The Application of Heterogeneous Asset Pricing Model in the Residential Real Estate Market in Kenya

By

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DECLARATION

Candidate's Declaration

I declare that this is my original work and has not been submitted for any degree or diploma in any university or any other institution.

Signature: .....Date: 8/11/2012

Francis Kibugi Wanjohi

Supervisor's Declaration

This project has been submitted with my approval as the candidate's Supervisor.

Signature:.....Date: 9.11.2012

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DEDICATION

This work is dedicated to my wife, Mary M. Kibugi, without whose caring support it would not have been possible, my mum, Purity Wanjohi who has given me the drive and discipline to tackle any task with enthusiasm and determination and to the memory of my dad, Moses Wanjohi, who passed on a love of reading and respect for education.

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I thank my family, closest friends and parents for their unending support and belief in me.

Last but not the least; I thank almighty God for his graces and mercies in life that have brought me this far in life.

ABSTRACT

This project assesses the applicability of heterogeneous asset pricing model in pricing heterogeneous assets, with specific examination of the Kenyan residential real estate market. Each of the three primary methods for pricing residential real estate assets – income, cost and sales comparables approaches – is susceptible to bias. This project therefore, mainly seeks to establish an alternative methodology with view to reducing subjectivity of the pricing process. The study also has a secondary objective of assessing how heuristic biases influence the pricing process leading to subjectivity. The study uses case study design, specifically Nairobi City residential real estate market, from where a sample is drawn and survey done.

Methodological comparisons are made in the study of pricing of residential real estate market. Using a few residential properties from Nairobi City, the prices are independently estimated using the three traditional approaches. The prices of the selected properties are then estimated using heterogeneous asset pricing model in its simplest form, to test its applicability. This allows a controlled cross-methodology comparison of results.

The results indicate that, heterogeneous asset pricing model is applicable in pricing of residential real estate assets in Kenya thus confirming the hypothesis of the study. The study also indicate that stereotypes, aversion to ambiguity, conservatism are some of the psychological bias that influence the pricing process of residential real estate assets. For instance, conservatism is seen where valuers fail to undertake fresh market analysis and continue to use comparables of sales made in the past. The study therefore concluded that

the pricing of heterogeneous asset pricing model is applicable and if well modeled and controlled. it has better results. The study recommends policy and academia review to base pricing of residential real estate assets on concepts of price distributions, pricing models and prediction error analysis. Further, the study recommends that the psychological bias should be identified and valuers trained on how to deal with them so as to reduce the subjectivity in pricing of heterogeneous real estate assets.

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LIST OF ABBREVIATIONS

ISK	Institution of Surveyors of Kenya
IVS	International Valuation Standards
REITS	Real Estate Investment Trusts
DCF	Discounted Cash flow
AVM	Automated Valuation Models
GOI	Gross Operating Income
NOI	Net Operating Income
NPV	Net Present Value

DEFINITION OF TERMS

Possible Price Distribution: A probability distribution showing the relative probability of different prices being revealed in a sale of the subject property at a particular time.

Pricing Model: A parsimonious representation of the market's pricing process used to "adjust" sales evidence to obtain an "indicated value" of the subject property.

Error Analysis: Errors in predicted prices provide a means for making estimates of variance of possible price distributions and the evaluating the accuracy of pricing models.

CHAPTER ONE

INTRODUCTION

1.1. Background of the Study

Price represents the amount of value the market has assigned, fairly or unfairly, to a good or service. Pricing is the determination of the price at which stock/asset will sell or the yield at which bonds will sell as new issues, David L. Scott, (2003). Value is a subjective rather than an objective term. The forces influencing the value of a property include its environmental and physical characteristics, social standards. economic influences and political or government regulations. The price of a specific property at a point in time is a random variable reflecting the heterogeneity, uncertainty and limited information of buyers and sellers.

1.1.1. Pricing of Heterogeneous Assets

Heterogeneous assets refer to assets with different characteristics from each other such as real estate assets. The profession of real estate valuers arises because each real estate asset is different from all other properties. Real estate assets are heterogeneous. that is. their characteristics vary. Researchers and practitioners have found that hundreds of factors might affect prices in various situations. Moreover, properties trade infrequently. perhaps once every 5-10 years for the average house, Lancaster (1966).

Heterogeneous asset pricing refers to establishing the prices of assets with different characteristics from each other such as the real estate residential houses whose

architectural designs, finishes, location, security, market, among others differs. Heterogeneity requires valuers to develop models of price differences. Instead of P(t) = P(t -1), where price of the subject property equals recent transaction prices, Valuers have to use Psubject(t)=Pcomparable(t-1)+differences. "Differences" means the price implications, positive or negative, of the differences in hedonic characteristics between the properties. This "sales comparison price differences" regression model is mathematically equivalent to the "adjustment grid" used by American Valuers, Colwell, Cannaday & Wu (1983). Modeling price differences due to differing characteristics stems from Kevin Lancaster's notion that utility and the price people pay for complex commodities like housing or automobiles is a sum of the utility of various characteristics, Lancaster(1966), Rosen,(1974).

1.1.2. Real Estate Market in Kenya.

The real estate market in both rural and urban areas is characterized by a mismatch between demand and supply of assets. If we consider the residential sub-market as an example, which is a major part of the overall real estate market, the following characteristics are noticeable.

First, the annual supply of residential units falls short of demand estimated at 200,000 units. Secondly, for the few units being supplied the actual price (both rent and mortgage) set by the market is way above what the majority of buyers and renters are willing and able to pay. This has resulted in the burgeoning of slums and the related social ills including insecurity and poor standards of living. As a consequence, ownership of residential structures in Kenya is way out of the reach of a majority of its citizens. The

real estate market is largely characterised by a number of weaknesses including low supply, and financial and regulatory constraints,Wanyama, (2012). .

1.1.3. Traditional Valuation Models Used in Kenya

There are three models used in estimating the prices of real estate assets by Valuers. The first approach is the Income Model, where the present value of the property is estimated based on the projected future net income and resale value. This method uses the discounted cash flow (DCF) model to determine the present value of an investment. The second approach is the Cost Model also known as the Summation Method. The value of the property is estimated by summing the land value and the cost to reconstruct any improvements less the depreciation of these improvements.

The third model is the Comparable Sales Approach also known as Inferred Analysis Method. This approach looks at the price or price per unit area of similar properties being sold in the market place. The basic assumption is therefore that a property is worth what it will sell for, in the absence of undue stress and if reasonable time is given. It is the most prevalent method in the residential property market, concerning general trends and projections and employing the principle of substitution, Kummerow(2002).

1.1.4. Heterogeneous Asset Pricing Model

The value of a house is affected by a particular combination of characteristics that it possesses given that properties with better qualities demand higher prices as compared to

properties with lower qualities. The price of a house is thus affected by the structural characteristics(s1,s2,s3...)of the house itself, characteristics of the locality/neighbourhood (n1, n2, n3...), and environmental characteristics (e1, e2, e3...)

Structural Characteristics could be anything from size of the house, to the number of rooms, type of flooring, etc. Neighbourhood attributes include variables like posh-ness of the locality, quality of roads, etc. And the environmental characteristics are variables such quality of air, proximity to parks, beaches and dumping yards. The analysis takes place in two stages. The first stage involves employing regression techniques to estimate the Hedonic Price Function of the property. This function will relate the prices of many properties in the same housing area to the different characteristics. So Price Function (P) = f (s1, s2, s3...sj; n1, n2, n3,...nj; e1, e2, e3,...ej).

In valuation context, the model is Psubject(t)=Pcomparable(t-1)+differences. "Differences" means the price implications, positive or negative, of the differences in hedonic characteristics between the properties. The equation is $Ps=\Sigma biXi$ where Xi are property characteristics like size, age, etc. and bi are coefficients or weights. The sales comparison model is, instead, $Ps-Po=\Sigma ai(Xsi-Xoi)$, the price differences model, estimated from a small sample of quite similar or "comparable" property sales, Colwell, Cannaday & Wu(1983).

1.2. Research Problem

Historically, there are three approaches/models used in estimating the prices of real estate assets which are Income approach, Cost approach and Sales Comparable approach.

Income approach is complex and ignores the actual market prices for property by neglecting the sales comparable method. Cost approach neglects the difference between cost and value, that one property might be cheaper than another but generate a much higher net income, Kummerow (2002).

Pasad and Richards (2007), observed that median price series used by comparable Sales Approach is susceptible to severe 'composition bias'. Makathimo and Kaberere (2002), in their analysis of challenges facing valuation profession globalization observes that market inefficiencies, speculation, lack of a central data centre for land transactions and inflated costs have led to severe challenges in the use of traditional valuation models in Kenya. Wrights(2010), in his heterogeneous asset pricing research in Australia observes that hedonic and repeat sales regression methods are very complex, require intensive data requirements and suffer sample selectivity problems. Mark and Goldberg(1984), acknowledge that median prices are more robust to extreme observations than mean prices and that period estimate of price levels or growth is not affected by the illiquidity of the residential real estate market.

The researcher therefore observed the following gaps. First, the traditional methods of pricing heterogeneous assets are subjective and susceptible to bias and therefore the need to update the heterogeneous assets pricing theory by adopting objective approaches based on concepts of price distributions, pricing models and prediction error analysis. Secondly, studies done in some countries such as Australia indicate behavioral factors such as stereotyping, frame dependence, among others affect the pricing of residential real estate

thus there is need to establish solutions in the context of Kenyan residential real estate market. The researcher will establish how the Valuers are managing behavioural factors in pricing residential real estate assets in Kenya so as to compare the findings with other countries and establish possible solutions. Thirdly, the researcher observed that strong form efficiency of information is key in controlling heterogeneity in pricing of residential real estate in developed countries and will therefore find out how valuers are coping with weak form efficiency in valuation of residential real estate in Kenya.

The research question is therefore how we can apply heterogeneous asset pricing model in residential real estate market in Kenya to minimize subjectivity and the influence of behavioural factors. The central focus will be how we can base heterogeneous assets pricing on concepts of price distribution, pricing models and prediction error analysis among other broad based approaches rather than thinking in the closed box of traditional three approaches to heterogeneous assets pricing (income approach, cost approach and sales comparison approach).

1.3. Research Objectives

1. To evaluate the applicability of heterogeneous asset pricing model in the residential real estate market in Kenya.

2. To establish the extent of influence of behavioural factors such as stereotyping in pricing of heterogeneous assets in the residential real estate market in Kenya.

1.4. Value of the Study

Valuation has been characterized by biasness and confusion as manifested by different opinion given by different Valuers when called upon to estimate the price of the same property. The application of heterogeneous asset pricing model is expected to reduce biasness in pricing of residential real estate market in Kenya. This updating of valuation theory and the valuation methodological implications flowing from this research is expected to ground real estate valuation more firmly in modern economics and finance theory and statistical methods as they have developed in recent academic literature. This will also reduce the level of litigation regarding the pricing of real estate assets as witnessed in the past, where even the public express discontent on the prices of public real estate assets being sold.

Investors will similarly benefit significantly, particularly given the recent innovation of REITs products in the Nairobi Securities Exchange. The results are of importance from both practical and academic perspectives. The pricing of new properties and their subsequent performance should affect investment decisions. Taxation and regulatory policies designed to encourage new home purchases and developments need to consider any pricing anomalies at the first sale. Such monetary incentives include the recent grants, and concessions on stamp duty applicable to new property purchases from the government. In essence, the main aspect would be to deal with these heuristic biases and how to manage them to control the pricing of residential real estate in Kenya. In this project, the researcher will endeavor to close the gap that the price of a real estate asset should reflect the intrinsic value or the worth of that asset.

CHAPTER TWO

LITERATURE REVIEW

2.1. Introduction

This section highlights the previous studies on heterogeneous real estate assets both at local level and global level. Under section 2.2, the researcher analyses the theoretical concepts upon which the pricing of heterogeneous assets is based upon. Under the section, we explore the methodologies applied in valuation practice which include income, cost and comparables approaches. Section 2.3 deals with the general issues influencing the pricing of heterogeneous assets including the macro economy, information efficiency, methodologies used and the market itself. Section 2.4 explores the empirical studies which have been done previously appreciating the input of other researchers with a view to establish the foundation of this research. Finally, section 2.5 concludes the literature review chapter by summarizing the main issues from the chapter.

2.2. Theoretical Review

2.2.1. Real Estate Property Valuation/Pricing

Real Estate valuation is a service provided by licensed or certified appraiser, who gives an opinion of value based on the highest and best use of the real property. The highest and best use is that use which produces the highest value for the land, as if vacant. This use is based on 4 parts; physically possible, appropriate, legal, and economically feasible.

The value or price of a heterogeneous asset depends on the purpose and therefore takes different forms. First, it could mean market value, which means the price at which an asset would trade in a competitive setting."Market Value is the estimated amount for which a property should exchange on the date of valuation between a willing buyer and a willing seller in an arms-length transaction after proper marketing wherein the parties had each acted knowledgably, prudently, and without compulsion", IVS 1–Market Value Basis of Valuation, Seventh Edition(2000).

Secondly, it could mean value in use, which implies the net present value (NPV) of a cash flow that an asset generates for a specific owner under a specific use. Value-in-use is the value to one particular user, which may be above or below the market value of a property, (IVS, Seventh Edition). Thirdly, it could mean the investment value which implies the value to one particular investor, which may be above or below the market value of a property, (IVS, Seventh Edition). Finally, it could mean the insurable value which the value of real property covered by an insurance policy. Generally it does not include the site value, IVS, Seventh Edition(2000).

2.2.2. Valuation Methods for Real Estate Property

The valuation methods are theoretical approaches to the question of value and help estimate the worth of a property to a buyer or seller. In practice, however, it is the free market, i.e. the forces of supply and demand, which decide what amount of money a house changes hands for. There are four main traditional methods for valuing a real estate property.

2.2.2.1. Income Method

The "Income Method" is the Fundamental or the intrinsic method of property valuation. The present value of the property is estimated based on the projected future net income and resale value. The method uses the discounted cash flow (DCF) model to determine the present value of an investment. One underlying assumption of this approach is the principle of opportunity cost of capital, i.e. that money is of more value to its holder today than in the future. This method is an essential element to the valuation of any property; it is almost always employed by financial and investment professionals when valuing assets. The Income approach capitalizes an income stream into a present value using Revenue multipliers or single-year capitalization rates of Net Operating Income (NOI). The NOI is therefore equal to GOI less the vacancy and operating expenses. Kummerow(2002).

Central to this valuation method are the various assumptions that are to be made for the DCF analysis- the future income, resale value and the opportunity cost of capital. For the income based valuation of real estate, first the assumptions are made. Next a DCF analysis is done. The PV of the property consists of two parts: the annual income generated and the re sale value. The annual income for each year and the re sale value are projected. Using the opportunity cost of capital, the present value is determined. This PV is the Income based value of the property, Kummerow(2002).

This method is advantageous in that it focuses on the value of the property to the individual concerned and income analysis is very detailed and draw specific conclusions

However, it is more complex and less intuitive than the sales comparable method and it ignores the actual market prices for property by neglecting the sales comparable method, Kummerow(2002).

2.2.2.2. The Cost Approach

The cost approach was formerly called the Summation approach. The value of a property can be estimated by summing the land value and the depreciated value of any improvements done on it. It is the land value, plus the cost to reconstruct any improvements less the depreciation of these improvements. The overall methodology is a hybrid of cost and the market data approaches. As the cost to construct a building can be determined by adding the labor and materials cost together but land values and depreciation have to be gathered from market data. This is most reliable when used on newer structures, Kummerow(2002).

This method estimates the replacement value of the property by analyzing the cost of its components- land and building. It is mid way between inferred and intrinsic methods. Free market value of the land as if vacant + reconstruction cost of building – Depreciation suffered over the years = Value based on cost approach, Kummerow(2002).

The value of the land as if it was vacant is estimated. The second step is to estimate the replacement cost of the building keeping in mind factors like utilities, building improvements, tenant improvements, soft costs etc. Next, the depreciation amount is assessed and deducted. Then add the estimated worth of land and the figure so obtained is the value of the real estate based on the cost approach. This method sets the value at the

actual cost or price of the property, however it relies upon other valuation methods to derive the value of the land. Furthermore, it neglects the difference between cost and value, namely that one property might be cheaper than another but generate a much higher net income. Kummerow(2002).

2.2.2.3. The Comparable Sales Method

Also called the Inferred Analysis method of property valuation, it estimates the value of a house by comparing it to the prices of similar properties sold in similar locations within a recent period of time. The basic assumption is therefore that a property is worth what it will sell for, in the absence of undue stress and if reasonable time is given. It is the most prevalent method in the residential property market, concerning general trends and projections and employing the principle of substitution, Kummerow(2002).

This approach looks at the price or price per unit area of similar properties being sold in the marketplace. The sales of properties similar to the subject are analyzed and the sale prices adjusted to account for differences in the comparables to the subject to determine the fair market value of the subject. This approach is generally considered the most reliable, if good comparable sales exist and can serve as an independent check on the reasonability of a valuation opinion, Kummerow(2002).

The most important task is to systematically assemble data on comparable properties. The relevant characters to be looked for can be split into transaction and asset characteristics: Transaction Characteristics – Date of transaction, means of payment, transaction speed, etc. Asset Characteristics – Size, location, conditions, utility, building regulations,

business climate, etc. Ideally, a property should be inspected in person. But considering the paucity of time, property transaction databases are used. Once, all the data is gathered, the next task is to draw informed conclusions. This is done by assigning weights to the properties. The ones closer to the property to be examined are given higher weights.Kummerow(2002) .

Important Considerations while comparing: When selecting properties that you consider comparable to your subject property, important considerations include: Statistically, sales far above or far below the bulk of the group are suspect. There likely are valid reasons for the divergence. Comparable properties should be from the subject property's area or as close as possible. Sold comparables should not be too old and should be in the current time frame as far as possible. Similar construction types should be used, Kummerow(2002).

Adjustment of Value for Property Differences: When comparing similar properties, there will always be differences. Property's value estimate should be adjusted for its differences from the comparable properties: Add or subtract value for difference in lot or acreage size. Feature differences, such as bedrooms, baths, garage, etc should also be considered. Financing differences could have also influenced the sale price.

This method is easy and straight forward. It has thus become the practice in residential housing market and it could lead to an objective valuation being placed on the property if an objective model is applied. In most countries this approach is applied without proper adjustment for differences. However, sometimes it becomes difficult to locate enough

similar property transactions to draw meaningful conclusions. Market value and price might differ due to unreasonable actions by others. This technique makes no reference to intrinsic value. If a property's price is reasonable on a comparable basis, it does not necessarily follow that this is a reasonable buying or selling price for an individual, Kummerow (2002).

2.2.2.4. Automated Valuation Models

Automated valuation models (AVMs) are growing in acceptance in developed countries. These rely on statistical models such as multiple regression analysis and geographic information systems (GIS). While AVMs can be quite accurate, particularly when used in a very homogeneous area, there is also evidence that AVMs are not accurate in other instances such as when they are used in rural areas, or when the appraised property does not conform well to the neighborhood. Extreme caution should be exercised when relying on AVMs, especially if the user is unfamiliar with modeling and the mathematics. The strengths of AVMs relative to traditional real estate appraisals are speed, reduced costs, consistency, and objectivity. An AVM can significantly reduce the time it takes to obtain an estimate of value and reduce the costs associated with the traditional property valuation, Kummerow(2002).

However, AVMs have three principal limitations. First, they are dependent upon the accuracy, comprehensiveness, and timeliness of the data they use. Data issues can include incomplete public records, insufficient sales of properties with comparable features within a specified geographic area, and a lag between the time when the market data are

current and the AVM uses the data to generate an estimate of value. Second, AVMs cannot be used to determine the physical condition and relative marketability of a property. Third, AVMs can never fully incorporate the breadth of knowledge and judgment of a skilled appraiser. Consequently, AVMs tend to work best in circumstances when there is a relative abundance of current data, when properties in a given area are relatively homogenous, and when a property's condition and marketability are relatively typical for the area. They work less well when data are thin, in heterogeneous neighborhoods, and for properties that differ markedly from the average property condition or marketability, Kummerow,(2002).

2.2.3. Pricing and Performance of New Residential Properties

In line with this exploration of rational expectations pricing, this project examines the pricing of residential property assets at their first sale. No previous research has considered this area of residential real estate pricing in Kenya, although similarities with the information asymmetry explanations for equity initial public offering (IPO) underpricing are identified.

2.3. General Issues in Literature Review

2.3.1. Residential Real Estate and the Macro economy

This section discusses the findings of research that has sought to identify the relationship between the economy and the residential real estate market. The key channel identified in the literature is the effect house prices have on consumption patterns. This in turn is used

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as a premise to explain the relationship between housing market activity, the business cycle and interest rates.

House prices and the economy are related through many channels. In many cases this relationship is endogenous; changes to the state of the housing market, for example, have an effect on the economy, and vice versa. The channels by which housing and the economy are related may be direct or indirect, and the consequences may be positively or negatively correlated. However, these channels and their specific working are far from understood, Iacoviello(2005). The interconnectivity of housing markets and the economy is further amplified through its effect on government revenues, production and investment activity, and wealth effects.

2.3.2. Residential Real Estate Market Weak-Form Efficiency

Disagreement exists in the conclusions of past research which has tested for weak form efficiency in residential real estate markets. The seminal work undertaken in the United States (USA) by Case and Shiller (1989) indicates that a significant degree of predictability exists in the returns to residential real estate. This conclusion, made using repeat-sales methods, violates the efficient markets hypothesis. More recent research however, such as Rosenthal (2006), has used hedonic-regression approaches and demonstrated that weak-form efficiency holds in housing returns. No study has previously considered the impact of methodology on the results of such research in Kenya.

2.3.3. The Effect of Sales Method on Prices

The Kenyan residential real estate market presents a unique opportunity to study the impact of market structure on prices. given the coexistence of multiple sale methods: auctions and private treaty sales. Taking a rational expectations perspective, property price should be unrelated to the sale method. That is, if a price premium to auctions persisted. relative to private treaty sales, then private treaty sales would disappear. as all sellers would choose to auction their properties. and vice versa. Wrights(2010).

Yet the consensus finding of previous research into the residential real estate market design is that a systematic price impact results from the use of auctions. Some researchers have found a price discount for auction sales, Allen and Swisher(2000); and Mayer(1998), both in the USA) based on the argument that the auction mechanism is typically used for disposal sales following defaults on financing. Other research has observed a price premium for auction sales Dotzour(1998), in New Zealand; Lusht. (1996); and Newell et al., (1993), in Australia). An issue in the comparability of the results of these studies is that they have all relied on different models. Mayer (1998). for example, uses a repeat-sales approach while Dotzour,(1998) estimate a hedonic-regression.

2.3.4. Residential Real Estate Investments Trusts Market

The recent innovation of REITs products in the Securities Exchange market motivates many new research questions – one of which is how informationally efficient the housing

market is, and what value can be put on public and private information. Traditionally, residential real estate information is difficult and costly to obtain, and rarely timely. This is a result of the highly disaggregated market, and of privacy laws which restrict public access to residential real estate sales information. Whereas in the direct investment market, real estate transactions typically require weeks to conclude, derivatives markets for housing may offer higher-frequency trading, Makathimo(2010).

2.3.4. Objective Valuation Algorithm

Kummerow (2002), further proposes the following objective valuation algorithm as an attempt to set out an algorithm or protocol for producing an objective valuation from a set of sales data.

2.3.4.1. Define a submarket

This process is subjective, but we can iterate back and redefine the submarket if the end result—the valuations—fail to predict prices well. Data should be recent sales from a defined geographical area, perhaps a few similar suburbs (Lusht & Pugh, 1986) or an area where properties are similar. Examples of "screens" for defining submarkets are 3 bedrooms, 2 bath homes industrial buildings 10-20 years old, size between 2000-5000 m2, and truss height at least 5 meters class A CBD office buildings between 10000 and 30000 m2 , homes in the Ksh 300,000-Ksh 400,000 price range. The subject property should be near the midpoint of the submarket. In the above examples it should be located in the heart of the geographical area chosen, in a typical area, it should be a 3x2 home, or a 3500 m^2 industrial building, a 20,000 m^2 class A office, or a Ksh 350,000 home respectively. As many comparable sales in the submarket chosen should be "above" as "below" the subject.

2.3.4.2. "Clean" the Data

This is meant to eliminate obvious mistakes and outliers, taking care not to bias the data. If the top price in the data set is eliminated, also discard the bottom price, to maintain the balance on each side of the subject property. A sample of 30 to 300 (more or less) sales should be chosen from the submarket, again editing out sales in an even handed fashion to "bracket" the subject property into the middle of the sample.

2.3.4.3. Inventory Points of Difference

This process enables the person pricing the asset to structure the model that explains the relationship between subject and sales. It explains why do prices vary in the sample and what kind of price differences model would be adequate to capture (explain) most of the price differences. This exercise almost certainly requires property inspections and market knowledge gained through discussions with agents, buyers and sellers and experience. Many locational factors, for example, are only noticed by going to the site and looking around. Points of difference like access, views, condition, appeal of the design, and spatial relationships with other surrounding properties, etc. are not usually identified without inspections.

2.3.4.3. Model Price Differences

This requires us to select a short list of the most important points of difference (in terms of effects on values) and estimate their effects by means of graphs, summary statistics, regression estimates or other techniques. If subjective estimates are the only way to come up with a number, write down the number and some justification for it. This is not a model of prices, but rather of price differences—hopefully the main factors influencing prices (neighbourhood, property size, etc.) do not vary in this relatively uniform submarket. What

we are after is the remaining few issues that explain the variation within a fairly uniform subset of sales.

2.3.4.4. Adjust the Sales in the Submarket

A standard used in the U.S. is that a property can be used as a comparable sale if the total absolute value of adjustments is not more than 25% of the sale price and the net adjustments (sum of positive and negative adjustments) is not more than 15% of the sale price. These screens can be tightened or loosened to reflect available data. Discard any outliers or sales that differ in important respects from the subject property, taking care not to retain a biased sample. From 5 to 10 comparables should remain after this second screening.

2.3.4.5. Value Each of the Comparables

That is, if there are ten properties, do nine valuations of each property, using from 1 to 9 comparables in each case. This will give a total of 90 valuations for which the actual prices are known. Calculate prediction errors for all of these valuations and look at the distribution of errors histogram. Calculate the valuation/sale price ratio and coefficient of dispersion. Calculate summary statistics of the prediction errors. Graph or tabulate how prediction errors vary with sample size. This will allow you to choose an error minimising sample size to use in valuing the presumably similar subject property. While this may sound too time consuming for practical implementation, in fact, these multiple valuations can be implemented in a few seconds using the speed of a computer and Excel macros or other programs to perform repetitive calculations. Within a few years it will probably be possible to buy programs to do all this with only the data and a few input assumptions entered by the valuer.

2.3.4.6. Value the Subject Property

So if there are 10 comparables, you will value the subject 10 times. Choose as your preferred value estimate the one from the sample size that showed minimum error in the tests in the previous step, but report all ten indicated values to demonstrate to the client the stability or instability of the estimate. Report an estimate of the variation in the price expectation estimate, based on the variation in the indicated valuates from the different comparables and the errors found in step 6 above. Report the variation to the client.

2.3.4.7. Iterate to Improve the Price Prediction Test

Iterate, modifying any step above and repeating the process to see if the sample or model of price differences can be improved with respect to the price prediction test in step 6 and whether model and price estimates are robust across changes in samples of sales and in different price differences models. Generate statistics on model performance—valuation to price ratios and coefficient of dispersion. These are measures of valuation bias and precision.

2.3.4.8. List all the Discarded Sales

In an appendix list all sales discarded and reasons for not using them as comparables, the rationale for choice of submarket, the price differences model and how it was estimated. This is necessary to help keep valuers honest. Other issues might be added. Before we come to the above steps, we need a protocol for data collection that deals with selection of relevant variables and measurement of their values for a set of properties.

If we select the wrong sample of sales, we will obtain biased results since responses differ in different parts of the sample space. This poses a circular reference or chicken and egg problem. We need a sample to get the right model and the model to get the right sample. If the model predicts poorly, the problem could be with either the sample or the model, so iteration, repeating the above steps might be necessary, modifying the data and/or the model. In the messy world of real estate, everything becomes data dependent with responses to hedonic models varying between samples and salient variables differing between samples. Pricing models as well as parameter estimates vary as the sample changes.

2.4. Empirical Review

A "hot topic" in academic empirical work on valuation is spatial statistics, where "spatial" means geographical space or alternatively "near neighbours" in hedonic characteristics space. Isakson (2001) proposed a way of calculating distances in multi-dimensional characteristics space to identify "near neighbours." Dilmore, Graaskamp and Robbins had earlier developed a method for calculating distances (in multivariate hedonic characteristics space) and identify best comparable sales.

Watkins and others, (1999), have shown that estimating prices for submarkets is more accurate than using larger aggregations of sales. The sales comparison approach of Colwell, Cannaday & Wu(1983) provides a rationale for even more disaggregation. Kummerow and Galfalvy's (2002), error trade-offs story suggests disaggregating to a few comparable sales, as is customary in valuation practice.

Pace, Sirmans & Slawson (2002) begin an article by remarking that "statistically challenged" practitioners usually produce more accurate valuations than those of learned professors who use high-powered econometrics. Pace, Sirmans & Slawson (2002), therefore proceed by using a "grid estimator" quite similar to sales comparison as practiced by valuers. The Colwell, Cannaday & Wu(1983) "trick" of using the price of a comparable sale as a proxy for an unknown complex, unidentifiable pricing model is beginning to be recognised by academic researchers as a more accurate method than regression when data are heterogeneous. Using "distance in hedonic characteristics space" as the comparable sale selection criterion is an objective way of selecting comparable sales.

Kuo (1996), using the same quarterly index data as Case and Shiller (1989), replicates their partitioned sample regression method, and compares the results to those obtained from a Bayesian model that treats the partitioned indices as random variables, since, depending on how the data are partitioned, the results are random variables in themselves. His results show weak evidence of a superior month in Chicago using both nominal and inflation-adjusted returns in the Bayesian model, and inconclusive support for seasonality in the other cities considered.

Rosenthal (2006) in the UK, and Rossini (2000, 2002) and Costello (2001) in Adelaide and Perth, respectively, use alternatives to the repeat-sales method of Case and Shiller (1987) to estimate house price indices from which they test for market seasonality. Costello (2001) and Rosenthal (2006) use hedonic index estimation techniques. Hedonic methods use regression analysis to statistically control for differences in the quality and

attributes of the traded housing stock, extracting constant-quality estimates of market-wide price changes. By contrast, Rossini (2000, 2002) uses a stratified index estimation methodology which measures median-price movements from partitions of the sales sample in an attempt to overcome.

The effect of omitted variable bias is examined empirically in Mayer (1998), where the auction-price effect is tested using a hedonic regression and a repeat-sales based method. Mayer (1998) argues that by considering the same property through time, this method avoids the issue of unobserved quality and demanding data requirements of previous research that has relied on hedonic regressions.

Mayer's (1998) data consists of condominium sales in Los Angeles for the period 1970 to 1991 and both condominium and house sales in Dallas covering 1979 to 1991. It is found that the auction mechanism has no statistically significant price effect in the Los Angeles market, where the attributes between the two subsamples are relatively constant. There is a much higher variation in the quality of properties between the two subsamples in Dallas, however, which presents some interesting results. From the repeat-sales regression, Mayer (1998) estimates a discount of 24% to auctions in Dallas, justifying this result as a reflection of the prevailing 'bust' market conditions. This discount is estimated at 37% using the hedonic method, significantly larger than the repeat-sales based estimate, and biased in line with the less desirable attributes of auctioned properties in this market. A major limitation to traditional repeat-sales measures is that depreciation is not accounted for. Mayer (1998) acknowledges this, specifying a dummy variable for 'newness' in his model.

Geltner (1997) argues that smoothing bias – the result of aggregating data over time, which biases second-order moments towards zero – is particularly acute in repeat sales based indices. This is because the incorporation of current transactions data are not included in the index estimation unless and until it is a trade pair. That is, the index can never be entirely contemporaneous and temporal aggregation is likely to be exaggerated in this index. As Campbell, Lo, and MacKinlay (1997) econometrically demonstrate. The following hypothesis is designed to test for the presence of smoothing bias and its effect in tests of weak-form market efficiency that use the returns from repeat-sales indices.

Kaberere(2000), argues that, in Kenya comparable sales data may not always be reliable and the question of how comparable the comparables are arises. The comparables hardly have adequate information on the determinants of value. The readily available relevant information is the area of land, tenure and term of the leasehold interest, date of sale and declared selling price. Information on nature of sale, improvements, incomes generated, actual property location, soils etc is not readily available. Unless one inspects each and every comparable or can get in touch with the seller/buyer or the estate agent involved, one may never get to know these relevant details. The task of collecting adequate comparables can be immense and a bottleneck to even the most experienced valuer who has not practised for long in a certain part of the country. Incomplete data set is one of the hindrances of the usage in Kenya of mass appraisal techniques such as multiple regression analysis.

2.5. Summary

Further to the above theoretical and empirical review, it is evident that heterogeneous assets pricing is surrounded by uncertainty and errors. Valuers create approximate estimates by art and subjective evaluation as well as measuring values through analysis of objective price evidence. Max Weber argues that subjective opinions and "gut feel" could very well produce better value estimates than "scientific, objective" statistical procedures based on flawed data and misspecified models. Choices have to be made even in "objective" methods.

So the two basic valuation methods in my opinion are: a) Science, b) Art. In the former, the valuer reasons from evidence using quantitative methods. In the latter the valuer creates a value by subjective opinion based on experience—an educated guess. Modern societies are dedicated to rationality rather than superstition.

We need to start with data and go as far as possible with data, but no farther. Pretending to get a precise quantitative answer from a quantitative method that is flawed is just another form of superstition. Once the data have told us all they have to say, we may need to rely on subjective opinion or "experience" to fill in the holes in the story. "Let the data speak," an econometrician joked, but then "tell the data to shut up." Appreciating therefore, the above inconclusiveness, then, the researcher found the need to explore the Kenyan cas4e, particularly on residential real estate market, with a view to proposing how to deal with subjectivity behind the pricing of the heterogeneous assets.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1. Introduction

The chapter deals with the methodologies that were used in sample design, data collection and data analysis. Section 3.2 presents the research design employed in collection and analysis of data. Section 3.3 deals with the population which formed the basis of the study while section 3.4 deals with the sample and the sampling procedure. Section 3.5 deals with the methodology employed in data collection while section 3.6 deals with the tools and procedure employed in data analysis.

3.2. Research Design

This research employed a qualitative research design as well as a qualitative research design. The researcher specifically used case study design to concentrate on the selected properties. The data collected was then analyzed using non experimental research designs, specifically relational, comparative and longitudinal designs. A flexible (qualitative) research design was used and specifically case study design to concentrate on a small region within the Kenyan residential estate. Specifically, the researcher studied residential properties in Nairobi County so as to optimize the error trade off and minimize total mean square error (MSE). Bell (1999) states "a case study approach is particularly appropriate for individual researchers because it gives an opportunity for one aspect of a problem to be studied in some depth within a limited time scale".

Under the non experimental research designs, relational designs (correlational) will be used, in which a range of variables will be measured and correlational data used for analysis. Comparative research designs will be used to compare two or more groups on one or more variable, such as the effect of hedonic attributes on heterogeneous real estate assets. A longitudinal design will be used to examine variables such as performance exhibited by a group or groups over time.

3.3. Population

The total population was residential real estate assets in the whole of Nairobi County in Kenya. Residential real estate market in Kenya is a large market made of many submarkets and Nairobi town was the target submarket in this research and thus the population.

3.4. Sample and Sampling Procedure

The total number of residential assets in Nairobi County is unknown. Further this research was interested in residential properties which had been valued in the year 2012, and therefore selection was be done from the valuation firms in Nairobi. Five firms were selected randomly and requested to forward to the researcher ten valuations each to be selected randomly. Judgmental sampling techniques were adopted to choose the five firms and fifty residential real estate properties from Nairobi County. Due to the complex nature of analysis required, the researcher subjectively decided that the sample was adequate for analysis purposes.

3.5. Data Collection

The main source of data was real estate pricing secondary data simply because the project required a lot of financial data which has accumulated over time. The secondary data was mostly used to achieve the first objective which was to test the applicability of the heterogeneous asset pricing model in the Kenyan residential real estate. The researcher collected primary data through questionnaires, mainly from professionals in real estate including Valuers, surveyors, government officers in the ministry of lands and real estate market participants. This was necessary to test the second objective especially on how real estate valuers are dealing with psychological biases in pricing of real estate assets. Secondary data on pricing of residential real estate assets was obtained from valuation firms and government databases. Generally, data was collected through questionnaires, interview, (structured or, loosely structured) observation, analysis of secondary data and other unobtrusive methods.

3.6. Data Analysis

The method for data analysis was based on the tool using to collect it, whether it was quantitative or qualitative and the objective it is intended to achieve. The backbone objective of this research was to test applicability of heterogeneous asset pricing model in the residential real estate. The researcher borrowed the heterogeneous assets pricing model which is used by American valuers to price the real estate assets, Colwell, Cannaday & Wu, (1983). The model is stated as "Psubject(t)=Pcomparable(t-1)+differences". This means that one takes two properties, property A, which has sold in the past at arm's length transaction and its price is known and property B, which the price

is unknown. The property A, is the "comparable" in the equation, while property B is the "subject".

The objective is to identify the differences between A and B and adjust the price of the known property, A, either downwards for inferior characteristics or upwards for superior characteristics. The resultant is the price of the unknown property; B. "Differences" means the price implications, positive or negative, of the differences in hedonic characteristics between the properties while "t-1" is adjustment for time value of money. Modelling price differences due to differing characteristics stems from Kevin Lancaster's notion that utility and the price people pay for complex commodities like housing or automobiles is a sum of the utility of various characteristics (Lancaster, 1966, Rosen, 1974).

Data analysis to test the heterogeneous asset pricing model therefore involved collecting valuations which have been done in the past or identifying properties which have been sold in the past and sampling them. The researcher then chose the sales which are best to use to infer price of a particular property, identifying price-affecting characteristics that differ between sales and subject property, estimating the dollar value of these differences for each pair-wise comparison of subject and sale, "Reconciling" to give a single price estimate, where indicated values of the subject from different adjusted comparable sales are not identical (the usual outcome).

For analysis of open-ended a computer programme called Statistical for Social Sciences (SPSS) was used. Data was analysed by using descriptive statistics. The open-ended questions were analysed through qualitative content analysis by the researcher with the aim of quantifying emerging characteristics and concepts. The concept analysis is the process of analysis verbal or written communications in a systematic way to measure variables quantitatively. The above was administered to Valuers, real estate specialists and generally market participants. Our main source of secondary data was analysis of literature available for further collection of data. The data collected both qualitative and quantitative was analyzed using charts and graphs to help in visualizing the trend over the years.

CHAPTER FOUR

DATA ANALYSIS, FINDINGS AND DISCUSSION

4.1 Introduction

This chapter deals with analysis and evaluation of the data which was collected by the researcher. The initial sections show what was found out with initial interpretations followed by in-depth analysis and discussions. Section 4.2 discusses the data analysis procedure, presenting how the researcher collected, cleaned and organized the data before analyzing it. Section 4.3 tests the applicability of heterogeneous asset pricing model in Kenyan residential real estate market while section 4.4 discusses limitations to traditional approaches to valuation. Section 4.5 discusses the pricing of new residential properties with a view to bring out the anomalies while section 4.6 discusses the pricing of real estate assets in NSE and the impact of price anomalies in the NSE with special attention to the newly introduced REITs. This chapter at the tail end looks at the impact of behavioural finance and in particular heuristic biases in pricing of heterogeneous real estate assets.

4.2 Data Analysis Procedure

The aim of the data collection is to answer the research questions and meet the objectives of the research project. In view of the above, this research had three steps in data analysis. First, to test the applicability of heterogeneous asset pricing model in the residential real estate in Kenya, secondary data which included the properties sold in the

past and their prices was collected and a sample taken from 142 properties to a sample of 50 valuations as had indicated in the research methodology chapter. First, data was cleansed and organized. This means that the data was logged as it was collected, checked for accuracy and organized into a form that it could be used for analysis. Once the data was ready the heterogeneous asset pricing model was tested as explained in data analysis part in chapter three of research methodology.

Secondly, to analyse the second objective on the effect of psychological bias on pricing of heterogeneous assets in residential real estate market in Kenya, the researcher analysed qualitative data collected mainly through questionnaires. 50 questionnaires were administered to target group mainly the real estate professionals including valuers, quantity surveyors and architects. The objective of the questionnaire was to undertake exploratory studies and find out what is happening; seek new insights; ask questions and to assess phenomena in a new light. This was particularly useful as the researcher sought to clarify the understanding of a problem, namely how heterogeneous asset pricing model can cure the deficiencies of the current pricing of the heterogeneous residential real estate assets.

The research sought to address three basic issues through the questionnaire: causal (to determine whether a variable causes or affects another), relational (to look at the relationships between two or more variables), or descriptive (to describe what is going on or what exists). In order to clearly establish relationships, the results were first entered into a computer and data collected from interviews was transcribed. Secondly, data was described and summarized in its simplest form either through descriptive statistics or the

emerging patterns in interviews. Comparable sales for analysis were chosen that result in the smallest errors in predicting the price of the subject property. To minimize adjustment errors, the researcher picked sales that either have very small adjustments so even a big error in the adjustment would not make much difference or, if adjustments are large, to use sales where the amount of the adjustment can be estimated precisely. Finally, the researcher went further and suggested and classified significant findings so as to test the hypothesis.

4.3 The Applicability of Heterogeneous Asset Pricing Model in Kenyan Residential Real Estate Market

4.3.1 The Building of Heterogeneous Asset Pricing Model

The researcher was tasked by the first objective to test the applicability of the heterogeneous asset pricing model in the residential real estate pricing. The researcher sampled 50 residential properties to assess but due to the limit of the research project, only two properties were selected to appear in the project paper. The intention was to undertake a reassessment using heterogeneous asset pricing model.

The researcher borrowed the heterogeneous assets pricing model which is used by American valuers to price the real estate assets, Colwell, Cannaday & Wu, (1983). The model is stated as "Psubject(t)=Pcomparable(t-1)+differences". This means that one takes two properties, property A, which has sold in the past at arm's length transaction and its

price is known and property B, which the price is unknown. The property A, is the "comparable" in the equation, while property B is the "subject".

The objective is to identify the differences between A and B and adjust the price of the known property, A, either downwards for inferior characteristics or upwards for superior characteristics. The resultant is the price of the unknown property; B. "Differences" means the price implications, positive or negative, of the differences in hedonic characteristics between the properties while "t-1" is adjustment for time value of money.

4.3.2 The Test of Applicability of the Heterogeneous Asset Pricing Model

For the purposes of comparison and a test of the first hypothesis, the researcher found it imperative to analyze and evaluate the pricing of the sampled properties using the three traditional approaches i.e. cost, income and comparables approaches.

Due to limitation of space, the researcher decided to discuss two cases out of the 50 that were sampled. These were identified as Oak apartments along Mombasa road and Elgeyo gardens in Kilimani estate. The following schedule shows the pricing of Oak apartments using the three traditional methods, cost, income and comparables approaches.

Table 4.1: Pricing of Oak Apartments using The Traditional Approaches

Oak Park Valuation Workings			
Method of Pricing	**Area in Square**	**Price per Square**	
(a) Construction Cost Approach	**Foot**	**Foot**	**Price in Kshs.**
	sq ft	Kshs.	Kshs
Total Built up area	560	2,000.00	1,120,000.00
Plot	say		600,000.00
Site Works	say		100,000.00
Total			1,820,000.00
Valuation Say			**1,800,000.00**
(b) Comparables Approach			
Subject Properties selling at 6.0M			6,000,000.00
(c) Income Capitalization Approach			
Annual net Rent			360,000.00
YP @ 11.5			4,140,000.00
Valuation Say			**4,200,000.00**
Let us adopt	**6,000,000.00**		**6,000,000.00**

Source: Research Findings (2012).

As shown above, the three traditional approaches, the price of the heterogeneous asset as computed above is Kshs. 1,800,000.00 from cost approach, Kshs. 6,000,000.00 from comparables sales approach and Kshs. 4,200,000.00 for income approach. The cost approach was based on depreciated replacement cost of improvements, comparable sales is the sale price of comparable properties in the immediate neighbourhood while income

approach is based on discounted future cashflows from the property either real or notional.

After evaluating the methods used in the example above, the researcher then sought to test the heterogeneous asset pricing model in pricing of the same residential assets that had been priced using the traditional approaches to valuation. The main difference is that, use of the model recognizes that the price difference between the comparable and the property in question should be a sum of value of the differences in characteristics.

The variables to be considered are; date of sale/time. Location, Leasehold/fee simple .Site/view, design and appeal, quality of construction, age, Condition, above-grade room count/gross living area. basement and finished rooms below grade, functional utility, heating/cooling, energy-efficient items. garage/carport, porch, patio, deck, fireplace(s) and Fence. pool. Once the variables are identified, each variable is valued either in units or percentage change. It is this value of the variables or price differences which is either deducted or added to the price of the known property depending on whether the variable is superior or inferior to the subject property. to arrive at indicative price of the heterogeneous asset.

The table below shows the test of heterogeneous asset pricing model of Oak apartment in the residential real estate market in Kenya.

Table 4.2: Pricing of Oak Apartments using Heterogeneous Asset Pricing Model

TEST FOR APPLICABILITY OF HETEROGENEOUS ASSET PRICING MODEL										
UNIFORM RESIDENTIAL APPRAISAL REPORT										
FEATURE	SUBJECT PROPERTY									
Address	OAK APARTMENTS LR NO 27600 (UNIT D7)									
Proximity to subject(kms)	11.5 KMS									
		COMPARABLE SALE 1			COMPARABLE SALE 2			COMPARABLE SALE 3		
NAME	SUNRISE APARTMENTS LR. NO 209/17508				EASY PRESTIGE			PARK VIEW APARTMENTS		
Price		6 Million			6.5 Million			9 Million		
			Adjust in %			Adjust in %			Adjust in %	
Value Adjustments		Description	(+)	(-)	Description	(+)	(-)	Description	(+)	(-)
Sale or Financing Concessions		0	0	0						
Date of Sale/Time		SAME			SAME			SAME		
Location		SAME					2%			2%
Leasehold/Fee Simple		SAME			SAME			SAME		
Site			2%		SAME			SAME		
View			2%			2%				2%
Design(Style) & Appeal			3%				3%			5%
Quality of Construction			1%				1%			2%
Actual Age		SAME					1%			1%
Condition			2%				1%			3%
Room Count				1%	SAME			SAME		
Gross Living Area		SAME			SAME			SAME		
Basement & Finished		N/A			N/A			N/A		
Functional Utility		SAME			SAME			SAME		
Heating/Cooling		SAME			SAME			SAME		
Energy Efficient Items		SAME			SAME			SAME		
Garage/Carport		2 CARPORTS			SAME			SAME		
Extra Amenities		SAME				1%			1%	
Porch/Patio/Deck		SAME			SAME			SAME		
Growth/Prospect		SAME				2%				5%
Net Adjustment (Total)			9%				-3%			19%
Adjusted Sale Price		1.09 X 6 MILLION	6.54 Million		0.97 X 6.5 Million	6.3 Million		0.81 X 8.5 Million	6.885 Million	
Indicated Value of Subject Property		6.5 Million			6.3 Million			6.9 Million		

Source: Research Findings, 2012.

The table above shows the residential asset to be priced i.e. Oak Apartments and the residential assets whose prices are known i.e Sunrise apartments, Easy Prestige and Park View apartments). The model as explained is stated as "Psubject(t)=Pcomparable(t-1)+differences. The idea is to take the prices of the known properties and adjust for time value of money and the

value of the differences. The adjustments are made in percentages for variables which are not similar. The effective change for comparable 1 is 9% , comparable 2 is (-3%) while comparable 3 is (-19%). The indicated prices of the subject property when the comparables are adjusted for price differences is Kshs. 6.5 million, Kshs. 6.3 million and Kshs. 6.9 million for comparable 1, 2 and 3 respectively.

Table 4.3: Final Computation of the Price of Oak Apartments from the Adjusted Prices

Price of Subject Asset = Current Price of the Comparable + Effective Value of Differences			
Name of Comparable	Price of Comparable in Kshs	Effective Value of Differences in percentage	Price of Subject in Kshs
Sunrise	6,000,000.00	Positive 9%	6,500,000.00
Prestige	6,500,000.00	Negative 3%	6,300,000.00
Park View	8,500,000.00	Negative 19%	6,900,000.00
Average price of the heterogeneous asset being priced (Oak apartments)			6,566,666.66

Source: Research Findings, 2012.

The table above shows the average of adjusted prices giving an indicated price of Kshs. 6,566,666.66 for the subject property.

In the case of Elgeyo gardens, the researcher after analyzing the property using the three traditional methods reported prices of Kshs. 8,120,000.00, Kshs. 9,500,000.00 and Kshs.

17,000,000.00 for cost, income and comparable sales approaches respectively. The cost approach was based on depreciated replacement cost of improvements, comparable sales is the sale price of comparable properties in the immediate neighbourhood while income approach is based on discounted future cash flows from the property either real or notional.

Table 4.4: Pricing of Elgeyo Apartments using The Traditional Approaches

ELGEYO GARDENS						
Workings						
(a) Construction Cost Approach						
Area	sq ft		M2	Rate/FT2	Rate/M2	Price(M2)
		2184.28	203	3717.472119	40000	8120000
	Land					
(b) Income Capitalisation Approach						
Annual Gross Rent						840,000.00
less outgoings @ 10%						84,000.00
Net Rent						756,000.00
YP @ 8%				12.5		9,450,000.00
Valuation Say						**9,500,000.00**
(c) Comparable Sales Approach						**17,000,000.00**
Note However, that we relied on comparables approach for the final figures						

Source: Research Findings, 2012.

After evaluating the methods used in the example above, the researcher then sought to test the heterogeneous asset pricing model in pricing of the same residential assets that

had been priced using the traditional approaches to valuation. The comparables to be considered are the same attributes as the above analysis for Oak apartments.

Table 4.5: Pricing of Elgeyo Apartments using Heterogeneous Asset Pricing Model

TEST FOR APPLICABILITY OF HETEROGENEOUS ASSET PRICING MODEL										
UNIFORM RESIDENTIAL APPRAISAL REPORT										
FEATURE	SUBJECT PROPERTY									
Address	L.R. No. 2/294, Apartment A4, Elgeyo Gardens.									
Proximity to subject(kms)										
		COMPARABLE SALE 1			COMPARABLE SALE 2			COMPARABLE SALE 3		
NAME	L.R. NO. 2/699 -PRIT LANE 2 APARTMENTS				L.R. No. 2/244 Bamboo Spring Apartments			L. R. NO. 2/267, RIARA APTS		
Price	16.5 Million				15 Million			15 Million		
			Adjust in %			Adjust in %			Adjust in %	
Value Adjustments		Description	(+)	(-)	Description	(+)	(-)	Description	(+)	(-)
Sale or Financing Concessions		0	0	0		0	0		0	0
Date of Sale/Time		SAME			SAME			SAME		
Location				2%			2%			1%
Leasehold/Fee Simple		SAME			SAME			SAME		
Site				2%	SAME		5%			1%
View				1%			2%			1%
Design(Style) & Appeal				2%			2%			1%
Quality of Construction				0%			0%			0%
Actual Age		SAME		0	SAME		0%			2%
Condition				0%			0%			1%
Room Count		SAME					2%			10%
Gross Living Area		SAME					2%			2%
Basement & Finished		N/A			N/A			N/A		
Functional Utility		SAME			SAME		1%			1%
Heating/Cooling		SAME			SAME			SAME		
Energy Efficient Items		SAME			SAME			SAME		
Garage/Carport		SAME			SAME			SAME		
Extra Amenities		SAME					1%			1%
Porch/Patio/Deck		SAME			SAME			SAME		
Growth Prospect	-	SAME		-		-	1%	SAME		-
Net Adjustment (Total)				7%			18%			21%
Adjusted Sale Price		1.07 X 16.5 MILLION	17.65 Million		1.18 X 15 Million	17.7Million		1.21 X 15Million	18.15 Million	
Indicated Value of Subject Property		17.65 Million			17.7Million			18.15 Million		

Source: Research Findings, 2012.

The variables to be considered are: date of sale/time, Location, Leasehold/fee simple .Site/view, design and appeal, quality of construction, age, Condition, above-grade room count/gross living area, basement and finished rooms below grade, functional utility, heating/cooling, energy-efficient items, garage/carport, porch, patio, deck, fireplace(s) and Fence, pool. Once the variables are identified, each variable is valued either in units or percentage change. It is this value of the variables or price differences which is either deducted or added to the price of the known property depending on whether the variable is superior or inferior to the subject property, to arrive at indicative price of the heterogeneous asset.

The table above shows the residential asset to be priced i.e. Elgeyo Apartments and the residential assets whose prices are known i.e Prit Lane 2 apartments, Bamboo Spring Apartments and Riara apartments. The model as explained is stated as "Psubject(t)=Pcomparable(t-1)+differences. The idea is to take the prices of the known properties and adjust for time value of money and the value of the differences. The adjustments are made in percentages for variables which are not similar. The effective change for comparable 1 is 7%, comparable 2 is 18% while comparable 3 is 21%. The indicated prices of the subject property when the comparables are adjusted for price differences is Kshs. 17.65 million, Kshs. 17.7 million and Kshs. 18.15 million for comparable 1, 2 and 3 respectively.

Table 4.6: Final Computation of the Price of Elgeyo Apartments from the Adjusted Prices

Price of Subject Asset = Current Price of the Comparable + Effective Value of Differences			
Name of Comparable	Price of Comparable in Kshs	Effective Value of Differences in percentage	Price of Subject in Kshs
Prit Lane 2	16,500,000.00	Positive 7%	17,650,000.00
Bamboo Spring	15,000,000.00	Positive 18%	17,700,000.00
Riara	15,000,000.00	Positive 21%	18,150,000.00
Average price of the heterogeneous asset being priced (Elgeyo apartment)			17,833,333.33

Source: Research Findings, 2012.

The table above shows the average of adjusted prices giving an indicated price of Kshs. 17.833.333.33 for the subject property. In conclusion, it was the researcher observed that the prices of residential real estate assets using the heterogeneous asset pricing model reduces the deviation from the mean as compared to the three traditional approaches which has a high deviation from the mean especially where the properties are geographically scattered.

The researcher also reviewed secondary information from global content on the applicability of heterogeneous pricing model in residential real estate market. Kummerow

(2002), argues in his paper on alternative ways of pricing real estate assets, that valuers can also value the differences in dollars, then, adjust the price of the comparable with the sum of the value of differences. The value of price differences can also be estimated and substituted into the heterogeneous pricing model Ps= Po + Σai(Xsi-Xoi). In this case, the buyer purchases a bundle of characteristics. The value of these characteristics is the price of a recent sale of a neighbouring property plus or minus the value of hedonic characteristic differences.

Here, the price of a subject property, Ps, is inferred from a transaction price of a similar property, Po, "adjusted" for hedonic characteristics differences where Xsi – Xoi is the difference between two similar properties in amount of the characteristic and ai are pricing weights or reveal preference market responses (i.e. price differences) due to these differences in characteristics. For instance, if b for square feet of floor area is Ksh. 1000, then in an example, for two houses with 2500 and 3000 square feet of floor area would be, Ps = 3,000,000 + 1000 x (2500-3000) = Ksh. 2,500,000.00. Valuers estimate models of the dollar implications of differences between properties, inferring likely sale prices of a subject property from samples of comparable properties' observed prices adjusted to reflect differences between the sale and subject properties.

Valuers in Australia do not generally use explicit adjustments for particular property hedonic characteristics. Instead of the American adjustment grid they prefer to locate sales that are slightly superior and slightly inferior to "bracket" the subject property and then make an overall estimate of how much more or less the prices of the sales will be compared to the subject. While this may seem to be inferior to the more systematic and

transparent U.S. method, in fact this "gestalt" or overall pattern method works fairly well and has some advantages.

The valuer is not restricted to a set list of characteristics, so anything that matters can be considered. Differences are not constrained to any simple functional form and interaction effects can be considered. A weakness that because this overall comparison method relies so much on judgment, different valuers can and do come to different conclusions. It is hard to write down any convincing method whereby the valuer could prove his conclusions from the evidence. Vandell criticised practitioners' "ad hoc" methods that could "allow bias to enter."

The central idea is that instead of teaching based around three approaches to value we should base teaching on concepts of price distributions, pricing models and prediction error analysis. This grounds real estate valuation more firmly in modern economics and finance theory and statistical methods as they have developed in recent academic literature.

4.4 Interpretation of Findings

4.4.1. Limitations of the Traditional Approaches to Valuation

Generally, all respondents were of the opinion that the traditional three approaches used in Kenya i.e cost, income and comparables approach, were inadequate and highly subjective and there was need to rethink about modern approaches to valuation both at academic and industry level. Further, they recommended that valuation should be taught

as a science based on concepts of price distributions, pricing models and prediction error analysis.

Cost approach was viewed to have the weaknesses of depending on comparison approach to derive the value of land, subjectivity of construction rates used by valuers and problem of control of heterogeneity between the subject property and the comparables. Income approach has the problem of derivation of the Years Purchase, control of market rent by leases and other contractual agreements and the comparable approach is affected by composition biasness. It is dependent on intensive data requirements and the difficulty in control of heterogeneity.

The theory presented above leads to the conclusion that all valuations require reference to market transactions that reflect supply and demand conditions as well as buyers' and sellers' expectations of future benefits of ownership. However, valuation has traditionally been presented to students in the form of "three approaches to value," namely sales comparison, cost and income.

In summary, the respondents gave the following limitations and general concerns sales comparison can lead to mispricing, because current markets can be far out of equilibrium during bubbles or busts, recent transactions can paint too rosy or pessimistic a picture of longer-term outcomes. Current transactions may represent mispricing in the sense that a knowledgeable person would have good grounds to forecast future price increases or decreases. Current market prices of shares are found by the trivial exercise of consulting the financial pages of a newspaper, calling a broker, logging into a website or watching

TV news. The current price is not, therefore, the issue that financial analysts (the valuers of share market assets) consider. Instead they give their attention to a search for mis-priced assets and to forecasting future price movements.

The experts try to help their clients make money by offering expert advice about asset values over a future period. In property markets, oddly, experts leave most of this kind of thinking to the investors. Few people consult a valuer to ask them to find mis-priced property assets or to predict investment outcomes. But there is a trend for valuers to be asked for this more sophisticated advice (Appraisal Institute White Paper, 1999). Many clients may wish to better understand potential risk and return in making a real estate decision.

Cost does not equal market price very often, economic theory says in the long run, cost should be related to value. Something that takes a week to build should cost less than something that takes a year to build. Supply will adjust until price=cost at equilibrium. But property markets are seldom at equilibrium so, in general, cost does not equal price. Supply adjustments involve long time lags. If market prices are above equilibrium, there is a potential developer profit, which can be quite substantial. One Dollar of land plus one Dollar of building might equal 3 Dollars of market value. In a property bust, cost may be much greater than current prices.

In Perth's oversupplied market in 1994, new office buildings sold for as little as 1/3 of their cost. Supply and demand rule short-run prices. Sales transactions are necessary to reveal the current relationship of costs to prices. The tendency will be for markets to adjust towards equilibrium—if prices are above costs, then new supply will tend to be

created and prices will fall. If prices are below costs, construction will cease until demand increases or buildings are removed from the stock. But because adjustments are slow, at any given time, the market is likely to be out of equilibrium.

The income approach requires sales to find discount rates, finance theory reached consensus by the 1920s that the value of an asset depends on the discounted expected future benefits of ownership. Any finance textbook has a passage something like "the value of any asset should be a function of three variables: how much the asset generates in cash flows, when these cash flows are expected to occur, and what uncertainty is associated with these cash flows. Discounted cash flow valuation brings all three variables together by computing the value of any asset to be the present value of its expected future cash flows," Damodaran(2001).

This tool of DCF (discounted cash flow) analysis finds ready application in property markets because cash flows are often somewhat forecastable due to long term rental contracts or patterns in past rents and operating expenses in a particular market segment. Nevertheless, the discount rate emerges from market's assessments of the risks of projects and supply and demand for investment funds in the capital markets. Again, sales comparison is the fundamental tool used to value properties by the income approach. Discount rates are revealed by sales.

As noted above, it is odd that in property markets, valuers have been trained to avoid forecasting future prices (future cash flows), when in finance markets this is the key to analysts' evaluation of investments. Property valuers relegate themselves to the relatively unrewarding task of substituting for the stock price ticker or financial press. This passive

reporting of recent transactions, without opinions about whether the investment is properly priced or any bets about whether it is worth owning, in terms of future performance, adds less value than share market "valuations." As the property industry continues its integration with the wider capital markets, surely valuers will have to adopt the standard finance view of asset values and devote more attention to offering market analysis and going beyond providing mere current price estimates.

4.4.2. Pricing of New Residential Properties

Valuation of residential real estate assets has several challenges as indicated by the respondents. 80% of the respondents pointed out that developers and land selling agents fixed prices with minimum bargaining and valuers are called upon to advise on prices that have already agreed upon. For instance, one respondent argued that a valuer could not give an opinion different from what the apartments are selling for even if in his opinion the prices suggested by the developer are unreasonable. This is because his decisions are in most cases irrelevant since he is following prices instead of prices following the valuer.

4.4.3. Pricing of Residential Real Estate Assets in Nairobi Securities Exchange.

The forth schedule of the Real Estate Investments Trusts (REITs) being introduced in the Nairobi Securities Exchange indicates the general principles to be followed in the valuation of REITs. In particular, it states that at least two valuation methods in

accordance with the valuation standards published or adopted by the Institution of Surveyors of Kenya and the Valuers Registration Board. The schedule further indicates that the approaches to be used in pricing derivatives are income approach, cost approach and comparables approach.

A survey done in Nairobi Securities Exchange indicates that one of the major challenges anticipated in REITs market is the pricing of the assets. Out of 5 people whose opinion was sought by the researcher, 4 were of the opinion that the market is likely to have a weak form of efficiency and highly subjective pricing processes. One of the respondents said that although the schedule provides that the valuation report should set out the analytical process, data and information used to arrive at the valuation, the process has been historically subjective with different Valuers giving different prices for same residential real estate assets.

4.4.4. The Impact of Behavioural Factors on pricing of Residential Real Estate Assets

Traditional finance argues that markets are efficient, implying that the price of each security is an unbiased estimate of its intrinsic value. In contrast, behavioural finance contends that heuristic driven biases and errors, frame dependence and effects of emotions and social influence often lead to discrepancy between market price and fundamental value. The important heuristic driven biases observed in residential real estate market and cognitive errors are representativeness, overconfidence, anchoring, aversion to ambiguity and innumeracy.

Representative which is the tendency to form judgments based on stereotypes. Valuers indicated in the questionnaire and discussion that valuers based their opinion on subjective comparables without using an objective process to adjust for differences. For instance, a valuer would ask the price of a 2 bedrooms apartments in Kilimani and use that as the price of the subject residential real estate asset.

Respondents observed that people tend to be overconfident and hence overestimate the accuracy of their forecasts. Overconfidence stems partly from the illusion of knowledge. While responding to the impact of conservatism in valuation practice, valuers who were sampled and interviewed argued that experienced valuers often ignored current information in their analysis due to the influence of historical decisions. Pricing of real estate assets depends on strong form efficiency of information and the available information to an experienced valuer may not always be adequate to develop an accurate forecast in uncertain situations.

Valuers who are conservative were found to be unwilling to change their opinion on prices of residential real estate assets. In a survey done on a sample of young valuers, 83% complained that their seniours were unwilling to incorporate new information which is relevant though the market had changed. Most of them were of the opinion that the decisions made in the past were the major basis of decision making process by the senior valuers instead of current market analysis. This in turn lead to mispricing of residential real estate assets. Thanks to anchoring/conservatism, valuers persist in the belief that the

prices in the market are not sustainable yet demand surpasses the supply of residential real estate assets by far.

Valuers instead of undertaking scientific analytical analysis, base most of their work on agents who sell residential real estate assets mainly based on uneducated guess work. Aversion to ambiguity is manifested when valuers price assets by using comparables far away from the subject area to avoid analytival analysis whose information is difficult to obtain.

Valuers also were observed in analysis of the questionnaires distributed to a sample of valuers, that they were uncomfortable with numbers and probabilities due to natural psychological responses to uncertainity and how a problem is framed. Valuers were observed to confuse between nominal changes and real changes(money illusion) especially in analyzing the time value of money in discounted cash flow analysis. Further, some valuers estimated the likelihood of an event on the basis of how vivid the past examples are and not on the basis of how frequently the event has actually occurred. This was observed in the sample of valuation reports where some real estate appraisers of residential real estate assets were basing their arguments on one or two actual sales without analyzing the frequency and transactional biasness. In addition, it was observed that valuers were more concerned with case performances which reflect experience other than base performances which represents the normal experience. For instance, valuers often asked how land is selling in the area of analysis without analyzing the time frame and frequency of information given.

When asked on the point of reference while making decisions on prices of residential real estate assets, most valuers insisted that they relied on other valuers insisted that they relied on other valuers previous decisions indicating the signs of moving with the herd and making decisions based on the herd instincts. This is a psychological bias and induces the valuers to decide on the "feel" of the herd rather than on rigorous independent analysis especially in case of decisions involving high uncertainty such as pricing of heterogeneous assets in residential real estate.

Behaviouralists argue that thanks to various behavioural influences as previously discussed, there is a discrepancy between market price and intrinsic value. In real estate there are investors and dealers who are not rational and their decisions are influenced by beliefs or sentiments that are not fully supported by fundamentals. When transactions based on "noise trading" take place in the residential real estate market, valuers use them as sales comparables leading to rational decisions in the market.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter provides a summary, conclusion and proposed recommendations. Under section 5.2, it is reported that heterogeneous asset pricing model is applicable in residential real estate assets pricing and generally majority of respondents were of the opinion that there is need to review the policy and academia on pricing of residential real estate assets. Section 5.3 states the conclusions based on interpreted results while section 5.4 states the recommendations among them the need for policy and academia review. This chapter at the tail end looks at the areas for further research and limitations of the study.

5.2 Summary

From the research findings, it was found that heterogeneous asset pricing model is applicable in residential real estate market in Kenya. The researcher sampled a number of residential apartments and tested the model. Although the model is more scientific and objective if not controlled, it can lead to composition bias and analytical errors.

Interviews and questionnaires revealed that the traditional approaches were highly subjective and susceptible to bias. Some of the limitations given by the respondents include: subjectivity of construction rates used in cost method, control of heterogeneity

while pricing residential real estate assets, unavailability of data for proper analytical analysis and culture of pricing which considers valuation as an art than a science.

Asked whether the valuation of residential real estate assets is influenced by behavioural factors, 83% were positive. Some of the heuristic biases that were evident are representative bias, anchoring/conservatism, innumeracy and psychological bias. Pricing of new residential real estate assets was reported to be controlled mostly by agents through irrational and sentimental processes and not fundamental analysis.

It was established that introduction of REITs in Nairobi Securities Exchange would be marred by challenges due to poor pricing of real estate assets hence the need to update both theory and practice on valuation methodologies. Instead of teaching pricing of real estate basing on the three traditional approaches to valuation i.e. cost, income and comparables approaches, academics should base teaching on concepts of price distributions, pricing models and prediction error analysis. This was observed to ground real estate valuation more firmly in modern economics and finance theory and statistical methods as they have developed in recent academic literature.

The challenges facing pricing of heterogeneous residential real estate assets were identified as (in order of decreasing effect); subjectivity of methodologies (academic gap), behavioural factors influence such as representative bias, conservatism, psychological bias among others, poor regulation on valuation procedures(weak institutions capacity), market inefficiencies and lack of readily available information.

5.3 Conclusion

Price of a specific property at a point in time is a random variable reflecting the heterogeneity, uncertainty and limited information of buyers and sellers. Therefore, at a given moment in time, there is actually a probability distribution of possible prices each property might sell for. Pre-test biases, misspecification and measurement errors are common in published models, leading to large standard errors and poor out of sample prediction.

Heterogeneous asset pricing model is applicable in pricing of residential real estate market in Kenya but require careful control of the analytical process to achieve better results. The model like traditional approaches to pricing of heterogeneous asset pricing methods is subjective and requires objective selection of sample and error analysis to produce reliable results.

Behavioural factors affect the traditional approaches to pricing of residential real estate assets such as representative bias, conservatism, innumeracy and psychological bias. These factors should be identified, compiled and made aware to valuers together with how to manage each of them. This would encourage more independent fundamental analysis.

We conclude that the greatest challenge facing the pricing of heterogeneous residential real estate assets is basing its teaching and practice on the three traditional approaches of

pricing rather than on concepts of price distributions, pricing models and prediction error analysis.

5.4 Recommendations for Academia and Policy

5.4.1. Recommendations for Academia

5.4.1.1. Review Theory for Real Estate Valuation

There is need to establish an alternative way to teach real estate price estimation methods. Pricing of residential real estate assets should be based on evidence using quantitative methods, a predetermined scientific process and later use experience and qualitative methods to fill in the holes in the created by the scientific processes. Academic review would change the "scientific, objective" statistical procedures based on flawed data and mis-specified models to objective scientific model with clear adjustments to arrive at time prices of the residential real estate assets. As Kummerow (2002), argues nothing is more practical than a good theory. A good theory helps make sense of complex situations by directing attention to key issues and guiding methods of analysis.

Kummerow (2002) proposes that valuation should be taught starting with concepts from statistics i.e. random variable, probability distribution, moments of a probability distribution (mean, standard deviation), sampling distribution, confidence intervals, measurement and misspecification errors and prediction errors. Further, concepts from the hedonic literature should be incorporated i.e. hedonic model (Lancester, (1966)), hedonic price differences model (Colwell, Cannaday & Wu (1983), error trade-off, law of

medium numbers (Kummerow and Galfalvy (2002)), grid estimators, spatial autocorrelation (Pace, et al. 2002), prediction errors, valuation/price ratio and coefficient of dispersion to evaluate pricing models and sample selection (Gloudemans, (1999)).

Kummerow (2002), observes that once students have been taught on scientific foundation, they can go on forever learning more sophisticated statistical estimators or just learning the local market i.e acquiring experience about what matters to buyers and sellers.

Although people often talk as if theory and practice are different things, as in "that is only theoretical," nothing is more practical than a good theory. Theory helps make sense of complex situations by directing attention to key issues and by guiding methods of analysis. This paper presents an updating of valuation theory and the methodological implications flowing from this theory. The central idea is that instead of teaching based around three approaches to value we should base teaching on concepts of price distributions, pricing models and prediction error analysis. This grounds real estate valuation more firmly in modern economics and finance theory and statistical methods as they have developed in recent academic literature.

5.4.1.2. Adopt Heterogeneous Asset pricing model in Academia

This study has shown that there is need to review the theory on pricing of heterogeneous real estate assets. Kummerow, 2002, argues that, in teaching valuation, the key concepts should be, possible price distribution which is a probability distribution showing the relative probability of different prices being revealed in a sale of the subject property at a

cular time, use of a pricing model which is a parsimonious representation of the ket's pricing process used to "adjust" sales evidence to obtain an "indicated value" of subject property and error analysis which implies errors in predicted prices provide a ns for making estimates of variance of possible price distributions and the evaluating accuracy of pricing models.

developed countries such as America, heterogeneous asset pricing model is already in in their residential real estate market. American valuers use "adjustment grid", which athematically equivalent to the "sales comparison price differences regression model". odeling price differences due to differing characteristics stems from Kevin Lanacasters tion that utility and the price people pay for complex commodities like housing is a m of the utility of various characteristics, Lancaster, (1966) and Rosen, (1974).

nder this model valuer tasks therefore include choosing which sales are best to use to nfer price of a particular property, identifying price-affecting characteristics that differ etween sales and subject property, estimating the dollar value of these differences for each pair-wise comparison of subject and sale and "Reconciling" to give a single price estimate, where indicated values of the subject from different adjusted comparable sales are not identical (the usual outcome).

5.4.1.3. Encourage Research on Residential Real Estate Market in Kenya.

Most of in the universities' school of business is biased towards financial market assets. However, the reality is that most corporate and individual investors invest a higher proportion of their income in residential real estate than in shares and stocks. A review of

America and Australia indicated that there was substantial research activity in residential real estate market done by business scholars while in Kenya, it was viewed to be a reserve of school of built environment. One of the respondents commented that pricing of heterogeneous real estate assets is based on concepts borrowed from finance courses, yet there was a myth that this area was technical and a reserve of real estate specialists.

5.4.2. Recommendations for Policy Review

5.4.2.1. Amend the Valuers Act (Cap 532) and Land Act No. 6 of 2012

There is need to review the law to clearly state the minimum requirements for a pricing process, clearly indicating the pricing procedure, the model to be used and penalties to be applied when valuers do not adhere to the proposed analytical processes. Other amendments should be to give the Valuers Registration Board powers to sample valuations done at any time and check that the objective processes are followed as stipulated in law. The law should also stipulate that financial institutions to always seek a second opinion before transacting in land related business. This would push valuers to take time in their analysis.

5.4.2.2. State Clear Standards and Procedures for Valuation Profession

Accurate and transparent property valuations are essential to the mortgage lending business as they promote confidence in the collateral system, which provides the guarantee that the lender will be repaid. The stakeholders in pricing of real estate assets should work on enhancing transparency and compatibility of property valuations for

lending purposes in Kenyan residential real estate through exchange of best practice in key areas, development of risk related criteria and publication of comparative studies. They should support for convergence in terms of valuers' qualifications, valuation definitions and reporting, coupled with mutual recognition of national valuation methodologies.

A centre for registering all sales of land should be established. All real estate assets should be valued by a qualified and independent valuer before any transaction is allowed and the information forwarded to the centre as public information. This would form source of reliable information for further analysis in future. A policy should be prepared that has a standard process of analysis which requires all valuers to price real assets in a step by step procedure. A copy of the analysis should be forwarded to the centre as a compliance practice. A good example is accounting profession where the standards of preparing financial statements are clear and implementation of the standards is not ambiguous. This should demystify pricing of real estate assets by having history of sales of properties which is based on real intrinsic value rather than noise trading and encourage the development of and use of reliable valuation standards. If the information inefficiency problem can be solved, then the objective models would be easy to formulate and use.

5.4.3. General Recommendations

5.4.3.1. Establish Systematic Methodology of Dealing with Behavioural Factors in Pricing of Real Estate Assets.

Understand the biases pogo, the folk philosopher created by the cartoonist Walt Kelly, provided an insight that is particularly relevant for investors, "we have met the enemy and it is us". So understand your biases (the enemy within) as this is an important step in avoiding them.

Valuation companies should focus on the big picture by developing a valuation policy and put it down on paper. Doing so will make all employees involved in pricing of residential real estate assets will react less impulsively to the gyrations of the market. In addition, an objective analytical process would go a long way in developing a culture of reliable, objective and dependable scientific analysis.

Participants of residential real estate market should review their biases periodically. Probably once a year, valuers should discuss how they are dealing with psychological biases. This would throw up useful pointers to contain such biases in future.

5.5 Areas of Further Study

This research covered a few properties and there was need to undertake a research with a larger sample to ground the results properly.

This research was limited to Nairobi residential real estate hence the need to extend the research in other towns in Kenya.

There is need to analyse the applicable models and evaluate the best model for the residential real estate in Kenya.

5.6 Limitations of Study

The study was faced with a number of limitations as follows;

There was little literature the pricing of residential real estate assets using heterogeneous pricing models.

Due to time and financial constraints, the researcher was only able to cover a few properties hence there was concern on generalization.

Most of the respondents disclosed information partially fearing it would be published for general public.

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APPENDICES

APPENDIX I

QUESTIONNAIRE

THE APPLICATION OF HETEROGENEOUS ASSET PRICING MODEL IN KENYAN RESIDENTIAL REAL ESTATE MARKET.

August, 2012

Dear Respondent,

QUESTIONNAIRE FOR VALUERS.

I am undertaking research for my Masters degree on the applicability of heterogeneous asset pricing in Kenyan residential real estate market with a view to identifying practical problems and make necessary recommendations on the possible ways of minimizing the pricing anomalies. I hope you may be willing to help us evaluate the practical experience on the pricing of residential real estate assets and identify problems in practice. This could be of great assistance to us when we make our recommendations to update the theory of valuation and heterogeneous asset pricing.

So, I very much hope you may wish to complete the attached questionnaire and contribute your views to this research. I am grateful to those who take the time to complete the questionnaire.

This Questionnaire is for research purposes only and we do not intend to identify any individual who makes a return. In addition, all information is guaranteed confidentiality.

SECTION A: PROFESSIONAL AND ACADEMIC QUALIFICATION

(a) Professional qualification of the valuer (Tick as appropriate)

Registered and practicing valuer ☐

Full member of the institution of surveyors of Kenya ☐

Graduate member of the institution of the surveyors of Kenya. ☐

(b) Number of years of experience

1-5 ☐

5-10 ☐

10 and above

(c) Academic qualifications

Post graduate (Masters, Phd.) ☐

Under graduate (Bachelors Degree) ☐

SECTION B: TRADITIONAL VALUATION METHODS

(a) In your opinion what are the limitations to each of the following traditional approaches to valuation?

Cost approach

.....

.....

.....

Income approach

.....

.....

Comparison approach

.....

.....

(b) How do you deal with these weaknesses in your day to day work as a valuer?.....

.....

.....

.....

SECTION C: VALUATION OF NEW RESIDENTIAL PROPERTIES

(a) Which method do you prefer in new residential properties especially vacant plots?.....

.....

(b) Do you adjust prices of residential properties to eliminate the effect of speculation?.....

(c) If no, are you tempted to follow the sale/purchase prices driven by brokers as the market value of property especially for vacant prices?.....

(d) If yes, how do you adjust for these differences through an objective process or subjective guess work?

.....

.....

(e) How do you adjust for the fact that the buyer of a house is in most cases on the weaker bargaining position due to the ever increasing demand of residential houses and fixed supply of land?

.....

.....

.....

SECTION D: NAIROBI SECURITIES EXCHANGE REITs MARKET

(a) Do you understand what REITs mean?.....

.....

(b) If yes, what do you think are the likely benefits and challenges in your opinion appreciating the variances in opinions of

valuers?.....

.....

SECTION E: BEHAVIOURAL HETEROGENEOUS ASSET PRICING

(a) How is your work affected by behavioral biases such as giving values which another valuer gave in a different valuation without analysis of fraudulent or innocent errors?

.....

.....

.....

(b) How do you deal with these heuristic biases?

Stereotyping.....

Frame dependence.....

SECTION F: SUGGESTIONS FOR IMPROVEMENTS

(i) In your opinion, what recommendations would you propose to improve the pricing of residential real estate assets in Kenya? Please detail these in the space below or append an extra page.

Recommendations on Academics

.....

.....

.....

Recommendations on Policy Framework

.....

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Note: Thank you for completing this questionnaire.