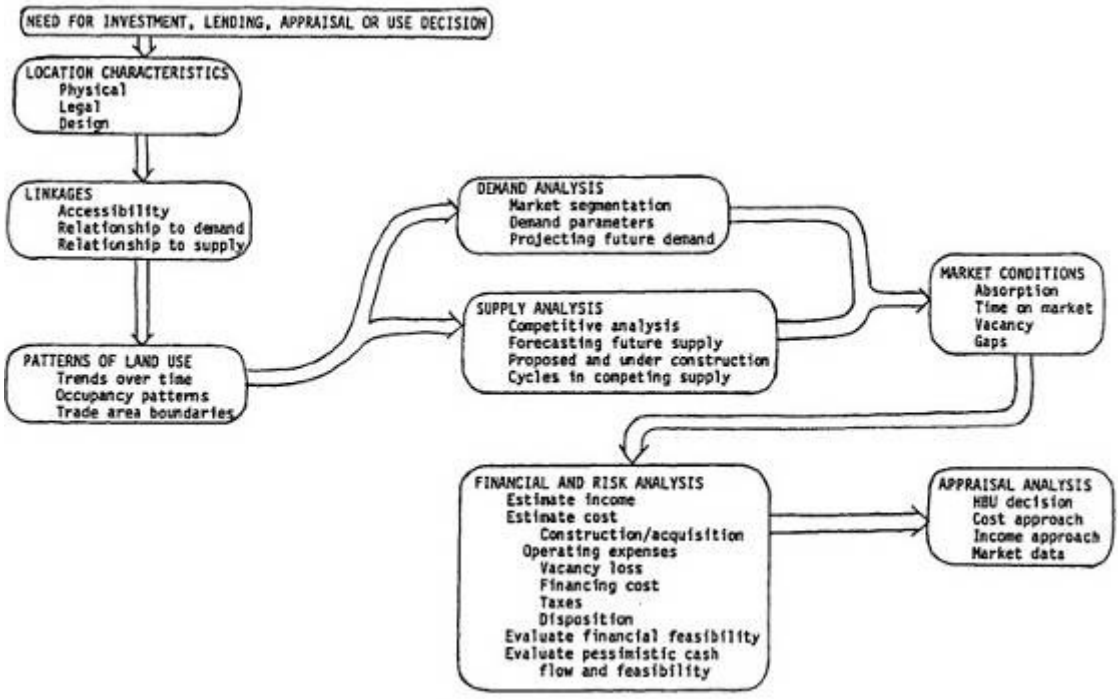
(Floyd and Allen, 1987: 229)

Data gathering steps begins after the appraisal problem is identified. According to nature of the subject property, appraiser collects the relevant data. The data contains economical, social, environmental conditions that may affect the value of the property. The appraiser collects spesific data regarding to general characteristics of the neighbourhood, physical characteristics of the subject property, mobility in real estate market, and etc.

After the appraisal problem is solved, scope of the work is defined and the relevant data is obtained, the data analysis process begins. Data analysis process consists of two elements that are:

- Market Analysis,
- Highest and Best Use Analysis (HBU).

Market Analysis: In the appraisal process, market analysis is a study of market that depends on the subject property's nature. The concept of the study is shown in the following figure 2.



Source: Clapp and Messner, 1988:4.

Figure 2 Market Analysis Process

In appraisal process, an appraiser develops basic indications with market analysis for the three approaches. In sales comparison analysis process, market analysis is used to identify the comparable sales in the same market as the propety. Market analysis provides the basis for adjustment of the cost of the appraised property for depreciation in the cost analysis process. In the process of income capitalization analysis, market analysis is used to evaluate income and expense "in light of the market forces of supply and demand". (AI, 2001: 59).

Highest and Best Use Analysis (HBU): Highest and best use analysis is an important part of the real estate appraisal. According to Dictionary of Real Estate; a property's highest and best use is the probable and legal use of vacant land or an improved property, which is physically possible, supported, financially feasible and that results in the highest value. Highest and the best use analysis should contain four criterias, which are legal permissibility, physical possibility, financial feasibility and maximum profitability (AI, 1993:171).

Highest and best use analysis points out that market value of a real estate asset should be estimated according to the most productive use of the subject property. The appraiser must take the physical components of the property and the comparebleness of the property with its surrondings into account while estimating the highest and best use.

2.3.4. Final Opinion of Value

After completing the data analysis process of appraisal, appraiser evaluates the final value with using one or more approaches and accesses a final value of the property. Appraiser informs the final value of the subject property to client as a written report. It is called as appraisal report. Appraisal reports contain all of the data that is gathered in the appraisal process and the approach that is used to reach the final value. There are sets of rules about appraisal reports that are established by appraisal societies such as International Valuation Standards Committee (IVSC), The Uniform Standards of Professional Appraisal Practice (USPAP), etc.

According to USPAP, Standard 2 states that, "it is essential that professional appraisers develop and communicate their analyses, opinions, and conclusions to intended users of their services in a manner that is meaningful and not misleading" (USPAP, 2009: U21)

Standards Rule 2-1 states that each written or oral appraisal report must "clearly and accurately set forth the appraisal in a manner that will not be misleading; contain sufficient information to enable the intended users of the appraisal to understand the report properly; and clearly and accurately disclose any extraordinary assumption, hypothetical condition, or limiting condition that directly affects the appraisal and indicate its impact on value" (USPAP, 2009: U15).

2.4. The Appraisal Approaches

An appraiser must try to determine the objective market value of the real estate. For this determination, the appraiser uses several approaches. These approaches depend on the type of the property, the purpose of the appraisal, the identified work and the quality and quantity of the accessible data. Real estate appraisers calculate the value of a property by using three traditional different methods, which are:

- Sales Comparison Approach,
- Cost Approach.
- Income Capitalization Approach,

Beyond these three traditional appraisal approaches, another one should be mentioned that differs from other approaches with calculating the price of real estate components:

- Hedonic Price Approach.

In reviewed literature, there are many studies about the appraisal process, appraisal methods, and their application. Most of the reviewed literature points out the importance of selecting the suitable method to appraise the value of the property. In addition, each appraisal method is criticised if it can reach the market value or not. In

this section, some studies about appraisal approaches will be mentioned briefly, then in following sections, each appraisal approach will be examined in detail.

The following table from 2002 Standard on Mass Appraisal shows the rank of typical usefulness of the three approaches to value in the appraisal of major types of property.

Table 3 Rank of Typical Usefulness of the Three Approaches

Type of Property	Sales Comparison Approach	Cost Approach	Income Approach
Single-family residential	1	2	3
Multifamily residential	1,2	3	1,2
Commercial	2	3	1
Industrial	3	1,2	1,2
Non-agricultural land	1	-	2
Agricultural*	2	-	1
Special purpose**	2,3	1	2,3

*Includes farm, ranch, and forest properties.

**Includes institutional, government, resort, and recreational properties.

Source: 2002 Standard on Mass Appraisal, February 2002:39

According to study of Lin, real estate appraisal models can be divided into sales comparison, cost, and income capitalization analysis. The sales comparison approach uses the properties, which are the same as the appraised property. This method estimates the market value of the property. Experiments with this method pointed that the appraised value may be impressed by speculations about price of the real estates (Lin, 2007:282). In the study of Kummerow, it is pointed that the sales comparison approach may fail to appreciate the long-term value where a market bubble exists (Kummerow, 1997: 25). As Kummerow, Tsukamoto analyzed the housing economy in the late 1980s in Japan and, he points the conclusion that Japanese appraisers and investors was largely caused by the inability of estimating the value by sales comparison approach (Tsukamoto, 1999:195).

Gorlow, Parr, and Taylor indicated that the value of a property should be evaluated by using the construction costs of the comparable project. According to their study, "The cost approach can evaluate the construction value; even so, the final faultless validation of value of the final period needs the market information for estimation" (Gorlow, Parr, Taylor, 1993). The cost approach uses two main factors as the basis for appraisal, which are the reconstruction/replacement costs and the subtraction of the depreciation. Although objectivity is the advantage of this method, the drawbacks of this method point that this approach is deficient in estimating the market value. Final appraised value may differ from the market value. (Lin, 2007:284).

The income approach discounts all the future net income to present value. It estimates the essential value of the real estate according to the revenues and costs. This method focuses on the estimation of the income stream and the discount rate. The income approach is formed into two ways: direct capitalization and yield capitalization. (Lin, 2007: 287)

According to French, the underlying requirement of appraisal is the value of the property. French also suggested that appraiser should determine which appraisal method is most suitable for the subject property. In his research, he defines the appraisal methods shortly and points out the terms: specialised property and non-specialised property. He also suggested that an appraiser could determine which method he would use for appraisal by classifying the subject property is specialised or non-specialised. (French, 2005: 9)

In this thesis, in the light of former studies, the three traditional approaches, which are Sales Comparison, Cost, and Income Capitalization will be examined. With the case study of this thesis, the data that are gathered with the Sales Comparison Approach will be used with Hedonic Price Approach for testing Hedonic Price Analysis in appraisal practice.

2.4.1. Sales Comparison Approach

The sales comparison analysis, also called direct sales comparison, is the most used method among the appraisers. This analysis uses actual proceedings among buyers and sellers to provide a direct indication of value perceptions and to establish asset value.

In the Dictionary of Real Estate Appraisal, this method is defined as a set of procedures in which a value indication is derived by comparing the subject property with the similar properties that have been sold recently (AI, 1993: 318).

This method depends on the substation principle, which states that the commodities, goods, and services with lower price will attract greatest demand according to others that have the same specifications in the same market (AI, 2001: 426). A circumspect buyer does not will to pay more money to a real estate asset than the cost of similar substitute property. This method can be applied all kinds of properties unless there is existence of sufficient market information.

The sales comparison method is contingent on availability, completeness, accuracy, and timelines of sale transaction data. The appraiser gathers these features from government records, data vendors, and appraiser's local contacts. (Pagourtzi and Assimakopoulos; 2003: 386)

When a large sample of transactions is available in the market, it is easy to find the comparable data for an appraiser. In such market, to appraise the value of the property, an appraiser uses some variables, as example; the address, the type of property, the age of property, the general condition of main property or dwelling unit, etc. (Parnham and Rispin, 2001: 19). More features can be added, such as the size of accommodation, proximity to facilities, etc. The appraiser collects the comparable data with according to these features.

In this method, appraiser has to examine resemblances and differences and make appropriate adjustments to reflect factors influenced the value or value determinants. These factors are location, topography, accessibility, construction, age, condition specification of the property, etc.

2.4.1.1. Sales Comparison Analysis Process

Process of the sales comparison method can be assorted into five steps:

1. Find Comparable Sales: In the first step of the appraisal process, the appraiser searches the market to gain information on sales transactions, offerings to purchase properties, listings of properties that are similar to the subject property. This search considers the features such as property type, size, physical characteristics, location, age, existing facilities of the subject property. These features are obtained from public records, real estate periodicals and interviews with the participants in the market.

According to Fridman, the features in the following list should be collected while using sales comparison method to appraise a property (Fridman, 1978: 30):

- Name and address of seller and buyer,
- Date, price and terms of sale,
- Location by street address or brief legal description,
- Size of property or capacity,
- Description of land types on the basis of differences in value, use, or potential use (if there is more than one land type),
- Description of improvements and fixtures and their condition at the time of sale,
- Use data, including information on leases, zoning, deed restriction, and easements affecting land use,

- Productivity, showing income and expenses broken down to indicate the amount of real estate taxes, assessments, and other significant items,
- Special reasons for buyer to buy the property and their experience in the market,
- Time and effort required to sell the property,
- Special factors peculiar to the type of property involved,
- Indicated sale price per comparison unit.

These features are meaningful for hedonic price appraoch, too. In hedonic price analysis, each of these features is a variable and price of each variable can be estimated.

2. Verify Transactional Data: In this step, the appraiser verifies the information by confirming that the data gained is reliable and transactions between the sellers and buyers without any forces.

3. Select Units of Comparison: In this step, an appraiser selects relevant units of comparison. When appraisal of a property is made, its sale price is divided by units of the comparison. The units of comparison consist on the nature of property. Units of comparison are used to make comparison easily between the subject and comparable properties. In table 4, standard units of comparison is shown.

Table 4 Standard Units of Comparison

PROPERTY TYPE	UNITS OF COMPARISON
Single-family Residence	Price per room, price per m^2
Vacant Commercial Land	Price per acre
Rental Apartment Complex	Price per dwelling unit, Price per room
Restaurants	Price per seat
Developed Subdivision	Price per developed lot
Marina	Price per boat slip

Source: Özçelik, 2004: 76

4. Compare Subject Property and Sold Properties: In this step, the appraiser compares the subject property and comparable sales properties using the elements of comparison and adjusts the sale price of each comparable appropriately.

5. Adjusting the Value: At the last step of the sales comparison process, the appraiser summarizes and re-examines the data. When adjusting the value, the appraiser questions if each comparable property or each method is a valid and reliable indicator of value of the subject property or not. According to Appraisal Institute, the appraiser may ask such questions within this survey (AI, 2001: 446). These questions are about the comparable properties' specifications, such as the physical characteristics, location and transaction type of the comparable property.

Adjustments are made from the known to the unknown. The comparable property is a known transaction that is adjusted to make it equal to the unknown. When a sufficient number of adjusted comparables is available, a reliable indication of value can be developed. According to Williams; there should be at least three comparables

to allow accurate interpretation of the market. Three comparables are suitable when there is something wrong with one of the three and the two that remain are probably insufficient to develop an indication of value (Williams,2004:156).

According to Appraisal Institute; adjustment process involves the following general steps:

- The identification of the elements of comparison,
- The comparison of the implicit features of the comparable and subject property to reach the reasonableness of the adjustment,
- Making net adjustments for all comparables and apply these to the selling price of the property,
- Reconcile the range of adjusted sale or unit prices to the subject property, using qualitative analysis if appropriate. (AI, 2001: 429)

Real estate appraisers and users of appraisal reports universally accept this general process. After verifying transactional data and selection of the units of comparison, the elements of comparison are assessed. While doing this assessment, the appraiser identifies which elements of comparison affect property values. Each basic elements of comparison must be analyzed to determine whether an adjustment is required. Adjustments for differences are made with the price of each comparable property to make equivalent to the appraised property in the market.

2.4.1.2. Limitations of Sales Comparison Approach

The major limitation of the sales comparison approach is the lack of available and comparable sales information in the same market. The market conditions may have affected the value of the subject property, so in this approach, the market conditions must be included in the appraisal process. Such a limitation makes hedonic price approach to come into question. As mentioned before, in these conditions, hedonic

price approach can be used to find the implicit value of each variables of the subject real estate asset.

Another limitation for this approach is income-producing properties. With sales comparison approach, it is not easy to find information about an income producing property from public records or sellers and buyers in the market.

2.4.2. Cost Approach

Cost Approach, is also called Contractor's Method, is one of the three traditional appraisal approaches. If the subject property is rarely sold in the market, it is impossible to appraise its value with sales comparison approach, and if there is no rental activity, the income approach, which will be mentioned in the following section, becomes inappropriate for appraisal.

The absence of market information of the property arises as a difficulty with certain types of building and uses; such as public and state schools, oil refineries, chemical plants, gas stations, power stations, steelworks, sports and leisure centres, and similar holdings. (Scarret, 2008:67) In these circumstances, cost approach is used for appraising. In addition, the cost approach is also appropriate when appraising the new improvements.

According to Fridman, cost approach is based on the proposition that the informed purchaser would pay no more than the cost of producing a substitute property with the same utility as the subject property. (Fridman, 1978:65)

When the property is owner occupied, so there is no rental income, and the business attached to the property is specialised that there is no comparable in the market, the appraiser focuses on the building's replacement cost to appraise the property. According to Pagourtzi and Assimakopoulos, in such circumstances, the appraiser

should ask how much it would cost to replace the property, if the business were deprived of its use (Pagourtzi and Assimakopoulos; 2003:391).

In this approach, the appraiser first assesses the market value of the raw land according to the comparable land values in the same market. This land value is added to the cost of rebuilding a new building as the same as the existing one. According to Pagourtzi and Assimakopoulos, the appraiser makes adjustments to allow for the obsolescence and depreciation of the existing building, relative to the new hypothetical unit (Pagourtzi and Assimakopoulos; 2003:391). These adjustments are made according to externalities, such as age, condition, quality, etc.

The main principle of the cost approach depends on the following formula:

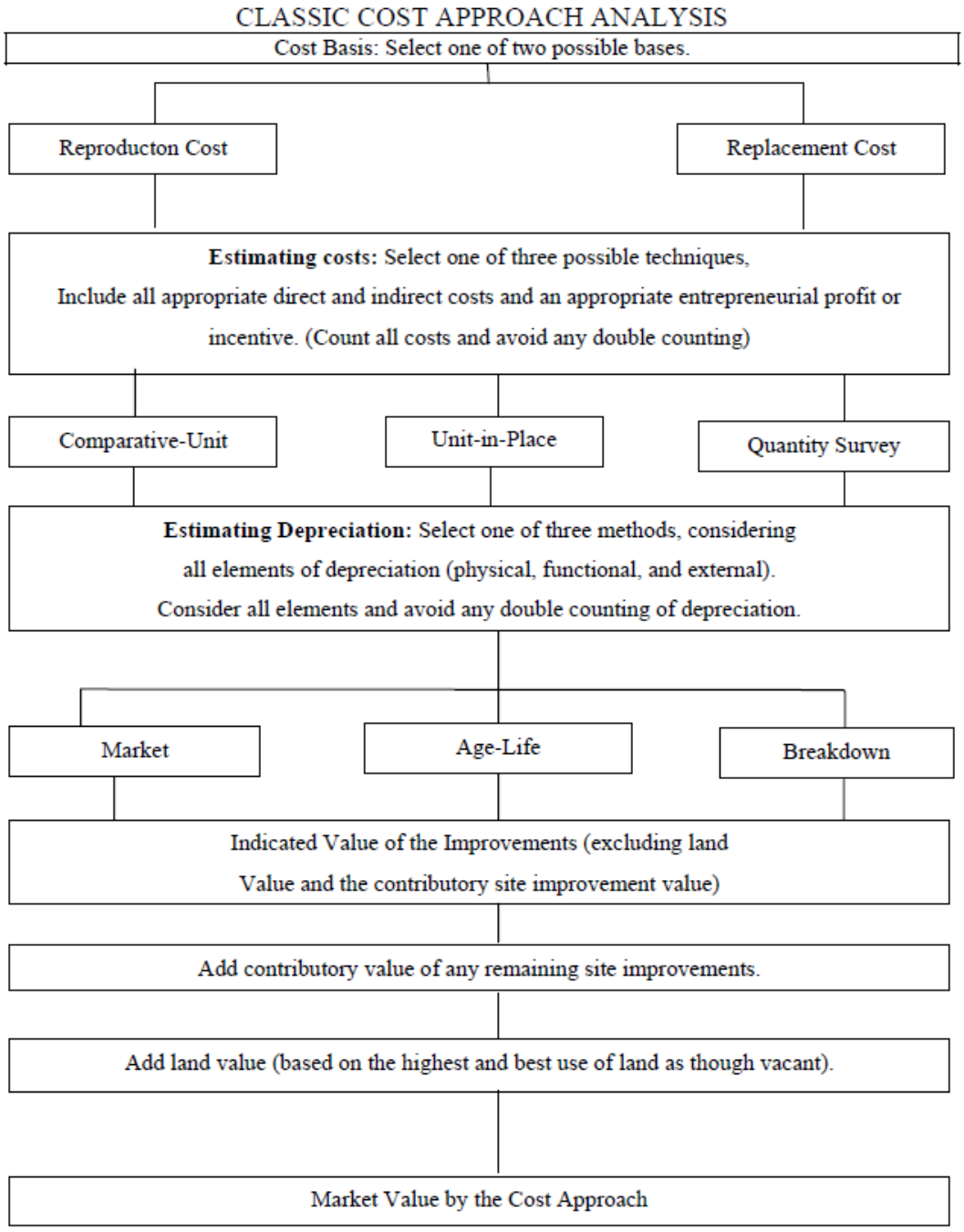
VALUE = Market Value of the Land + Cost of Rebuilding - Depreciation

2.4.2.1. Cost Analysis Process

The process of cost analysis is formed into several steps.

1. Land Value Estimation,
2. Estimation of Reproduction or Replacement Cost of Subject Property,
3. Estimation of Cost (Direct and Indirect Costs),
4. Entrepreneurial Profit Estimation,
5. Estimation of the Depreciation,
6. Making Adjustments.

The steps of cost analysis are defined after the following Figure 3, which shows the process of cost analysis.



Source: Appraisal of Real Estate, 12th Edition, 2001:351.

Figure 3 Process of Cost Analysis

1. Land Value Estimation: In this first step of the cost analysis, the land value is estimated by techniques that depend on the market analysis and highest and best use analysis. These techniques are explained in the previos Section 2.3.3.

2. Estimation of Reproduction or Replacement Cost of Subject Property: In this step, the appraiser has two ways to assess the utility of improvements: estimation of reproduction cost or estimating the replacement cost.

Reproduction cost is the cost of construction at current prices of the exactly the same materials, design, layout, standard of construction and the workmanship quality as the subject property. Replacement cost is the cost of construction at current prices of a building that has the same attributes as the subject property with modern materials and according to current design, standard of construction, and layout.

In practice, many appraisers refer estimation of replacement cost due to presence of data. In reproduction cost estimation, appraiser has to measure many kinds of functional obsolescence. The appraiser chooses estimation method according to age, current highest and best use, and singularity of the subject property.

3. Estimation of Cost (Direct and Indirect Costs): This estimation shows what it would cost a purchaser to build the new structure as the subject property at the appraisal date. The distinction of direct and indirect costs is shown in the Table 5. In this step, appraiser must have knowledge about building techniques and construction types to analyse the architectural plans when evaluating the cost.

Table 5 Direct and Indirect Costs

Direct Costs	**Indirect Costs**
Cost of permanent facilities as defines by drawings and specifications	**Cost associated with facilities and activities which cannot be identified directly to the permanent facility accounts.**
• Building permits • Materials, product, and equipment • Labor used in construction • Security during construction • Contractor' shack and temporary fencing • Material storage facilities • Power line installation and utility costs • Contractor's profit and overhead, including job supervision, coordination and management, worker's compensation, and fire, liability and unemployment insurance • Performance bonds	• Architectural and engineering fees for plans, surveys to establish building lines and environmental studies • Appraisal, consulting, accounting and legal fees • The cost of carrying the investment in the land and contract payments during construction • All-risk insurance expense and ad valorem taxes during construction • The cost of carrying the investment in the property after construction is complete but before stabilization is achieved • Supplemental capital investment in tenant improvements and leasing commissions • Marketing costs, sales commissions and any applicable holding costs to achieve stabilized occupancy in a normal market • Administrative expenses of the developer

Source: Appraisal of Real Estate, 12th Edition, 2001:359.

Cost estimation is made with three methods, which are:

- The Comparative-unit Method,
- The Unit-in-place Method,
- The Quantity Survey Method.

The Comparative-unit Method: This method evaluates the costs of a property in terms of unit of area. It includes the cost of similar properties in the same market, making adjustments with the market conditions and the physical differences. The appraiser applies this method with the comparables that are constructed recently and similar to the subject property. Firstly, the cost per m^2 of a recently constructed comparable property is calculated. This calculation is applied to the subject property.

As an example, if there is a 100 m^2 property in the market that is sold for 220.000 TL and the site cost of this property is 20.000 TL, the cost per m^2 of the property is 2000 TL. If the subject property is 120 m^2 and the site cost of the property is 40.000 TL, the value of the subject property using the cost approach is 280.000 TL. In this example, the comparative unit is the square meter, which is generally suitable for housing. This method can be applied as cost per room for hotels, cost per unit for apartments, cost per cubic foot for warehouses, etc.

The Unit-in-place Method: This method calculates the cost of the property in which quantities of the components such as floors, walls, windows, ceilings, roof, etc. These components' costs are calculated based on cubic foot, lineal and a square basis. To arrive at the total cost, the appraiser evaluates a unit cost based on the quantity of materials used and the labor required for each unit of the area. Then all costs of the units are added to determine the total cost of the improvement.

The Quantity Survey Method: This method is used when subject property is new or there is no similar property in the market. In this method, the appraiser makes a detailed inventory of the quality and quantity of all materials of the property and all categories of the labour. To provide the total cost of the material and labour, unit costs are applied. This method is rarely used in practice by appraiser, because it consumes too much time and applying this method needs profession.

4. Entrepreneurial Profit Estimation: In this step, the additional return that is expected by the developer is calculated by appraiser. When the direct and indirect costs are used to provide value indication, entrepreneurial profit must be included in order to incur the risk connected to building project.

Entrepreneurial profit is the differences between market value and total cost of development for a complete project.

Entrepreneurial Profit = Market Value - Total Cost of Development

The appraiser compares market value and the value indicated by the cost approach without profit. Estimates of entrepreneurial profit is only as reliable as the available market data documents. Most market areas have a typical range of profit and the estimate of profit is necessary element of total cost.

5. Estimation of the Depreciation: Depreciation consists of a loss of utility from any source. In other words, it is the differences between market value of an improvement and its cost at the time of appraisal.

Depreciation = Market Value - Cost of Improvements

There are three types of depreciation: Physical deterioration, Functional Obsolescence and External Obsolescence. In addition, each type of depreciation is either curable or incurable. If it is curable, depreciation amount is the cost to fix it.

Physical Deterioration: Physical deteration includes the impairments because of the ages. These deteriorations are mostly incurable. It is hard and expensive to fix or replace the fundamentals of the building, such as electirical systems, sanitary ware, etc.

Functional Obsolescence: Functional obsolonce contains unauthorized constructions such as unusual floor plans or changes in the architectural plans. It can be curable or incurable. If the functional obsolence is easy to correct, it is curable. If it is too ard and expensive to fix, it becomes incurable.

External Obsolescence: This type of depreciation includes external impacts which are out of the control of the property owner. External obsolonce is mostly incurable and caused by externalities such as noisy roads, lack of infrastructure, and etc.

The sum of all these elements is totaled depreciation. Depreciation can begin in the design phase or the moment construction started. There are several methods to estimate depreciation, such as, the market extraction method, the age-life method, the breakdown method. The main purposes of depreciation analysis are to identify all depreciation forms recognized by the market, to treat all these forms and to charge only once for each form.

2.4.2.2. Limitations of the Cost Approach

One limitation of cost approach is the presumption that value is calculated as costs minus depreciation. Market value is not equal to the cost in all conditions; it can be lower or higher than total costs. Any improvements that are made on the building may not be agreed to the demand of the market and these improvements make the cost higher. Another limitation of this approach is the subjective appreciation of the costs, cost of an improvement depends on who evaluates.

2.4.3. Income Capitalization Approach

Income Capitalization Approach is the last of the three traditional approaches. The income capitalization approach is preferred for income producing properties as an appraisal method when reliable data are available in the market.

Income Capitalization Approach takes the expected future cash flows into account. This appraisal method estimates the present value of anticipated income benefits. (Fridman,1978: 41). The income capitalization approach defines value as the present value of the future cash flows. The present value is estimated as dividing the expected income stream with the rate of capitalization. (Andersson and Landberg, 2005:45)

In this method, the appraiser uses mathematical procedures to evaluate the capacity of the property to generate future benefits and adopts these benefits into indication of present value. The analysis steps of former approaches, sales comparison and cost, may be used as an integral part of the income capitalization approach. Some of the techniques and procedures from this approach are used to analyze comparable sales data and to measure obsolescence in the cost approach.

As a summary; the appraiser analyzes the capacity of the subject property to generate future benefits and capitalizes the income into an indication of present value.

2.4.3.1. Income Capitalization Analysis Process

In the analysis process of income capitalization approach there are two basic capitalization methods:

- Direct Capitalization
- Yield Capitalization

Direct Capitalization derives the relationship of one year's income. In this method, value is reflected by the capitalization rate. Yield Capitalization considers a series of cash flows over time together with any reversion value or resale proceeds.

Both of these methods require a comprehensive study of historical income and expenses for the subject property. A reconstructed operating statement is developed for the subject property.

The process of income capitalization analysis is formed into several steps according to Appraisal Institute:

1. Analysis of the Income and Expense Data,
2. Estimation of the Potential Gross Income (PGI),
3. Estimation of the Vacancy and Collection Loss,
4. Estimation of the Effective Gross Income (EGI),
5. Estimation of the Total Operating Costs,
6. Estimation of the Net Operating Income (NOI),
7. Application of Direct or Yield Capitalization Techniques.

(AI, 2001: 493)

1. Analysis of the Income and Expense Data: In this step, estimation of expected income is calculated by appraiser. For this estimation, appraiser analyses comparable sales and rentals of competitive income-producing properties which are same type in the same market (Özçelik, 2004:89).

2. Estimation of the Potential Gross Income (PGI): In this step, appraisers calculates the potential gross income on an annual basis. According to Appraisal Institute, Potential Gross Income includes as follows:

- Rent for all space in the property, such as, contract rent for current leases, market rent for vacant or owner-occupied space, percentage and overage rent for retail properties.

- Rent from escalation clauses.
- Reimbursement income.
- Income from services supplied to the tenants. (AI, 2001: 512)

3. Estimation of the Vacancy and Collection Loss: In this step, appraiser takes unoccupied units, possible vacancies, or not rented properties into account. These total share of vacancies and losses are substracted from the gross income.

4. Estimation of the Effective Gross Income (EGI): Appraiser should evaluate the effective gross income to find out the value of a piece of investment property. Effective gross income is calculated with this formula:

EGI = Potential Gross Income + Other Income - Vacancy and Collection Loss

5. Estimation of the Total Operating Costs: In this step, after estimation of effective gross income, appraiser evaluates the operating costs of the property. While evaluating total operating costs, appraiser considers many kinds of costs related to the property, such as, real estate taxes, insurance, management charges, utilities (electricity, gas, water, etc.), heating, air-conditioning, and etc.

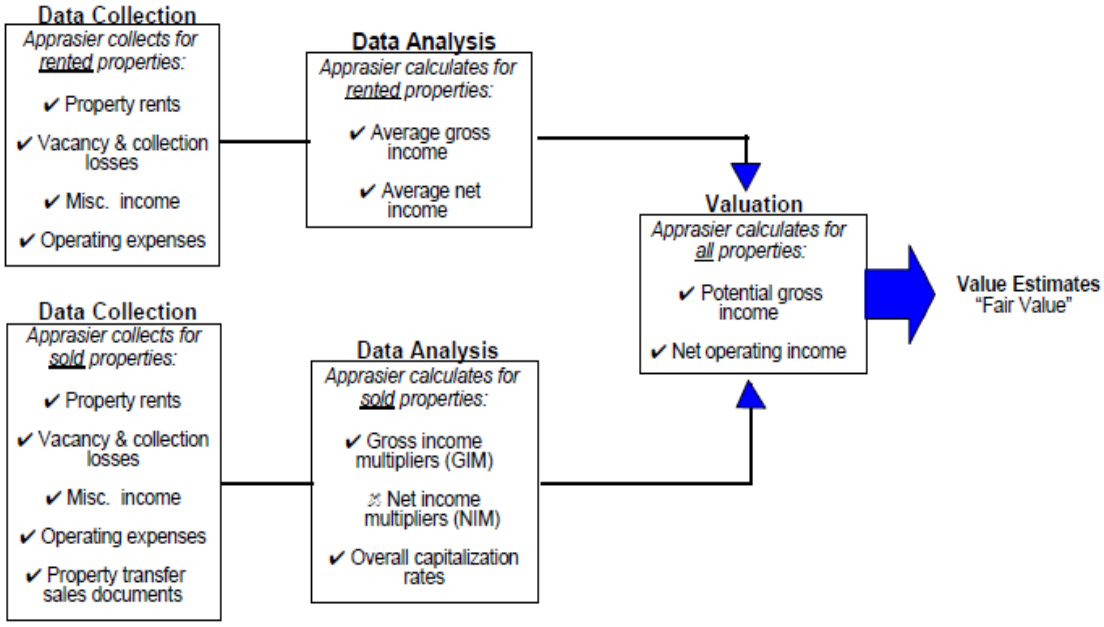
6. Estimation of the Net Operating Income (NOI): In this step, appraiser substracts the total operating costs from effective gross income to reach the net operating income. Net operating income is an important ingredient in a investment property.

NOI = Effective Gross Income - Total Operating Expenses

7. Application of Direct or Yield Capitalization Techniques: Lastly, appraiser applies direct capitalization method or yield capitalization method to reach the final value of the property. Direct capitalization consists on a single year's income. In this

method, the most important ingredient is choosing comparable sales with similar income and cost expectations.

In yield capitalization method, future incomes are taken into account by the appraiser. Appraiser converts future benefits into a present value by appliying an applicable yield rate (Özçelik, 2004:95).



Source: Saskatchewan Assessment Management Agency, 2001:1.

Figure 4 Process of Income Capitalization Analysis

2.4.3.2. Limitations of Income Capitalization Approach

The major limitation of the income capitalization approach is the properties that do not generate income, a church as an example. The possible change in the real estate sector is one of the limitations of this approach. Appraisers or investors in the market cannot know if the value will appreciate or depreciate in the future. Lastly, the capitalization rate is an important limitation that the capitalization rate used by an appraiser is controversy to another appraiser's or investor's choice of rate.

2.4.4. Criticism of Three Traditional Approaches

In this section, the traditional approaches will be criticized. The weaknesses of these approaches are mentioned in the previous sections as limitations. In sales comparison approach and cost approach, appraiser acquires the information about subject property by observing the available data in the market. This observation contains the present comparable sales. Cost approach goes one-step forward with assessing replacement or reproduction costs, but land value is estimated with the data that is gathered with market data observation. This observational research makes the value of the subject property subjective. Income approach depends on available income and expense of the subject property and it is obvious that income and expense are hard to estimate accurately. Both of three approaches are applicable when there are current and available data.

In the study of Anderson and Landberg, the survey that is done with Swedish appraisers shows that most appraisers concern with taxation and neighbourhood characteristics causing appraisal problems (Andersson and Landberg, 2005:95). In the processes of three traditional approaches, general economic conditions of the neighbourhood are not considered. However, the characteristics of the neighbourhood should be weighed in the appraisal process before estimating the final value of the subject property. Estimating the value with the influences of the neighbourhood characteristics gives concrete results.

In this thesis, the limitations of the three appraisal approaches are identified. As a solution to these limitations, hedonic price analysis is considered which concerns with the neighbourhood characteristics as well as structural characteristics of real estate assets. It is analyzed that hedonic price approach is a practical instrument as an appraisal method that concerns with the neighbourhood characteristics and the lack of available data beyond the three traditional approaches in the Chapter 3 as case study.

2.4.5. Hedonic Price Approach

In this section, the literature on the hedonic price approach will be reviewed. To reach the aim of this thesis, it will be investigated that the usability of hedonic price analysis as an alternative method to three traditional approaches in the real estate appraisal process.

The hedonic hypothesis assumes that heterogeneous goods are a combination of characteristics. Implicit marginal prices for the characteristics can be estimated as derived functions of the hedonic price equation (Berndt, 1991:117). Hedonic price approach is used to evaluate the price of the components of a good when heterogeneity exists.

Etymologically, the word "hedonic" comes from the Greek word "hedonikos" which simply means pleasure. This word refers to the utility or satisfaction that one derives through the consumption of goods and services. (Leong, 2002: 3).

In several studies, hedonic price approach has been used to calculate implicit price of the components when the nature of subject good is heterogeneous. For example, in study of Haas in 1922, this method is applied to agricultural land prices and so on for automobile industry this method is used by Court in 1939. In addition, several studies have used this approach to examine the relationship between the prices of properties and attribute preference.

The pioneering work on hedonic price analysis is made by Court in 1939. He states that hedonic price hypothesis identifies the potential inputs of any good "a motor car in this instance, to the welfare and happiness of its purchasers and community"(Court 1939: 107).

Hedonic price theory includes two contents mainly, first one is made by Lancaster as a new costumer theory in 1966. The second content is improved by Rosen in 1976 as

the equilibrium model of market supply and demand based on product characteristics.

According to Lancaster's hedonic theory, heterogeneous goods have a series of integrated characteristics, and the goods are sold as the gathering of inherent characteristics. These goods are purchased and used as a kind of investment, and it means price of a good is set of a series of prices. Therefore, the product price is made up of hedonic prices, with each product characteristic having its own implicit price, and all hedonic prices form a price structure. (Lancaster, 1966:134)

Lancaster's theory suggests that goods are parts of a whole and they are consumed as combinations, indeed a consumer chooses the good as participant from the whole. He also assumed that "consumption is an activity in which goods, singly or in combination, are inputs and in which the output is a collection of characteristics" (Lancaster, 1966: 133).

In the study of Leong, he suggested that the hedonic theory of Lancaster assumed that there is a linear relationship between the price of goods and the characteristics of the goods indeed. The price of one component of a good is constant and it may change "when there is a change in the combination of goods consumed" (Leong, 2002: 4).

Rosen designated that the theory of hedonic price approach is developed as a question in which implicit prices of a good direct both customer and producer (Rosen, 1974: 54). In his hedonic model, Rosen assumes that consumers do not gather the goods that are preferred by purchasing a combination of goods. On the contrary, to Lancaster's theory, Rosen's theory assumes that consumers choose the good from a range of goods. The consumer consumes the chosen good discretely.

In hedonic model of Rosen, it is pointed out that the consumer's willingness to pay for an implicit indication of a good can change according to the income level of the

consumer. About this assumption, Leong states that the demand or willingness to pay for an attribute is directly connected to the preferencies, tendencies, and income level of the buyer (Leong, 2002: 5).

Real estate market is a set of heterogeneous goods. Real estate assets differ in physical characteristics, locational specifications and etc. Hedonic price method is based on the assumption that consumers appraise the implicit characteristics of the good and the facilities it gives rather than the good itself. The housing estates differ in size, structure characteristics, neighboorhods, and etc. It occurs from the implicit choices of a household. A household chooses many different goods and services when he selects a house, including neighborhood, structure size, quantity of rooms, and etc. It can be interpreted that the price shows the value of a set of implicit characteristics, which contains environmental, physical, location characteristics that consumers regard when purchasing a real estate (Karagöl, 2007:28).

According to Dipasquale and Wheaton, households apply a valuation process when they decide to rent or buy a housing unit. This valuation is based on the attributes of the housing unit. It is important for both sellers of existing units and builders of new units to understand this implicit valuation process of buyers (Dipasquale and Wheaton 1996:67).

The multiple regression analysis, which is used to evaluate the implicit price of the real estate asset's characteristics due to the heterogeneity, is called hedonic price equation. About this equation Dipasquale and Wheaton states that "a hedonic price equation considers the market price paid for a house, P, to be a function of the levels of all observable characteristics of that house, X_i , $i = 1,\ldots,n$. The dependent variable, housing price or rent, can be developed by tracking actual sale or lease transactions or by surveying current unit occupants and obtaining estimates of market price or rent. The characteristics used as independent variables include continuous variables such as square meter, integer variables such as number of baths, as well as discrete variables such as identifying whether the unit has a garage or a swimming

pool. Estimating such hedonic equation requires housing unit data that combines information on housing price or rent with a complete set of measures for the characteristics of the house and neighborhood". (Dipasquale and Wheaton 1996: 67)

Since the hedonic theory of Lancaster has been expanded to the housing market by Rosen, hedonic price regressions are widely used as an assessment tool. According to Kestens et al.; the regression of house prices on a variety of property specific and neighbourhood descriptors evaluates their marginal contribution. (Kestens et al., 2005:63)

In basic form, hedonic regression analysis presumes each implicit characteristics of the good has the same influence;

$$Y = x\beta + \varepsilon$$

Where;

Y = vector of selling prices,
x = matrix of explanatory variables,
β = vector of regression coefficients,
ε = the error term.

Real estate characteristics can be classified into location characteristics, structural characteristics, and neighbourhood characteristics. These characteristics include both quantitative and qualitative attributes. According to Malpezzi, very detailed data are needed when using hedonic price analysis in real estate market. The data should contain following variables:

- Number of the rooms by types (bedrooms, bathrooms, etc.),
- Residential area of the unit,
- Type of structure (single family, attached or detached, number of floors),
- Heating type,

- Age of the main building,
- Existence of fireplaces, garages, etc.,
- Quality of materials and the finished work,
- Neighborhood variables, including transport facilities and social infrastructure,
- Distance to the central business district,
- Date of data collection (especially if the data are collected over a period of months or years). (Malpezzi,2002:19)

The hedonic regression assumes that the following determinants of a unit's rent or value are known:

$$V \text{ or } R = f(S, N, L, C, T),$$

Where;

V = value (substitute; R = rent),
S = structural characteristics,
N = neighborhood characteristics,
L = locational characteristics,
C = contract conditions or characteristics,
T = the time rent or value is observed.

General form of the linear hedonic function is as follows:

$$P = \alpha + \beta 1X1 + \beta 2X2 + \ldots\ldots + \beta nXn$$

In this equation, β_i represents the estimated coefficients of the subject dwellings that consumers are willing to pay for each characteristic. This linear formula assumes that the price of the asset do not depend on the number of the characteristics that the dwelling unit has. It may be interpreted, as the price is independent from the amount of the characteristics.

The functional form of the hedonic regression equation can be linear, semi-log, or log-log form. Most common is the semi-logarithmic form which has the advantage that the coefficient estimates are proportions of the price that are directly attributable to the respective characteristic. The advantage of the log-log form is that the hedonic regression equation estimates elasticities with respect to each and every characteristic under consideration (Herath and Maier, 2010: 8). Karagöl states that the linear function of hedonic analysis assumes that all of a unit's square meter or space add the same value and that there is no diminishing marginal utility with additional space (Karagöl, 2007: 30).

In our case, we need implicit prices of housing attributes. We will use the linear functional form to be able to compare the usability of hedonic price analysis. We will compare the sum of implicit prices of dwelling unit to the value that is evaluated by sales comparison approach.

2.4.5.1. Empirical Studies on Hedonic Price Analysis

As mentioned before, there are several studies about hedonic price analysis in the literature. In this section, some of them will be discussed. It is observed that the hedonic price analysis is used for many different purposes in the studies. In some of them, the hedonic price analysis is used in order to examine the determinants of housing prices. In other studies, it is used to find out the contribution of a specific attribute in the housing price or to display implicit prices of different housing characteristics. Firstly, some of these studies will be mentioned briefly in order to show the variety, then three of them will be analysed in detail.

The hedonic price analysis was firstly applied by Haas to determine agricultural land prices in Minnesota, USA in 1922. Another early application of hedonic price analysis is made by Waugh in 1929, in order to identify the factors that influence the price of vegetables.

In residential properties, Freeman made the pioneering work with hedonic price analysis in 1979. He used hedonic price analysis to evaluate the implicit prices and the willingness to pay for housing attributes, such as environmental quality. Ridger and Henning followed Freeman by their work in 1979 about the relationship between air quality and price of the property.

Hedonic price analysis is widely used in many studies that research the relationship between rent and real estate attributes. Vandell and Lane (1989), Gloscock et al. (1990), Hysom and Crawford (1997), Bollinger et al. (1998), Dunse and Jones (1998), Nagai et al. (2000), Webb and Tse (2000), Ustaoğlu (2003), Jin (2007), Nappi-Choulet et al. (2007), used the hedonic price analysis to analyse the rents in different countries according to its relationship with real estate attributes.

Many studies noted that a higher floor level, a better view, a larger sized flat require higher price or higher rent. In 1994, with their work, Rodrigues and Sirmans indicated that a good view changes the price of real estate about eight percent of a its value in Fairfax County, Virginia. Chau, another researcher who focused on view, investigated the implicit value of the balcony and the effects of security concerns on balconies situated on lower floors in 2004. His study shows that a balcony has a positive effect on the housing prices, regardless the quality of its view.(Choy, Mak, Ho, 2007:361)

Hedonic price analysis is also used in studies, which investigate location attributes of housing. In their study, McMillan (1992), Palmquist (1992), Ridker (1968) measured the effect of accessibility on housing prices in terms of access to the Central Business District (CBD). Some other studies, made by Cooper and Ryley (2000) and So et al. (1996) measured location attributes by travelling time, travel costs, availability of different transport modes. (Leong, 2002:21)

In literature, there are numerous studies, which indicate that number of the rooms, number of the bathrooms and floor area have positive effect on housing prices or

rents. These studies are made by Fletcher (2000), Li and Brown (1980), Garrod and Willis (1992), Linneman (1980), Carroll, Clauretie, and Jensen, (1996), Rodriguez and Sirmans (1994). This positive effect is because the willingness to pay of buyers for additional and functional space (Leong, 2002:17). Residential properties with bigger floor areas are preferred by buyers and big families to have a better standard of living.

Lot size, the existence of a basement, the existence of garage, and heating system are other housing attributes that have been analyzed with hedonic price analysis in many studies. Garrod and Willis (1992), Li and Brown (1980), Michaels and Smith (1990) have both indicated that these attributes are significantly related to the price or rent of the residential property.

As above overviews show, in many studies hedonic price analysis is used for many purposes. In this stage, we will examine three studies in detail that have used the linear regression method in order to understand the details of application of this method.

Firstly, we will describe in detail the study of Rahmatian and Cockerill, which investigates airport noise and residential housing valuation in Southern California by hedonic equations. Then we will examine two studies from our country. The first study, prepared by Türel in 1981, examines the spatial differentiation of housing prices in Ankara. The second study, a Master's thesis that is prepared by Karagöl in 2007, aims to reveal the implicit prices of housing attributes in the housing market with the purpose of gaining more information about the demand side of the housing sector.

The first study that we will examine is study of Rahmatian and Cockerill, "Airport Noise and Residential Housing Valuation in Southern California: A Hedonic Pricing Approach". The main goals of this study are to analyze the impact of airports and

airport light paths on housing prices and to evaluate implicit price of distance from large and small airports in Southern California.

In this study, 50,000 randomly selected observations from the Southern California Region was used. The data was gathered from nearly 106.000 recorded home sales that took place in 1995. The properties in this study were all single family dwellings. The independent data set of this study was formed by structural, community, and environmental variables. These variables are shown in the following figure:

Variable	Definition	Units	Source
Dependent			
Sale price	Sale price of single family home	$	Experian*
Independent-Housing:			
Lot size	Total square feet of land area	Square feet	Experian
Square Footage	Total square feet of living space	Square feet	Experian
Bath	Sum of full baths and half baths	Number	Experian
Bedrooms	Number of bedrooms	Number	Experian
Pool	1 if in/above ground pool, 0 if not	0/1	Experian
Fireplace	1 if one or more fireplaces, 0 if not	0/1	Experian
Central Heating	1 if central air, 0 if not	0/1	Experian
View	1 if the home has View, 0 if not	0/1	Experian
Cornerlot	1 if house a corner lot, 0 if not	0/1	Experian
Independent- Neighborhood, Community:			
College education	Percent of population with college degree	percent	Census
Above 65	Percent of population above 65 years old	percent	Census
Below Poverty	Percent of population below poverty	percent	Census
Age distribution	Percent of population over 60 years old	percent	Census
Time to work	Average time to work for census tract	minutes	Census
White	Percent of population white	percent	Census
Independent- Environmental:			
Beach	Distance to the beach	miles	Calculate
Beachdum	1 if within 5 miles, 0 if not	0/1	Calculate
Suspended particulates	Annual average of suspended particulates	≤ 10microns	Thayer 1995
Ozone Levels	Average of the worst four days of daily ozone	(Parts / Mill)	Thayer 1995
Distance from airport	Distance from closest airport	Meters	Calculate**
Distance from flight path	Distance from the closest flight path	Meters	Calculate**

*Experian corporation formerly TRW 1995
** Calculated with ARCVIEW 3.1 software.

Source: Rahmatian and Cockerill, 2004:19.

Figure 5 Variable Description and Sources

In this study, firstly residential properties were described with footage of living space, number of bathrooms, existence of a fireplace, and ammenities (such as a swimming pool) variables. The community variables that are percent of persons in census tract living below poverty level income, average time to work, percent of persons living in a particular tract with college degree, and percent white in tract were derived from the 1990 census results. Measurements of total average suspended particulate matter, level of ozone concentration, proximity to the ocean, and the average visibility in miles were the environmental variables. Estimation of the distance to nearest airport and distance to nearest flight path were the interest points of this study.

The data were formed according to the distance to a small, medium or large airport. As the hypothesis, households should be more reluctant to living near a large airport as compared to living near a small or medium sized airport. For this case, an airport was considered large if annual passenger totals were greater than 100,000 per year. An airport was classified as medium passenger totals were less than 100,000 annually. Small airports were limited to small aircraft only. The aim of this study was to employ a slope shifter model in an attempt to estimate the price gradients for the three categories of airports.

The linear, semi-log and log-log function forms of hedonic equation was used in this study. The relationship of airports and housing prices was expressed as;

$$P(a) = b0 + b1a1 + b2D1 + b3D2 + b4a1D1 + b5a1D2 + \sum biai$$

Where;

a_1 = distance to the nearest airport,
D_1 = 0 if small or medium airport; 1 if large airport,
D_2 = 0 if small or large airport; 1 if medium airport,
a_i = other explanatory variables.

	Linear R^2 = 0.50		Semi-log R^2 = 0.62		Log-log R^2 = 0.62	
Variable	coefficient	t-stat	coefficient	t-stat	coefficient	t-stat
C	66848.22	8.93	11.83965	583.12	7.0612	123.29
OVER65	1548.95	13.95	0.002456	8.15	0.0033	10.72
BATH	-985.71	-0.80	0.016744	5.01	0.0349	10.34
BEACH	-2169.02	-33.27	-0.01287	-72.76	**-0.2781	-72.41
BEACHDUM	101550.50	24.73	0.190517	17.10	0.1006	8.49
POVERTY	628.68	5.26	-0.00792	-24.42	-0.0083	-25.47
CENHEAT	10789.33	7.22	0.077961	19.22	0.0461	11.33
CORNERLOT	1191.81	0.58	0.009685	1.74	0.0234	4.16
FIRE	6679.83	6.13	0.063079	21.34	0.0513	17.00
LANDAREA	0.84	22.22	1.53E-06	14.83	**0.1355	37.61
LIVAREA	145.78	108.95	0.00038	104.58	**0.6313	87.54
AIR QUALITY	-652.50	-4.69	-0.00161	-4.25	-0.0035	-9.81
POOL	6549.58	4.37	0.046003	11.32	0.0461	11.14
WORK	-3218.46	-20.27	-0.00969	-22.50	-0.0102	-23.62
VIEW	11664.36	4.13	0.065888	8.60	0.0470	6.04
WHITE	645.06	18.55	0.002509	26.59	0.0014	15.00
MEDIUM***	-44958.84	-17.73	-0.17527	-25.47	0.1029	2.29
EDIUM*AIRPORT	1.38	6.90	4.29E-06	7.88	**-0.0283	-5.58
LARGE***	-26265.32	-10.89	-0.12512	-19.13	-0.3192	-7.41
LARGE*AIRPORT	0.48	2.03	5.14E-06	7.97	**0.0286	5.87
AIRPORT	-0.36	-2.89	5.12E-07	1.51	**0.0283	9.36

**log of the variable
***medium = 1 if near a medium airport; 0 if near a small or large airport
large =1 if near a large airport; 0 if near a small or

Source: Rahmatian and Cockerill, 2004:23

Figure 6 Distances to Nearest Airport: Airports Classified as Small, Medium and Large

According to Figure 7, the R^2 of the model was 0.5. This means the fitness of the model is at an average level. The linear model calculated FIRE (existence of fire place) to be worth an additional 6679$ and a POOL 6549 $ to the price of a home. The increase of AIR QUALITY by one miligram per cubic meter meant 652$ reduction on home prices. A home with VİEW was 11664$ expensive to a similar. The linear model estimated a 2169 $ decline in home prices for each mile from the BEACH.

At the end of the study, the implicit price of one additional meter from a large airport was worth approximately $1.23 and the price per meter from a small airport was evaluated to be between 65 and 77 cents.

This study is a different model as a concept but in application, it is a good example for our study. We concern the results of linear model, in that we will use linear regression model in our case study.

The second study that we will review in detail is "Spatial Differentiation of Housing Prices in Ankara" by Türel (1981). He was interested in examination of housing market in Ankara. In his study, he used the cross-section data that was gathered in 1969-1970. His hedonic model can be expressed as,

$$Ri = R(X_{1i}, X_{2i}, \ldots\ldots, X_{ni})$$

Where;

R_i = the annual rent of the i^{th} housing unit as the dependent variable

X_i consist of (as independent variables):

- Physical characteristics of the building (area of garden, existence of central heating system, hot running water and elevator, building's age, whether the building is new or not, whether the building is one or two storey),
- Physical characteristics of the housing unit (number of rooms, gross floor area, unit's vertical location within the building-whether it is a basement floor or a ground floor),
- Lease characteristics (whether the leaseholder is new or residing in the dwelling unit longer than three years),
- Locational characteristics (straight line distance to the Central Business District, straight line distance to the employment nodes),
- Characteristics of the sub-areas (air pollution, education quality, total public services (in m^2) per person, percentage of people in managerial professional occupation residing in the sub-area).

(Ustaoğlu, 2003:39, Karagöl, 2007:48)

In this study, the metropolitan area of Ankara was divided into eight sub-areas to capture the rental price variations, which is assumed to perform a spatial variation in the housing market in Ankara.

The hedonic model was estimated in four stages by using linear functional form. At the first stage, four different sets of equations were estimated. Some of the variables such as gross floor area, age, and straight line to distance to the employment nodes were dropped from the model, ever since the high correlations with other variables.

In the second stage, the sub-areas characteristics were involved into the model and three sets of equations were evaluated. In first two equations, the education quality and total public services were found to be insignificant. In same equation, t statistics of air pollution was high which meant this variable was significant. Türel explains this result as air pollution level was higher in the centrally located neighbourhoods because of the existence of high building densities.

Other variables, such as land area, number of rooms, central heating system, new building, hot running water, and percentage of managerial-professional groups residing in the sub-area were significant. The significance of the percentage of managerial- professional groups residing in the sub-area points out that housing areas which are densely populated by high income groups command high rents.

The sub-area variables were also observed from the equations. The sub-zoning of the metropolitan area of Ankara was made in reference to the railway as the south and the north, then each of the two part was also divided into four sub-areas. The variables of northern sub-areas were insignificant, regarding to the rental prices of houses did not vary compared with the houses located in Ulus.

Lastly, Türel estimated his hedonic model for all eight sub-areas. In this model, physical characteristics of the building and the unit, and the lease characteristics were included. This estimation showed that hedonic prices of the housing characteristics

perform a spatial variation (Ustaoğlu, 2003: 41). About this estimation, Türel stated that central heating system and unit housing prices were the factors which were responsible for most of the variation in rental prices.

At the end of his study, he concluded that rental prices of the housing stock varied in location verifying the housing market for Ankara and this variation was occured by the high income groups' location preferences and the externalities came from locational advantages and environmental conditions.

The last study, we will examine in detail, is study of Karagöl in 2007 as "A Study of Housing Prices in Ankara". With this study, Karagöl aims to reveal the implicit prices of housing attributes in the housing market with the purpose of gaining more information about the demand side of the housing sector.

Karagöl used very detailed data to examine the housing prices in Ankara with hedonic price analysis. In her study, the linear, semi-log, and log-log functional forms of hedonic equation were used. We will analyze the application and the results of the linear model of this study.

The data, used in this study, were mainly extracted from appraisal reports, which have been prepared by different appraisers in 2006 in Ankara. Data included information about 501 dwelling units from different neighbourhoods from eight districts of Ankara, which are Altındağ, Çankaya, Etimesgut, Gölbaşı, Keçiören, Mamak, Sincan and Yenimahalle. The content of data is shown following figure:

Characteristics Class	Variable Code	Variable definitions and measurement methods
Structure characteristic	DESCRIP	Description of the individual division that is written on the title deed; if it is a dwelling scored as 1, if it is a duplex house scored as 2, if it is a villa scored as 3
	GAREA	Gross area of the dwelling unit
	LAND	The owner's share in the land; it is calculated by owner's share ratio in the land multiple the area of the parcel
	PARCEL	The area of the parcel
	ROOMS	Total number of living rooms and bedrooms
	BATHS	Total number of bathrooms
	BALCON	Total number of balconies and terraces
	DEPROOM	If there is a dependent room, which is a room that directly attached to living room, is scored as 2, otherwise 1
	CHANROOM	If there is a changing room in at least one of the bedrooms, scored as 2, otherwise scored as 1
	AGE	Age of the building is calculated by subtracting the building year from 2006
	QUALMW	Quality of materials and workmanship scored as 1 for bad quality, scored as 2 for middle quality, scored as 3 for good quality, and scored as 4 for very good quality
	TOTFLOOR	Total number of floors in the building except basement floors
	FLOOR	The floor of the dwelling unit is calculated by considering all basement floors as 1, basement floors and ground floor as 2, and all other floors as 2 + the floor number
	FRONTIS	For the frontispiece of the dwelling unit; north is scored as 1, west is scored as 2, east is scored as 3 and south is scored as 4 (there are two frontispieces for each dwelling unit)
	INUSE	If the dwelling unit is being used as a residence it is scored as 2, if it is being used as an office it is scored as 1.
	HEATING	If there is a heating stove, scored as 1, if there is a central heating system or kombi, scored as 2
	ELEVATOR	If there is a elevator in the building it is scored as 2, otherwise scored as 1
	PARKING	If there is not any parking facility; scored as 1, if there is a parking lot; scored as 2, if there is a garage; scored as 3, if there is a garage and a parking lot; scored as 4
	HESTATE	If the dwelling unit is located in a housing estate, it is scored as 2, otherwise scored as 1
Neighborhood characteristic	INCOME	Income level of neighborhoods; low income is scored as 1, middle income is scored as 2, high income is scored as 3
	CANKAYA	If the dwelling unit is located in Çankaya it is scored as 1, otherwise scored as 0
Locational characteristic	DISTANCE	The linear distance to from dwelling unit to CBD (in km.)
	STREET	The rating of the street is scored from 1 to 5, according to its width and intensity
	TRANSPO	The existence of public transportation facilities scored as 2, if not scored as 1
	SHOPP	The existence of shopping facilities in short distance to dwelling unit scored as 2, if not scored as 1

Source: Karagöl, 2007:77

Figure 7 Variable Definitions

In light of the former studies, Karagöl used linear, semi-log, and log-log functions in her study. We will analyze the results of linear functional form. Karagöl set three different model according to the correlations of variables. The models will be discussed below.

In her first model, nine variables were included. R^2 of the model was 0.777 and adjusted R^2 was 0.773. She noted that the β coefficients showed the implicit prices that buyers are willing to pay for more of each attribute (Karagöl, 2007:86). The coefficient are shown in Figure 8.

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-175565	15248,281		-11,514	,000
	GAREA	1159,505	47,166	,614	24,583	,000
	HESTATE	29908,738	7378,316	,106	4,054	,000
	DISTANCE	-1351,725	519,668	-,069	-2,601	,010
	LAND	85,274	10,288	,193	8,289	,000
	FLOOR	1605,178	1145,260	,033	1,402	,162
	PARKING	15524,534	2957,675	,120	5,249	,000
	INCOME	36824,124	4419,243	,213	8,333	,000
	FRONTIS1	2061,739	1855,114	,024	1,111	,267
	STREET	3767,473	3192,556	,025	1,180	,239

a. Dependent Variable: PRICE (VALUE)

Source: Karagöl, 2007:87

Figure 8 Regression Coefficients of Model 1 in Linear Functional Form

According to figure 8, each additional m^2 in the gross area of the dwelling unit was worth 1159 TL., being located in a house estate was worth 29.908 TL., the existence of a parking facility added 15.524 TL. to the price. Willingness to live in a higher income neighborhood cost 36.824 TL. and each km. from Central Business District decreased the price 1351 TL.

Karagöl used other independent variables in the second and third models. The coefficients of models are shown in Figure 9 and Figure 10.

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-243692	33236,992		-7,332	,000
	ROOMS	59398,490	3905,241	,495	15,210	,000
	ELEVATOR	28058,757	7982,251	,117	3,515	,000
	INCOME	58283,734	5910,494	,334	9,861	,000
	PARCEL	2,063	,243	,254	8,477	,000
	SHOPP	-16231,3	10739,259	-,046	-1,511	,131
	AGE	-46,374	346,659	-,005	-,134	,894
	FRONTIS2	-7305,087	3731,677	-,058	-1,958	,051
	STREET	8579,896	4635,274	,056	1,851	,065

a. Dependent Variable: PRICE (VALUE)

Source: Karagöl, 2007:89

Figure 9 Regression Coefficients of Model 2 in Linear Functional Form

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-168486	27873,814		-6,045	,000
	QUALMW	68620,880	5373,202	,414	12,771	,000
	HESTATE	16256,466	8707,459	,057	1,867	,062
	INCOME	53278,808	5347,565	,309	9,963	,000
	LAND	139,204	13,338	,314	10,437	,000
	ELEVATOR	16978,457	7578,390	,072	2,240	,026
	SHOPP	-21277,6	10149,363	-,062	-2,096	,037

a. Dependent Variable: PRICE (VALUE)

Source: Karagöl, 2007:91

Figure 10 Regression Coefficients of Model 3 in Linear Functional Form

By using three different sets, Karagöl estimated the implicit prices of the variables. Karagöl stated that the most dramatic result of her study was the high impact level of being located in a housing estate, which is mostly related with environmental factors. Karagöl also noted that the high impact level of being located in a housing estate, which was mostly related with environmental factors, rather than those which were inside of dwellings (Karagöl, 2007:95). She explained the increase in house buyers' interest in locational and neighborhood characteristics together with structural characteristics, with the rise in differentiation which is caused by decentralization of

the city. A housing estate usually means more than those which are the dwelling unit, by including an image, security, well kept garden, and even recreation and sports grounds.

Although this study is a guide for us, it will be useful to compare the results of our study.

CHAPTER 3

THE APPRAISAL OF REAL ESTATE WITH HEDONIC PRICE ANALYSIS IN ANKARA

In this chapter, firstly the background of appraisal practice in Turkey is reviewed briefly to investigate the dynamics and the participants of the sector in our country. Then, applicability of the Hedonic Price Approach is investigated in practice within the framework of seeking an alternative and a completemantery method for appraisal beyond three traditional approaches.

3.1. The Background of Appraisal Practice in Turkey

Real estate appraisal is crucial for taxes, expropriation applications, and mostly liquidity of the real estate assets in Turkey. The market value of the real estate is needed to evaluate the tax of the subject property. Appraisal is also important for application of expropriations. Expropriation is a real estate obtaining method for various public investments and it is taken from the private property. In the Expropriation Law, it is accepted that the expropriation value must be current and objective value.

Importance of real estate appraisal is also crucial for the liquidity of the real estate assets. The liquidity concept means to determination of the real estate's values and circulation of valuable bonds. Both participation of capital to the economic system and transferring sources to the real estate and residence investments can be provided with liquidation of real estate values according to Turkish Civil Code and The Capital Market Law.

In Turkish capital market, another important liquidity tool is the Real Estate Investment Trust (REITs). For determination of REIT Company's net active value and profit rate of investors, market value of the real estates must be estimated periodically. These valuations results are published with the company's financial tables and so, investors' gets information about the company's real value.

3.1.1. History and Present Situation of Appraisal in Turkey

In the 1980's, Real Estate Counceling Companies were doing feasibility analysis and highest and best use analysis. When foreign investment companies came into the market in late 1980's to cooperate with Turkish companies or to work alone, the appraisal issue became important. With this movement, legal structure and appraisal practice began to be developed.

The development of real estate appraisal continued till 2000's with national investments because of the economical crisis in 1995 (Özçelik, 2004:106). In the year 2001, the economic crisis withdrew the development in the market which affected appraisal practice. Currently, any positive step in the economy affects the appraisal. In recent years, some crucial steps have been taken in appraisal such as organization of Appraisal Institute courses and establishment of Appraisers' Assosiation in Turkey.

Capital Markets Board of Turkey is the only regulator commitee for appraisers and appraisal practice in Turkey now. All these developments help the appraisal practice to reach to the international valuation standards and improve their international competitiveness.

Capital Markets Board of Turkey explains the reasons for making arrangements for Appraisal Companies and certification of appraisers as follows:

- Lack of legal arrangements on the appraisal of real estate,
- Lack of any organization for real estate appraisal in public and private sector,
- The need for different speciality in real estate appraisal,
- To Provide a high-quality in appraisal service.

According to Capital Markets Board of Turkey, Appraisal Company is defined as "the Appraisal Companies (AC) are professional institutions which employ appraisers to determine values of real estates, components of the real estates and real estate projects by gathering, analyzing, and applying relevant information with respect to the general accepted international principles of valuation" (CMBT,2009:23). There are currently 84 Appraisal Companies in Turkey that are approved by the Capital Markets Board of Turkey.

3.1.2. The Methods of Appraisal that are used in Turkey

In practice, traditional appraisal methods that are mentioned in section 4 as Sales Comparison, Cost, and Income Capitalization Approaches are mainly used in Turkey. As mentioned in previous sections, when there is available data about current sales in market, the sales comparison and cost approaches are used according to the nature of the property, whether it is a single-family house, a residence, or an industrial building or a school, etc. For income properties, the income capitalization approach should be used in appraisal theory but in Turkish practice income approach is not used because of data problems as it require special knowledge and experience.

Using Sales Comparison and Cost approaches make the appraisal process to be based on appraiser's observation and it converts real estate appraisal to a subjective decision making process.

3.2. The Data

The case study is prepared with the data that are extracted from appraisal reports. Data contain information about main features of the real estate assets and the appraised values of them. In this case, the values that are calculated by Sales Comparison Approach are used.

This study tries to give an answer to the question that hedonic price analysis is usable as an appraisal method or not. For this examination, very detailed data are needed that contain information about main characteristics of the real estate and appraised values. The data are used with hedonic price analysis to evaluate the implicit values of housing attributes. At the end of the analysis, the sum of implicit values according to the subject property's nature is compared to the value that is examined with sales comparison approach.

The data, which used in this study, are extracted from 200 appraisal reports that have been prepared by several appraisers in several districts in Ankara in 2008. The data contain these variables:

- District,
- Neighborhood,
- Building parcel number,
- Area of the parcel,
- Address,
- Age of the building,
- Total number of individual divisions in the building,
- Number of floors in the building,
- Existence of elevator,
- Existence of garage or parking lot,
- Architectural project of the building,
- Owner's share in the land,

- Floor number,
- Gross residential area,
- Number of rooms,
- Number of bathrooms,
- Number of balconies and terraces,
- Frontispiece,
- Heating System,
- Material and workmanship quality,
- Intended use,
- Existence of the certificate for occupancy,
- Transportation facilities,
- Shopping facilities,
- Date of the report,
- Expertise value of the property.

3.3. Data Distribution

In this study, the central districts of Ankara, which are Çankaya, Keçiören, Yenimahalle, Altındağ, Etimesgut, Mamak, and Sincan, are chosen as the study field. Table 6 shows the distribution of the data among the districts and neighbourhoods;

Table 6 Distribution of Dwelling Units among Districts and Neighbourhoods

Districts	Number of Neighbourhoods	Number of Dwelling Units
ÇANKAYA	33	58
KEÇİÖREN	25	47
YENİMAHALLE	17	25
ALTINDAĞ	6	14
ETİMESGUT	9	17
MAMAK	11	14
SİNCAN	11	25
Total	112	200

The study contains detailed data of 200 dwelling units from 112 neighbourhood from 7 central district of Ankara. The distribution of the data among neighbourhoods and districts are shown in the Figure 11 and Figure 12.

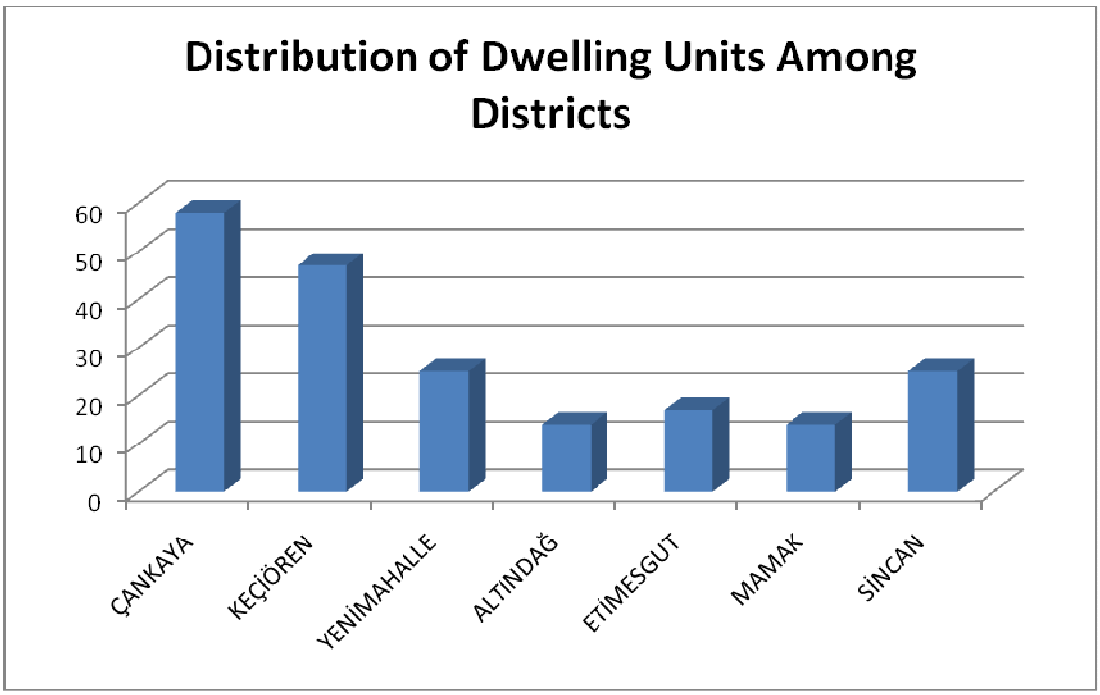


Figure 11 Numbers of Dwelling Units from Districts

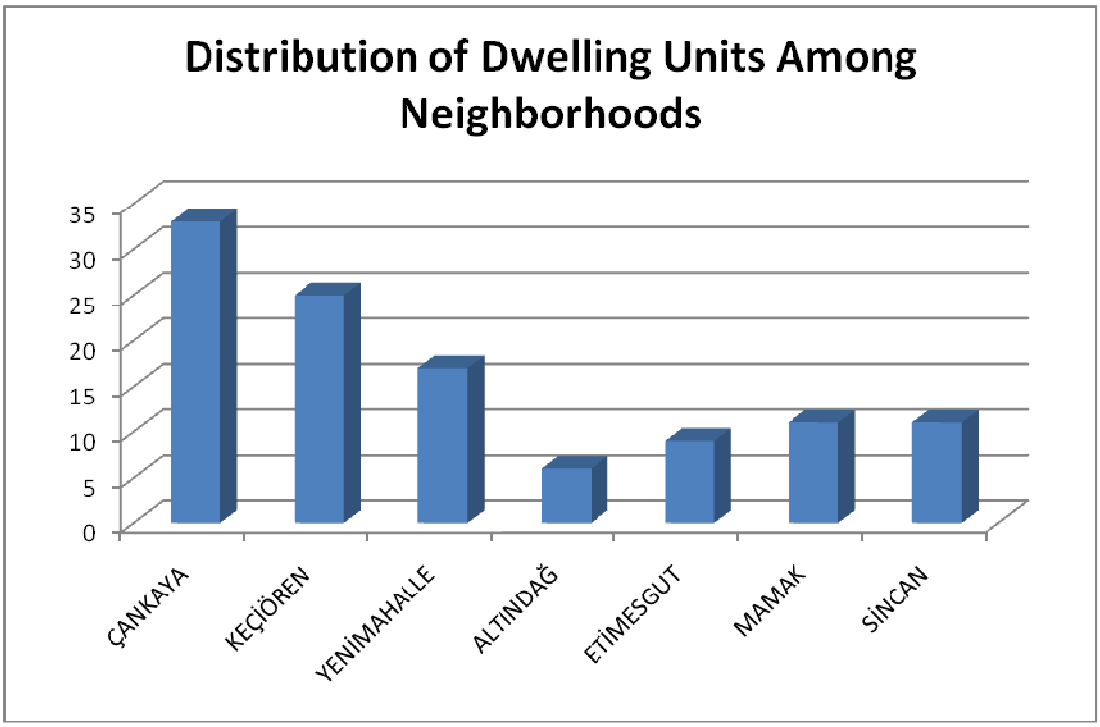


Figure 12 Numbers of Neighbourhoods from Districts

3.4. Specification of the Model

In this study, we need implicit prices of housing attributes. This study tries to give an answer to the question of whether Hedonic Price Analysis can be used in practice and gives efficient results as the Sales Comparison Approach or not.

The data that are extracted from 200 appraisal reports. The value of the housing units are estimated by using the Sales Comparison Approach. In this study, we use the linear functional form in order to compare the sum of implicit prices of dwelling units to the values that are evaluated by sales comparison approach.

This study concerns with the estimation of hedonic price function in order to identify and quantify the significant determinants of housing value in the form of implicit or hedonic prices according to the hedonic theory of Rosen.

According to the Rosen's hedonic theory, implicit prices are estimated by the first-step regression analysis, in which product price regressed on characteristics, in the construction of hedonic price indexes. (Rosen 1974: 34).

Hedonic equation, which is subject to the regression analysis, is written as:

$$P = \alpha 0 + \Sigma \alpha i Zi + \varepsilon$$

Where;

αi = estimated coefficients of independent variables in the linear model; regression coefficients αi are the corresponding hedonic prices of the variables
Zi = relevant housing characteristics,
ε = random error

General form of the linear hedonic function is as follows:

$$P = \alpha + \beta 1X1 + \beta 2X2 + \ldots\ldots + \beta nXn$$

In this study, we use linear functional form of hedonic price analysis in order to estimate the price of each housing attribute. In such analysis, it is also useful to use the semi-log and log-log functional form of hedonic analysis when analyzing the tendencies of housing buyers and the differentiation of the housing sector. Our aim is to compare the results of hedonic prices with the results of sales comparison analysis. The linear functional form is the most appropriate form of hedonic price analysis for our purpose.

3.5. Definitions of Variables

In case study, three main types of data are used. The whole data is divided into three parts: physical characteristics, locational characteristics and neighbourhood.

Physical Characteristics:

- Size (Gross area of the dwelling unit)

- Area of the parcel
- Rooms (Total number of room(s) and bedrooms)
- Bathrooms (Number of bathrooms)
- Balconies (Number of balconies)
- Quality of material and workmanship
    - Kitchen (the counter is marble or hardboard, the cabinet is wood or mdf, etc.)
    - Bathroom (the quality of bathroom furnishing and floor covering)
    - Windows-Doors (window is double glazed, PVC or wooden, door is panel or chipboard)
    - Floor Covering (wood, laminate or Marley)
- Age of the building
- Total number of floors in the building
- Floor number of the dwelling unit
- Frontispiece
- Heating system (Heating stove, individual heating or central heating)
- Elevator
- Parking facilities (parking lot or garage)

Locational Characteristics:

- Rating of the Street (main or not)
- Public Transportation
- Social Infrastructure (shopping facilities, schools, and etc.)

Neighborhood Characteristics:

- Çankaya (If the dwelling unit is located in Çankaya or not)
- Keçiören (If the dwelling unit is located in Keçiören or not)
- Yenimahalle (If the dwelling unit is located in Yenimahalle or not)
- Altındağ (If the dwelling unit is located in Altındağ or not)
- Etimesgut (If the dwelling unit is located in Etimesgut or not)
- Mamak (If the dwelling unit is located in Mamak or not)
- Sincan (If the dwelling unit is located in Sincan or not)

We used as many variables as possible. For each variable, variable code and variable type is listed in Table 7. In addition, variable definitions are given in Table 8.

Table 7 Variables

Variable	**Variable Codes**
Çankaya	CANKAYA
Mamak- Etimesgut	MAMAKETIMES
Yenimahalle	YENIMAH
Keçiören	KECIOREN
Altındağ	ALTINDAG
Sincan	SINCAN
İlçe	ILCE
Location	STREET
Area of the parcel	PARCEL
Age of the building	AGE
Total number of floors	TOTFLOOR
Floor number of the dwelling unit	FLOOR
Gross residential area	GRA
Number of rooms	ROOMS
Number of bathrooms	BATHS
Housing estate	HESTATE
Frontispiece	FRONTV1
Number of balconies and terraces	BALCONY
Parking facilities	PARKING
Social facilities	SOCIAL
Transport facilities	TRANSPORT
Quality of material and workmanship	QUALMW
Floor covering	FLCOVER
Elevator	ELEVAT
Heating system	HEATING
Appraised value	VALUE

Table 8 Variable Definitions

Variable Codes	Variable Definitions
CANKAYA	If the dwelling unit is located in Çankaya it is scored as 1, otherwise scored as 0
MAMAKETIMES	If the dwelling unit is located in Mamak and Etimesgut it is scored as 1, otherwise scored as 0
YENIMAH	If the dwelling unit is located in Yenimahalle it is scored as 1, otherwise scored as 0
KECIOREN	If the dwelling unit is located in Keçiören it is scored as 1, otherwise scored as 0
ALTINDAG	If the dwelling unit is located in Altındağ it is scored as 1, otherwise scored as 0
SINCAN	If the dwelling unit is located in Sincan it is scored as 1, otherwise scored as 0
ILCE	If the dwelling unit is located in Çankaya it is scored as 1, in Keçiören it is scored as 2, in Yenimahalle it is scored as 3, in Altındağ it is scored as 4, in Etimesgut it is scored as 5, in Mamak it is scored as 6, in Sincan it is scored as 7
STREET	If the dwelling unit is located in main street it is scored as 1 otherwise scored as 0
PARCEL	The area of parcel
AGE	Age of building is calculated by subtracting the building year from 2008
TOTFLOOR	Total number of floors, including basement floors
FLOOR	The floor of the dwelling unit is calculated by considering basement floors as 0, ground floors and 1.floors are scored as 1, and all other floors are scored as 2
GRA	Gross residential area of the dwelling unit
ROOMS	Number of the rooms
BATHS	Number of the bathrooms
HESTATE	If the dwelling unit is located in a housing estate it is scored as 1, otherwise scored as 0
FRONTV1	If the dwelling unit's frontispiece is south and east it is scored as 1, north and west scored as 0
BALCONY	Number of balconies and terraces
PARKING	If there is no parking facility it is scored as 0, if there is a parking lot it is scored as 1, if there is parking garage it is scored as 2
SOCIAL	The existence of the social facilities in short distance scored as 1, if not scored as 0
TRANSPORT	The existence of the public transportation facilities in short distance scored as 1, if not scored as 0
QUALMW	Quality of materials and workmanship is scored as 0 for bad quality, 1 for middle quality, 2 for good quality.
FLCOVER	Floor covering is scored as 1 for wood and laminant covering, 0 for marley.
ELEVAT	If there is an elevator it is scored as 1 otherwise scored as 0
HEATING	If there is a heating stove it is scored as 0 otherwise scored as 1
VALUE	The appraised value of the property

3.6. Application of the Model

As mentioned in the section 3.4., linear functional form is used in this study to estimate the marginal implicit prices of each housing attributes. For linear estimation, ordinary least squares method (OLS) is used. The multiple-regression is obtained by the SPSS software.

Firstly, the variables are examined. The minimum, maximum and mean values and the standard deviations of all variables are calculated. In table 9, these values are shown.

The correlations between variables are estimated. The correlations are important to see linear relationships between variables. Using variables that are in a high correlation to each other in the same equation may cause misleading results due to the multicollinearity problem. In the Appendix A, the correlations of the variables are shown.

According to correlations table, it is clearly seen that parcel size is highly related to total floor number, number of bathrooms, existence of the elevator, located in a housing estate, and located in Yenimahalle.

Another set of high correlation is between number of the rooms and total floor number, existence of parking area, number of balconies, floor number, gross residential area and the number of the bathrooms.

Çankaya is in a high correlation with Keçiören and the age of the building. Gross residential area of the dwelling unit is in high correlation between total floor number, floor number, number of rooms and bathrooms, existence of parking and the quality of material and workmanship. Other variables and the correlations can be seen from the Appendix A.

Table 9 Descriptive Statistics

Variables	N	Minimum	Maximum	Mean	Std. Deviation
CANKAYA	200	,00	1,00	,2900	,45490
MAMAKETIMES	200	,00	1,00	,1550	,36281
YENIMAH	200	,00	1,00	,1250	,33155
KECIOREN	200	,00	1,00	,2350	,42506
ALTINDAG	200	,00	1,00	,0700	,25579
SINCAN	200	,00	1,00	,1250	,33155
ILCE	200	1,00	7,00	3,1350	2,10689
STREET	200	,00	1,00	,5350	,50003
PARCEL	200	352,00	98042,00	6101,0800	14223,42578
AGE	200	1,00	50,00	12,3050	11,99296
TOTFLOOR	200	3,00	14,00	6,3000	2,52624
FLOOR	200	,00	2,00	1,4150	,73175
GRA	200	55,00	248,00	110,0750	31,40623
ROOMS	200	2,00	6,00	3,9200	,67519
BATHS	200	1,00	3,00	1,1950	,40965
HESTATE	200	,00	1,00	,2150	,41185
FRONTV1	200	,00	1,00	,5550	,49821
BALCONY	200	,00	1,00	,8900	,31367
PARKING	200	,00	2,00	1,0450	,69671
SOCIAL	200	,00	1,00	,5250	,50063
TRANSPORT	200	,00	1,00	,3900	,48897
QUALMW	200	,00	2,00	1,1600	,75979
FLCOVER	200	,00	1,00	,9000	,30075
ELEVAT	200	,00	1,00	,2350	,42506
HEATING	200	,00	1,00	,9850	,12186
VALUE	200	43000,00	4,20E5	129620,0000	84620,33506
Valid N (list wise)	200				

According to high correlations, different set of variables are entered into analysis. The t-statistics of the variables and the R^2 of the estimations are observed. The variables that have low t-statistics value are extracted from the equation model according to their insignificance. HEATING, AGE, FRONTV1, FLCOVER, STREET, ILCE, STREET variables are extracted from analysis because of their insignificance. Then, due to the multicollinearity problem, the correlations of each variables are also observed. At the end, four different data sets are created and entered into analysis. GRA, ROOM and TOTFLOOR variables are taken as the basis. The correlations are observed according to these variables.

The first data set contains Gross Residential Area, Çankaya, Floor, Housing Estate, Bathroom, Parking, Social, Elevation, Transport, and Yenimahalle. This data set can also be used with Mamak-Etimesgut. These data sets are called as Model 1.

P_1 = f (GRA, ÇANKAYA, FLOOR, HESTATE, BATHS, SOCIAL, TRANSPORT, ELEVAT, PARKING,YENIMAHALLE OR MAMAKETIMES)

The second data set contains Room, Çankaya, Floor, Bathroom, Housing Estate, Social, Transport, Elevation, Quality of material and workmanship, and Yenimahalle. This data set is called as Model 2.

P_2 = f (ROOM, ÇANKAYA, FLOOR, HESTATE, BATHS, SOCIAL, TRANSPORT, ELEVAT, QUALMW, YENIMAHALLE)

The third data set contains Room, Çankaya, Floor, Bathroom, Housing Estate, Social, Transport, Elevation, Quality of material and workmanship, Mamak-Etimesgut, Sincan, and Parking. This data set is called as Model 3.

P_3 = f (ROOM, ÇANKAYA, FLOOR, HESTATE, BATHS, SOCIAL, TRANSPORT, ELEVAT, QUALMW, PARKING, MAMAKETIMES, SINCAN)

The fourth data set contains Total number of floors, Çankaya, Mamak-Etimesgut, Sincan, Floor, Bathroom, Housing Estate, Social, Transport, and Quality of material and workmanship. This data set can also be used with Yenimahalle. This data set is called as Model 4.

P_4 = f (TOTFLOOR, ÇANKAYA, FLOOR, HESTATE, BATHS, SOCIAL, TRANSPORT, QUALMW MAMAKETIMES, SINCAN OR YENIMAHALLE)

3.7. Evaluation Results

Four sets of data are entered into analysis and the coefficients of each model are estimated. In order to reach the aim of this thesis, the sum of coefficients that represent the implicit prices and the value, which is estimated by sales comparison, is compared. First, each model is estimated with linear functional form of hedonic prices. After the details of each model are given, the comparison of hedonic price analysis and sales comparison analysis is made.

In this study, we concentrate on the R^2 and t-statistics value and the B coefficients of the models. R^2 values of the models show that the fitness of the models are high or not. t-statistics values show the significance of the variables. As mentioned before, the variables that have low t-statistics value are extracted from the analysis. B coefficients give us implicit prices that house buyers are willing to pay for more of each attribute.

Model 1 is estimated by using linear functional form. Nine variables are entered into the hedonic price model. R^2 of the model is 0.790 that means the model is highly suitable. The summary of the model is shown in the Table 10 and the coefficients of this model are shown in the Table 11.

Table 10 Summary-1 of Model 1

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,889[a]	,790	,779	39809,84490

a. Predictors: (Constant), YENIMAH, TRANSPORT, FLOOR, ELEVAT, PARKING, BATHS, CANKAYA, SOCIAL, HESTATE, GRA

Table 11 Coefficients of Model 1

Coefficients[a]

Model		B	t
1	(Constant)	-100665,749	-8,791
	CANKAYA	37170,265	4,745
	GRA	1142,061	8,052
	FLOOR	10008,063	2,185
	HESTATE	24961,302	2,345
	BATHS	33037,515	3,425
	PARKING	5207,149	1,102
	SOCIAL	26771,206	3,871
	ELEVAT	19925,887	2,210
	TRANSPORT	17620,740	2,359
	YENIMAH	29880,212	2,692

a. Dependent Variable: VALUE

As the linear functional form is used, the B coefficients give us implicit prices that house buyers are willing to pay for more of each attribute. This model is created with the variables that are in a low correlation with the GRA variable. According to the

Coefficient Table of Model 1; each additional m^2 to the gross residential area of the housing unit is worth 1142 TL. The price of being located in Çankaya is 37170 TL. and in a housing estate is 24961 TL. The price of one bathroom is 33037 TL. A parking lot is worth 5207 TL, and a garage is worth 10414 TL. the existence of elevator adds 19925 TL to the price of the dwelling unit. Being located in Yenimahalle is worth 29880 TL.

All variables in this model, except PARKING, have a high level significant effect on the housing prices. Being located in Çankaya and in a housing estate have great impact on housing prices. The high impact of Çankaya can be interpreted as being an upper income district and close to the central business district of Ankara. The impact of being located in a housing estate points that the housing units which have security, well kept garden, recreation, sports grounds, and etc. are preferred by households. This impact also explains the price of being located in Yenimahalle. Social infrastructure and public transportation have significant effects on the prices, too.

Model 2 is estimated by using linear functional form. Nine variables are entered into the hedonic price model. R^2 of the model is 0.755 that means the model is highly suitable. The summary of the model is shown in the Table 12 and the coefficients of this model are shown in the Table 13.

Table 12 Summary-1 of Model 2

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,869[a]	,755	,742	42942,92566

a. Predictors: (Constant), YENIMAH, TRANSPORT, QUALMW, ROOMS, ELEVAT, FLOOR, CANKAYA, SOCIAL, BATHS, HESTATE

Table 13 Coefficients of Model 2

Coefficients[a]

Model		B	t
1	(Constant)	-137346,512	-7,316
	CANKAYA	46376,956	5,624
	FLOOR	13245,989	2,667
	ROOMS	30664,274	5,349
	BATHS	55403,858	5,824
	HESTATE	28047,638	2,439
	SOCIAL	20546,041	2,762
	TRANSPORT	22312,920	2,747
	ELEVAT	20823,203	2,096
	QUALMW	11746,032	2,492
	YENIMAH	34598,044	2,905

a. Dependent Variable: VALUE

All variables in the second model have significant effects on housing prices. The second model is created with the variables that are in a low correlation with the ROOM variable. According to the coefficient table of Model 2, price of an additional room is worth 30664 TL and additional bathroom is worth 55403 TL. Homebuyers tend to pay additional 20546 TL for better social facilities. Existence of an elevator in the main building adds 20823 TL to the price of dwelling unit.

As the results of Model 1, Model 2 estimates that being located in Çankaya, in Yenimahalle and in a housing estate have great impact on housing prices. The high impact of being located in Çankaya points that homebuyers tend to live close to the center of the city.

The impact of being located in Yenimahalle can be explained with the reason of the high impact of being located in housing estate. In the neighbourhoods of Yenimahalle, such as Koru, Ümit, Konutkent, etc., the number of housing estates is high. It explains the impact of being located in Yenimahalle.

Model 3 is estimated by using linear functional form. Nine variables are entered into the hedonic price model. R^2 of the model is 0.761 that means the model is highly suitable. The summary of the model is shown in the Table 14 and the coefficients of this model are shown in the Table 15.

Table 14 Summary-1 of Model 3

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,872[a]	,761	,745	42708,94472

a. Predictors: (Constant), SINCAN, ROOMS, TRANSPORT, MAMAKETIMES, ELEVAT, PARKING, FLOOR, QUALMW, SOCIAL, BATHS, CANKAYA, HESTATE

Table 15 Coefficients of Model 3

Coefficients[a]

Model		B	t
1	(Constant)	-127317,153	-6,657
	CANKAYA	33032,358	3,896
	FLOOR	16378,034	3,273
	ROOMS	29113,204	4,933
	BATHS	55119,505	5,825
	HESTATE	37288,247	3,417
	SOCIAL	22019,605	2,965
	TRANSPORT	21271,638	2,627
	ELEVAT	21095,001	2,134
	QUALMW	9718,441	1,992
	PARKING	6631,830	1,286
	MAMAKETIMES	-22917,587	-2,513
	SINCAN	-26325,402	-2,563

a. Dependent Variable: VALUE

The third model is created with the variables that are in a low correlation with the ROOM variable as Model 2. In the coefficient table of the Model 3, it is clearly seen that being located in Çankaya and being located in housing estate show similar significance on housing prices as the previous results of Model 1 and Model 2. The variables of public transportation and social facilities have significant effects on housing prices according to Model 1, Model 2, and Model 3. According to the coefficient of PARKING variable, 6631 TL is the price of a parking lot and 13262 TL is the price of a garage.

One of the important results of this model is the negative impact of being located in Mamak-Etimesgut and Sincan. If the dwelling unit is located in Mamak or in Etimesgut, there is 22917 TL decrease in its price. For being located in Sincan, the decrease is 26325 TL. The reduction of the housing prices in Mamak, Etimesgut and Sincan is relevant to the distance from the city center, as well as the effect of social status.

Model 4 is estimated by using linear functional form. Ten variables are entered into the hedonic price model. R^2 of the model is 0.727 that means the model is highly suitable. The summary of the model is shown in the Table 16 and the coefficients of this model are shown in the Table 17.

Table 16 Summary-1 of Model 4

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,853[a]	,727	,713	45338,95242

a. Predictors: (Constant), QUALMW, SOCIAL, MAMAKETIMES, HESTATE, SINCAN, FLOOR, CANKAYA, BATHS, TRANSPORT, TOTFLOOR

Table 17 Coefficients of Model 4

Coefficients[a]

Model		B	t
1	(Constant)	-74717,010	-5,118
	CANKAYA	39067,364	4,442
	MAMAKETIMES	-25243,506	-2,611
	SINCAN	-20871,386	-1,915
	TOTFLOOR	5738,730	3,349
	FLOOR	24161,415	4,916
	BATHS	71001,502	7,532
	HESTATE	34571,124	3,139
	SOCIAL	23077,449	2,928
	TRANSPORT	22309,941	2,602
	QUALMW	13871,222	2,788

a. Dependent Variable: VALUE

The last model is created with the variables that are in a low correlation with the TOTFLOOR variable. All of the variables in this model have significance effects on housing prices. Like previous results, ÇANKAYA, HESTATE, MAMAKETIMES, and SINCAN variables have similar effects.

The results of four models prove that the preference of being located in Çankaya and in a housing estate is in a rise. The high impact of being located in Yenimahalle is connected with the preference of living in a housing estate.

Türel (1981) and Karagöl (2007) analyzed housing prices in Ankara, as mentioned in the section 2.4.5.1. Türel intended to analyze the spatial variation of housing prices. His study also pointed out that the most valued attributes of housing were number of rooms and existence of central heating system. Türel also called attention to the fact

that the house buyers gave importance to the locational and neighbourhood characteristics of housing unit as well as structural characteristics. In the study of Karagöl, the implicit prices of housing attributes in the housing market were estimated according to the data of 2006. Karagöl stated that the most dramatic result of her study was the high impact level of being located in a housing estate, which is mostly related with environmental factors. According to the results of our study, it is clearly seen that the tendency of living in a housing estate continues. Locational and neighbourhood characteristics of housing are taking into account by house buyers as well as structural characteristics.

After the application of the linear functional form of hedonic prices and the explanation of results, the comparison of Sales Comparison Analysis and Hedonic Price Analysis is made due to the our hypothesis.

For this comparison, five samples are chosen from each ÇANKAYA, KEÇİÖREN, ALTINDAĞ, MAMAKETIMES, SINCAN, and YENIMAHALLE districts. According to the nature of the dwelling unit, the implicit prices are estimated. This estimation is made with 30 sample dwellings by using all models.

As an example, we take a dwelling unit that is located in Çankaya and estimate the price of the unit with Model 1. Model 1 is created with the variables that are in a low correlation with the GRA. The sample unit has 1 bathroom and is located at the second floor of the main building. The gross residential area of the dwelling unit is 108 m^2. The transport and social facilities of the housing unit is positive but there is no parking facility. In the table 22, the specifications of housing unit and the coefficients of the model are shown. The appraised value of this property with sales comparison analysis is 165000 TL. Linear functional form of hedonic price estimates the price as 157295 TL. It is an acceptable result for this sample.

Table 18 Example of Model 1

	Coefficients	Specifications	Hedonic Price
CONSTANT	-100655		-100655
ÇANKAYA	37170	1	37170
FLOORNO	10008	2	20016
GRA	1142	108	123336
BATHS	33037	1	33037
HESTATE	24961	0	0
PARKING	5207	0	0
SOCIAL	26771	1	26771
TRANSPORT	17620	1	17620
ELEVAT	19925	0	0
		TOTAL	**157295**

This estimation is entered with 30 sample dwelling units. For all Models, the details of the chosen dwelling units, the appraised values, and the hedonic price estimations are given as Appendix B, Appendix C, Appendix D, and Appendix E. In the following table, the appraised values of 30 dwelling units and the sum of implicit prices that are estimated by four models of hedonic prices are shown.

Table 19 The Comparison of Sales Comparison and Hedonic Price

		SALES COM.	MODEL 1		MODEL 2		MODEL 3		MODEL 4	
NO	DISTRICT	VALUE	HEDONIC PRICE	Std. Dev.	HEDONIC PRICE	Std. Dev.	HEDONIC PRICE	Std. Dev.	HEDONIC PRICE	Std. Dev.
1	ÇANKAYA	340000	272292	0,80	286919	0,84	270262	0,79	267968	0,78
2	ÇANKAYA	200000	221172	1,10	222087	1,11	159934	0,79	218460	1,09
3	ÇANKAYA	165000	157295	0,95	179929	1,09	172768	1,04	179753	1,08
4	ÇANKAYA	185000	148798	0,80	179929	0,97	179199	0,96	185491	1,00
5	ÇANKAYA	220000	228152	1,03	223138	1,01	220341	1,00	166301	0,75
6	ALTINDAĞ	60000	61634	1,02	71887	1,19	87457	1,45	112521	1,87
7	ALTINDAĞ	75500	67373	0,89	74504	0,98	82651	1,09	72212	0,95
8	ALTINDAĞ	70000	72580	1,03	35040	0,50	47868	0,68	51530	0,73
9	ALTINDAĞ	90000	101099	1,12	99435	1,10	66890	0,74	104506	1,16
10	ALTINDAĞ	90500	83348	0,92	108562	1,19	120271	1,32	114130	1,26
11	MAMAK	100000	95082	0,95	133553	1,33	116819	1,16	121181	1,21
12	ETİMESGUT	90000	90077	1,00	78949	0,87	70442	0,78	67662	0,75
13	ETİMESGUT	50000	57585	1,15	89644	1,79	71328	1,42	108496	2,16
14	MAMAK	87500	92851	1,06	113007	1,29	46312	0,52	98104	1,12
15	ETİMESGUT	115000	152643	1,32	118742	1,03	165936	1,44	175486	1,52
16	KEÇİÖREN	120000	113273	0,94	133553	1,11	139736	1,16	140686	1,17
17	KEÇİÖREN	80000	80425	1,00	96816	1,21	103922	1,29	118682	1,48
18	KEÇİÖREN	135000	140417	1,04	133553	0,98	152998	1,13	122263	0,90
19	KEÇİÖREN	150000	99569	0,66	79397	0,52	91187	0,60	107206	0,71
20	KEÇİÖREN	115000	116699	1,01	121807	1,05	130018	1,13	126815	1,10
21	SİNCAN	66000	75231	1,13	78949	1,19	88305	1,33	72034	1,09
22	SİNCAN	80000	73217	0,91	53958	0,67	62209	0,77	42135	0,52
23	SİNCAN	85000	107058	1,25	101261	1,19	81674	0,96	88605	1,04
24	SİNCAN	102000	134854	1,32	121359	1,18	112496	1,10	80167	0,78
25	SİNCAN	65000	65456	1,00	78949	1,21	60403	0,92	66296	1,01
26	Y.MAHALLE	105000	165218	1,57	173623	1,65	168091	1,60	170037	1,61
27	Y.MAHALLE	70000	113616	1,62	109379	1,56	114425	1,63	66349	0,94
28	Y.MAHALLE	90000	127171	1,41	144936	1,61	119376	1,32	124295	1,38
29	Y.MAHALLE	355000	261458	0,73	261038	0,73	256782	0,72	278291	0,78
30	Y.MAHALLE	340000	303939	0,89	303088	0,89	288982	0,84	286424	0,84

In Table 19, it is seen that the hedonic models obtain approximate results. Model 1 is based on the gross residential area of the housing unit. It contains GRA, ÇANKAYA, FLOOR, HESTATE, BATHS, PARKING, SOCIAL, ELEVAT, TRANSPORT, and YENIMAHALLE OR MAMAKETIMES variables. Model 1 estimates the price of the dwelling units with an average of 105,83 percent. This model estimated the closest results to the results of Sales Comparison Approach.

Model 2 is formed of ROOM, ÇANKAYA, FLOOR, BATHS, HESTATE, SOCIAL, TRANSPORT, ELEVAT, QUALMW, and YENIMAHALLE variables. This model is based on the number of the rooms. Model 2 finds the prices of dwelling units with an average of 110,57 percent.

Model 3 is based on the number of the rooms, too. In this model, we use Mamak-Etimesgut and Sincan variables instead of Yenimahalle. This model contains ROOM, ÇANKAYA, FLOOR, BATHS, HESTATE, SOCIAL, TRANSPORT, ELEVAT, QUALMW, PARKING, MAMAKETIMES, and SINCAN variables. With the coefficients of these variables, it estimated the price of the dwelling units in an average of 106,16 percent.

Finally, the coefficients of model 4 are estimated. This model is based on the total number of the floors in the main building. It contains TOTFLOOR, ÇANKAYA, FLOOR, BATHS, HESTATE, SOCIAL, TRANSPORT, QUALMW MAMAKETIMES, SINCAN OR YENIMAHALLE. This model estimates the prices of 30 housing units in an average of 109,73 percent.

The hedonic models in this study, which are determined according to the correlations and significance of the variables, calculate the price of the dwelling units almost the same as the Sales Comparison Approach did. Linear models estimate high or low prices for some of the samples. The difference of the appraised value and the hedonic value can be a cause of the extracted variables which have low significance. It is sure that with bigger and detailed data, the result will be more close to the real values.

According to these analyses, it is clearly seen that linear functional form of hedonic price can be used in real estate appraisal. It is obvious that a very big and detailed data are needed to be able to use hedonic prices in real estate appraisal. The linear functional form of hedonic analysis can be used with a huge data of sale transactions in the market. Hedonic Prices can also be used as a complementary instrument to the appraisal process. When there is lack of data in the market, the implicit value of the dwelling unit can be calculated.

CHAPTER 4

CONCLUSION

In this thesis, it is aimed to provide a brief overview of the methods used in real estate appraisal according to international valuation standards, to research the position of appraisal practice in Turkey, and to make a study on hedonic price analysis with appraised values in the framework of seeking an alternative appraisal approach.

This thesis is composed of four main chapters, introduction, theoretical framework, appraisal practice in Turkey and appraisal of real estate with hedonic price analysis in Ankara.

In the first part, the aim and the scope of the thesis and the methodology are mentioned. For the aim of this thesis, these questions are asked in the first chapter:

- What is real estate appraisal?

- What are the appraisal techniques and methods that are used in several countries and in Turkey?

- How does the appraisal process work?

- How can hedonic price approach be used in appraisal as the three traditional appraisal techniques?

In relation to these questions and the case study, this thesis hypothesis is as follows:

Using hedonic price analysis in appraisal practice gives efficient results as an alternative appraisal method.

In order to be able to answer these questions, theoretical framework is constructed for analyzing the appraisal term, the appraisal methods, and their application processes in the second chapter of the thesis. The conceptual descriptions of real estate, real property and value are given to clarify the appraisal concept. Then, the purpose and the principles of appraisal are explained. After these explanations, the traditional appraisal methods that are Sales Comparison Approach, Cost Approach, and Income Capitalization Approach are discussed. The conceptual definitions, analysis processes and the limitations of three traditional approaches are explained. Then, the criticism of the three approaches is made. After the three approaches' examination, Hedonic Price Approach is discussed. The historical evolution and the literature on Hedonic Price Analysis is discussed. At the end of these, the empirical studies on Hedonic Price Analysis are analyzed. After the variety of studies are mentioned, three of them are analyzed in detail in order to understand the basic points of Hedonic Price Analysis.

In the third chapter, firstly Real Estate Appraial Practice in Turkey is analyzed. History and the present situation of real estate appraisal in Turkey are explained. The role of Capital Markets Board of Turkey as the regulator committee for appraisers and appraisal practice is explained. Then, the application of the real estate appraisal methods in Turkey is discussed. After the review of the real estate appraisal background of Turkey, hedonic price analysis is used with the data, which are extracted from appraisal reports. The sources of data, which are mainly extracted from appraisal reports and their distribution among districts and neighbourhoods, are displayed. Linear functional form of hedonic price analysis is discussed in the specification of the model. The variables and the definitions of them are explained. The minimum, maximum, mean values and the standard deviations of variables are calculated. Then, the correlations are estimated. According to low correlations, different set of variables are entered into analysis. The t-statistics of the variables and

the R^2 of the estimations are observed. The variables, which have low t-statistics value, are extracted from the equation model according to their significance. Then, four different data sets are created and entered into analysis.

The results of four models prove that the preference of being located in Çankaya and in a housing estate is in a rise. The high impact of being located in Yenimahalle is connected with the preference of living in a housing estate. The tendency of living in a housing estate continues as the results of the study of Türel (1981) and Karagöl (2007). Locational and neighbourhood characteristics of housing are taking into account by house buyers as well as the structural characteristics.

After the application of the linear functional form of hedonic prices and the explanation of results, the comparison of Sales Comparison Analysis and Hedonic Price Analysis is made. For this comparison, five samples are chosen from each of the ÇANKAYA, KEÇİÖREN, ALTINDAĞ, MAMAKETIMES, SINCAN, and YENIMAHALLE districts. According to the nature of the dwelling unit, the implicit prices are estimated. This estimation is made with 30 sample dwellings by using all models. The hedonic models in this study, which are determined according to the correlations and significance of the variables, calculate the price of the dwelling units.

According to the analyses in this study, linear functional form of hedonic price can be used in real estate appraisal. Another type of usage can be a complementary instrument to the appraisal process. When there is lack of comparable sales in the market, the hedonic price can be used to calculate implicit price of housing attributes.

The abilitiy to estimate the implicit prices makes hedonic price analysis important for planning. Implicit prices of housing attributes indicate the tendencies of house buyers. This information gives hint to urban planners, policy makers, house developers and other actors in the sector about how the urban development should be. Planning should pay attention to the desired housing attributes in order to decide

where to locate residential buildings, commercial buildings, schools, and so on. The application of the hedonic model is also a guide for housing developers. With the hedonic analysis, housing developers have the ability to predict home buyers' tendencies of attributes. Apartments, dwelling units that meet the tendencies and preferences of buyers improve the profit margin of the house developers. The general public also stands to gain indirectly from better planning decisions made by authorities and the judicious use of public money for facilities such as public schools, recreational parks, and shopping complexes.

The main advantages of using hedonic prices in real estate appraisal are the ability to know the tendencies of the house buyers, the removal of subjectivity from the appraisal process, and the estimation of implicit prices of real estate assets. Beside these advantages, using Hedonic price analysis in real estate appraisal has disadvantages too. It is obvious that a very big, up to date and detailed data are needed to be able to use hedonic prices in real estate appraisal. The data should have number of samples of transactions and their detailed and actual information. Furthermore, it is necessary to use appropriate computer software of hedonic price analysis for real estate appraisal. The handicap of the need for big data and the cost of acquiring the software come out as disadvantages of using hedonic prices in real estate appraisal. A weakness of this study is the limited data. It would be necessary to make this analysis with more detailed and bigger size data.

In conclusion, as the hypothesis of this study, it is proved that using hedonic price analysis as an alternative or complementary method gives efficient results in real estate appraisal.

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APPENDIX A

Table of Correlations

Correlations

	CANKAYA	MAMAKETIMES	YENIMAH	KECIOREN	ALTINDAG	SINCAN	PARCEL	AGE	TOTFLOOR	FLOOR	GRA	ROOMS	BATHS	HESTATE	FRONTV1	BALCONY	PARKING	SOCIAL	TRANSPORT	QUALMW	FLCOVER	ELEVAT	HEATING
CANKAYA	1	-,274**	-,242**	-,354**	-,175*	-,242**	-,105	,368**	,011	-,018	,282**	,190**	,128	-,147*	-,115	,013	-,041	,277**	,460**	,040	,088	,082	-,012
MAMAKETIMES	-,274**	1	-,162*	-,237**	-,118	-,162*	,146*	-,221**	,048	,021	-,103	-,093	-,035	,146*	,050	,018	,052	-,035	-,116	,147*	,097	,056	,053
YENIMAH	-,242**	-,162*	1	-,209**	-,104	-,143*	,461**	-,149*	,393**	,199**	,221**	,180*	,338**	,575**	,034	,133	,324**	,148*	-,085	,120	,076	,325**	,047
KECIOREN	-,354**	-,237**	-,209**	1	-,152*	-,209**	-,201**	-,050	-,099	-,202**	-,125	-,162*	-,149*	-,233**	-,097	-,107	-,070	-,252**	-,153*	-,070	-,090	-,168*	-,029
ALTINDAG	-,175*	-,118	-,104	-,152*	1	-,104	-,104	,136	-,212**	,005	-,181*	-,113	-,131	-,096	,049	-,154*	-,159*	,104	-,139*	-,084	,026	-,152*	,034
SINCAN	-,242**	-,162*	-,143*	-,209**	-,104	1	-,137	-,155*	-,171*	,054	-,168*	-,045	-,180*	-,161*	,156*	,085	-,111	-,246**	-,116	-,180*	-,176*	-,138	-,078
PARCEL	-,105	,146*	,461**	-,201**	-,104	-,137	1	-,103	,468**	,190**	,251**	,239**	,349**	,713**	,023	,133	,337**	,074	-,014	,204**	,099	,413**	,046
AGE	,368**	-,221**	-,149*	-,050	,136	-,155*	-,103	1	-,307**	-,142*	-,284**	-,273**	-,313**	-,174*	-,091	-,197**	-,421**	,409**	,388**	-,374**	-,157*	-,255**	-,128
TOTFLOOR	,011	,048	,393**	-,099	-,212**	-,171*	,468**	-,307**	1	,161*	,393**	,306**	,390**	,624**	-,029	,188**	,426**	-,010	,002	,284**	,079	,594**	,064
FLOOR	-,018	,021	,199**	-,202**	,005	,054	,190**	-,142*	,161*	1	,464**	,444**	,232**	,219**	,040	,419**	,150*	,116	,149*	,332**	,121	,121	,183**
GRA	,282**	-,103	,221**	-,125	-,181*	-,168*	,251**	-,284**	,393**	,464**	1	,759**	,642**	,301**	,020	,342**	,407**	,090	,152*	,453**	,199**	,358**	,126
ROOMS	,190**	-,093	,180*	-,162*	-,113	-,045	,239**	-,273**	,306**	,444**	,759**	1	,475**	,225**	-,062	,385**	,382**	,110	,141*	,339**	,183**	,276**	,107
BATHS	,128	-,035	,338**	-,149*	-,131	-,180*	,349**	-,313**	,390**	,232**	,642**	,475**	1	,406**	,009	,168*	,392**	,086	,020	,384**	,159*	,342**	,059
HESTATE	-,147*	,146*	,575**	-,233**	-,096	-,161*	,713**	-,174*	,624**	,219**	,301**	,225**	,406**	1	,003	,145*	,351**	,108	-,069	,211**	,134	,628**	,065
FRONTV1	-,115	,050	,034	-,097	,049	,156*	,023	-,091	-,029	,040	,020	-,062	,009	,003	1	,071	-,029	-,086	-,027	-,037	,138	,045	-,028
BALCONY	,013	,018	,133	-,107	-,154*	,085	,133	-,197**	,188**	,419**	,342**	,385**	,168*	,145*	,071	1	,138	-,110	,019	,264**	,096	,157*	-,043
PARKING	-,041	,052	,324**	-,070	-,159*	-,111	,337**	-,421**	,426**	,150*	,407**	,382**	,392**	,351**	-,029	,138	1	-,010	-,008	,338**	,118	,303**	,186**
SOCIAL	,277**	-,035	,148*	-,252**	,104	-,246**	,074	,409**	-,010	,116	,090	,110	,086	,108	-,086	-,110	-,010	1	,514**	,029	,117	,008	,130
TRANSPORT	,460**	-,116	-,085	-,153*	-,139*	-,116	-,014	,388**	,002	,149*	,152*	,141*	,020	-,069	-,027	,019	-,008	,514**	1	-,047	,062	,016	,014
QUALMW	,040	,147*	,120	-,070	-,084	-,180*	,204**	-,374**	,284**	,332**	,453**	,339**	,384**	,211**	-,037	,264**	,338**	,029	-,047	1	,290**	,319**	,189**
FLCOVER	,088	,097	,076	-,090	,026	-,176*	,099	-,157*	,079	,121	,199**	,183**	,159*	,134	,138	,096	,118	,117	,062	,290**	1	,185**	,098
ELEVAT	,082	,056	,325**	-,168*	-,152*	-,138	,413**	-,255**	,594**	,121	,358**	,276**	,342**	,628**	,045	,157*	,303**	,008	,016	,319**	,185**	1	,068
HEATING	-,012	,053	,047	-,029	,034	-,078	,046	-,128	,064	,183**	,126	,107	,059	,065	-,028	-,043	,186**	,130	,014	,189**	,098	,068	1

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

APPENDIX B

The Comparison Table of Model 1

MODEL 1	FLOORNO	GFA	BATHS	HESTATE	PARKING	SOCIAL	TRANSPORT	ELEVAT	SALES COMPARISON	HEDONIC PRICE	%
COEFFICIENTS/DISTRICT	10008	1142	33037	24961	5207	28771	17620	19925			
ÇANKAYA	2	171	2	0	2	1	1	0	340000	272692	80,20
ÇANKAYA	1	135	2	0	2	1	1	0	200000	221172	110,59
ÇANKAYA	2	108	1	0	0	1	1	0	165000	157295	95,33
ÇANKAYA	2	96	1	0	1	1	1	0	185000	148798	80,43
ÇANKAYA	2	160	2	0	1	0	0	0	220000	228152	103,71
ALTINDAĞ	1	78	1	1	1	1	0	0	60000	61634	102,72
ALTINDAĞ	1	86	1	0	0	1	0	0	75500	67373	89,24
ALTINDAĞ	1	75	1	0	1	0	0	0	70000	72580	103,69
ALTINDAĞ	2	98	1	0	2	1	0	0	90000	101099	112,33
ALTINDAĞ	1	80	1	0	1	1	1	0	90500	83348	92,10
MAMAK	2	115	1	0	0	1	1	0	100000	95082	95,08
ETIMESGUT	2	116	1	0	1	0	0	0	90000	90077	100,09
ETIMESGUT	1	62	1	0	0	1	1	0	50000	57585	115,17
MAMAK	2	103	1	0	1	0	1	0	87500	92851	106,12
ETIMESGUT	2	120	2	1	2	0	0	0	115000	152643	132,73
KEÇIÖREN	2	102	1	0	0	1	1	0	120000	113273	94,39
KEÇIÖREN	1	82	1	0	0	1	1	0	80000	80425	100,53
KEÇIÖREN	2	117	1	0	2	1	1	0	135000	140417	104,01
KEÇIÖREN	2	90	1	0	0	1	1	0	150000	99569	66,38
KEÇIÖREN	2	105	1	0	0	1	1	0	115000	116699	101,48
SINCAN	2	103	1	0	1	0	0	0	66000	75231	113,99
SINCAN	1	110	1	0	1	0	0	0	80000	73217	91,52
SINCAN	2	120	1	0	0	0	1	0	85000	107058	125,95
SINCAN	2	151	1	0	2	0	0	0	102000	134854	132,21
SINCAN	2	99	1	0	0	0	0	0	65000	65456	100,70
Y.MAHALLE	2	120	1	1	2	0	0	1	105000	165218	157,35
Y.MAHALLE	1	93	1	0	1	0	0	1	70000	113616	162,31
Y.MAHALLE	2	94	1	0	0	0	1	1	90000	127171	141,30
Y.MAHALLE	2	154	2	1	2	1	1	1	355000	261458	73,65
Y.MAHALLE	2	170	2	1	1	1	1	1	340000	303939	89,39

APPENDIX C

The Comparison Table of Model 2

MODEL 2	FLOORNO	ROOMS	BATHS	HESTATE	SOCIAL	TRANSPORT	QUALMW	ELEVAT	SALES COMPARISON	HEDONIC PRICE	%
COEFFICIENTS/ DISTRICT	13245	30664	55403	28047	20546	22312	11746	20823			
ÇANKAYA	2	5	2	0	1	1	2	0	340000	286919	84,39
ÇANKAYA	1	4	2	0	1	1	1	0	200000	222087	111,04
ÇANKAYA	2	4	1	0	1	1	2	0	165000	179929	109,05
ÇANKAYA	2	4	1	0	1	1	2	0	185000	179929	97,26
ÇANKAYA	2	5	2	0	0	0	2	0	220000	223139	101,43
ALTINDAĞ	1	3	1	1	1	0	0	0	60000	71887	119,81
ALTINDAĞ	1	4	1	0	1	0	0	0	75500	74504	98,68
ALTINDAĞ	1	3	1	0	0	0	1	0	70000	35040	50,06
ALTINDAĞ	2	4	1	0	1	0	1	0	90000	99435	110,48
ALTINDAĞ	1	4	1	0	1	1	1	0	90500	108562	119,96
MAMAK	2	4	1	0	1	1	2	0	100000	133553	133,55
ETIMESGUT	2	4	1	0	0	0	1	0	90000	78949	87,72
ETIMESGUT	1	3	1	0	1	1	2	0	50000	89644	179,29
MAMAK	2	4	1	0	0	1	2	0	87500	113007	129,15
ETIMESGUT	2	4	2	1	0	0	2	0	115000	118742	103,25
KEÇIÖREN	2	4	1	0	1	1	2	0	120000	133553	111,29
KEÇIÖREN	1	4	1	0	1	1	0	0	80000	96816	121,02
KEÇIÖREN	2	4	1	0	1	1	2	0	135000	133553	98,93
KEÇIÖREN	2	3	1	0	1	1	0	0	150000	79397	52,93
KEÇIÖREN	2	4	1	0	1	1	1	0	115000	121807	105,92
SINCAN	2	4	1	0	0	0	1	0	66000	78949	119,62
SINCAN	1	4	1	0	0	0	0	0	80000	53959	67,45
SINCAN	2	4	1	0	0	1	1	0	85000	101261	119,13
SINCAN	2	5	1	0	0	0	2	0	102000	121359	118,98
SINCAN	2	4	1	0	0	0	1	0	65000	78949	121,46
Y.MAHALLE	2	4	1	1	0	0	2	1	105000	173623	165,36
Y.MAHALLE	1	4	1	0	0	0	0	1	70000	109379	156,26
Y.MAHALLE	2	4	1	0	0	1	0	1	90000	144936	161,04
Y.MAHALLE	2	4	2	1	1	1	1	1	355000	261039	73,53
Y.MAHALLE	2	5	2	1	1	1	2	1	340000	303089	89,14

APPENDIX D

The Comparison Table of Model 3

MODEL 3	FLOORNO	ROOMS	BATHS	HESTATE	PARKING	SOCIAL	TRANSPORT	QUALMW	ELEVAT	SALES COMPARISON	HEDONIC PRICE	%
COEFFICIENTS/DISTRIC	16378	29113	55119	37288	6631	22019	21271	9718	21095			
ÇANKAYA	2	5	2	0	2	1	1	2	0	340000	270262	79,49
ÇANKAYA	1	4	2	0	2	1	1	1	0	200000	159934	79,97
ÇANKAYA	2	4	1	0	0	1	1	2	0	165000	172768	104,71
ÇANKAYA	2	4	1	0	1	1	1	2	0	185000	179199	96,86
ÇANKAYA	2	5	2	0	1	0	0	2	0	220000	220341	100,16
ALTINDAĞ	1	3	1	1	1	1	0	0	0	60000	87457	145,76
ALTINDAĞ	1	4	1	0	0	1	0	0	0	75500	82651	109,47
ALTINDAĞ	1	3	1	0	1	0	0	1	0	70000	47868	68,38
ALTINDAĞ	2	4	1	0	2	1	0	1	0	90000	66890	74,32
ALTINDAĞ	1	4	1	0	1	1	1	1	0	90500	120271	132,90
MAMAK	2	4	1	0	0	1	1	2	0	100000	116819	116,82
ETIMESGUT	2	4	1	0	1	0	0	1	0	90000	70442	78,27
ETIMESGUT	1	3	1	0	0	1	1	2	0	50000	71328	142,66
MAMAK	2	4	1	0	1	0	1	2	0	87500	46312	52,93
ETIMESGUT	2	4	2	1	2	0	0	2	0	115000	165936	144,29
KEÇIÖREN	2	4	1	0	0	1	1	2	0	120000	139736	116,45
KEÇIÖREN	1	4	1	0	0	1	1	0	0	80000	103922	129,90
KEÇIÖREN	2	4	1	0	2	1	1	2	0	135000	152998	113,33
KEÇIÖREN	2	3	1	0	0	1	1	0	0	150000	91187	60,79
KEÇIÖREN	2	4	1	0	0	1	1	1	0	115000	130018	113,06
SINCAN	2	4	1	0	1	0	0	1	0	66000	88305	133,80
SINCAN	1	4	1	0	1	0	0	0	0	80000	62209	77,76
SINCAN	2	4	1	0	0	0	1	1	0	85000	81674	96,09
SINCAN	2	5	1	0	2	0	0	2	0	102000	112496	110,29
SINCAN	2	4	1	0	0	0	0	1	0	65000	60403	92,93
Y.MAHALLE	2	4	1	1	2	0	0	2	1	105000	168091	160,09
Y.MAHALLE	1	4	1	0	1	0	0	0	1	70000	114425	163,46
Y.MAHALLE	2	4	1	0	0	0	1	0	1	90000	119376	132,64
Y.MAHALLE	2	4	2	1	2	1	1	1	1	355000	256782	72,33
Y.IMAHALLE	2	5	2	1	1	1	1	2	1	340000	288982	84,99

APPENDIX E

The Comparison Table of Model 4

MODEL 4	TOTFLOOR	FLOORNO	BATHS	HESTATE	SOCIAL	TRANSPORT	QUALMW	SALES COMPARISON	HEDONIC PRICE	%
COEFFICIENTS/DISTRICT	5738	24161	71001	34571	23077	22309	13871			
ÇANKAYA	7	2	2	0	1	1	2	340000	267968	78,81
ÇANKAYA	5	1	2	0	1	1	1	200000	218460	109,23
ÇANKAYA	4	2	1	0	1	1	2	165000	179753	108,94
ÇANKAYA	5	2	1	0	1	1	2	185000	185491	100,27
ÇANKAYA	4	2	2	0	0	0	2	220000	166301	75,59
ALTINDAĞ	6	1	1	1	1	0	0	60000	112521	187,54
ALTINDAĞ	5	1	1	0	1	0	0	75500	72212	95,65
ALTINDAĞ	3	1	1	0	0	0	1	70000	51530	73,61
ALTINDAĞ	4	2	1	0	1	0	1	90000	104506	116,12
ALTINDAĞ	6	1	1	0	1	1	1	90500	114130	126,11
MAMAK	5	2	1	0	1	1	2	100000	121181	121,18
ETIMESGUT	6	2	1	0	0	0	1	90000	67662	75,18
ETIMESGUT	7	1	1	0	1	1	2	50000	108496	216,99
MAMAK	5	2	1	0	0	1	2	87500	98104	112,12
ETIMESGUT	10	2	2	1	0	0	2	115000	175486	152,60
KEÇIÖREN	4	2	1	0	1	1	2	120000	140686	117,24
KEÇIÖREN	5	1	1	0	1	1	0	80000	118682	148,35
KEÇIÖREN	5	2	1	0	1	1	2	135000	122263	90,57
KEÇIÖREN	3	2	1	0	1	1	0	150000	107206	71,47
KEÇIÖREN	4	2	1	0	1	1	1	115000	126815	110,27
SINCAN	6	2	1	0	0	0	1	66000	72034	109,14
SINCAN	5	1	1	0	0	0	0	80000	42135	52,67
SINCAN	5	2	1	0	0	1	1	85000	88605	104,24
SINCAN	5	2	1	0	0	0	2	102000	80167	78,60
SINCAN	5	2	1	0	0	0	1	65000	66296	101,99
Y.MAHALLE	11	2	1	1	0	0	2	105000	170037	161,94
Y.MAHALLE	8	1	1	0	0	0	0	70000	66349	94,78
Y.MAHALLE	10	2	1	0	0	1	0	90000	124295	138,11
Y.MAHALLE	12	2	2	1	1	1	1	355000	278291	78,39
Y.MAHALLE	11	2	2	1	1	1	2	340000	286424	84,24