A REVIEW OF REAL ESTATE VALUATION AND OPTIMAL PRICING TECHNIQUES

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ABSTRACT

Real estate is a unique asset whose valuation is critical to its management and development. Its uniqueness lies in the fact that in most economies, unlike the stock market, there is absence of an active interaction between sellers and buyers as in the normal market to establish price, hence most property portfolio decisions are based on subjective valuation rather than price. This paper analysed and reviewed the relevant theories and literature with the quest to establish a valuation model that can serve as proxy for optimal price. Achieving optima and efficient pricing requires that valuation serve as accurate reflection of all available and relevant information about the property. Contemporary traditional valuation models and approaches reviewed include the traditional market or sales comparative approach, cost approach, income capitalization approach, the hedonic models, mean or median transaction prices, repeat-sales method, hybrid methods, the option model, the equivalent yield model, the constant growth model, and periodic growth or equated yield model. It is suggested that the optimal value of a property or a real estate equates market value, to the true value and present value.

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Contribution/ Originality

This study documents and evaluates the various models used in real estate appraisals and valuations bringing out the basis for them and justifying their use. The literature introducing their use is generally surveyed while it states the general line of thoughts expected to be followed by a valuer in adopting a particular model.

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1. INTRODUCTION

Properties in particular and real estate in general require specialized valuation technique since they constitute unique assets in the community of tradable assets. Real estate constitutes an agglomeration of rights, fixtures, the land, building and other aesthetics that are sometimes unquantifiable. Therefore, valuation of real estate is a function of the attached rights and the physical features. Real estate consists of four elements: the land surface, the sub-surface, the air-surface; the permanently affixed objects and fixtures; the appurtenances or incidental rights attached to the use of the properties therewith; and the immovable properties belonging to the landowner in law (Adetiloye, 2013). Real estate or property investment is concerned with acquiring real assets that is worth more than their cost. Unlike the stock market, properties are not frequently traded in the open market and access to information is limited. Thus, professional valuers have to acquire information about comparative transactions as guide when making an assessment of value. This has led to emergence of independent property information services whose role is the provision of information about the market, for investment decision (Brown and Matysiak, 2000).

The increasing importance of real estate to the social, political and economic life of different economies has craved the indulgence of researchers into dearth of information for proper valuation of properties. Valuation provides the impetus for major property tax reforms and other public policy measures (Calhoun, 2001). In the United States, in the very recent years the data problem for critical information for real estate valuation has been addressed as availability of broad-based house price indexes (HPIs) and automated valuation models (AVMs) have evolved rapidly. The HPIs are used to track the national, regional, and local performance of residential real estate. Periodic HPI publication represents the most readily available source of information on the economic performance of the most important financial asset for a majority of households. HPI basically helps to estimate the rate of appreciation or depreciation in housing values overtime when a relative minority of property is actually traded. The index also comprises of an essential component of many large- scale commercial AVMs. PriceWaterhouse Coopers indicates that AVMs are used on between 5% and 25% of purchase and refinancing loans as a supplementary estimate of value. AVMs are however used exclusively on 35% to 55% of home equity loans as the only estimate of value (Calhoun, 2001). Ross and Nattagh (1996) describe four primary applications which AVM models or systems are likely to be adopted. These include mortgage quality control or appraisal review, loss, mitigation analysis, portfolio valuation, and appraisal process redesign.

Kummerow (2011) contends that the profession of real estate valuers arises because each real estate asset is different from all other properties since properties are heterogeneous. 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. The amount of sales evidence varies widely in particular cases, but generally there are few sales of properties similar enough to be considered as comparables and none of identical properties.

Issues about the concepts and theory of value of real estate have dominated the academic literature. The debate over a proper definition of value is frequently revisited in the real estate

appraisal literature. Real estate appraisers generally attempt to estimate market value. The prospective home buyer needs to evaluate the drivers of house price appreciation, in order to establish if the property is competitively priced and avoid overpaying while lenders want assurance concerning the price of the property because it will be serving as security for repayment for a mortgaged debt, and over time, it must remain sufficiently high to repay the outstanding loan balance in the event of default (Brueggeman and Fisher, 2005). The embroilment between prospective buyer-investor and the lender usually require that a specialist independent appraiser be employed to carry out the valuation. It is also and usually the requirement that the specialist appraiser be unrelated to the parties to the transaction and must have no vested or financial interest in the transaction being appraised.

In totality, the objective of an appraisal is to establish the market value which is the most probable price that would be paid for a property under competitive market conditions. It is the exchange value in a transaction carried out at 'arm's length'. This concept of value is usually different from the price that an individual could have intended to pay for same property, which incidentally is a utility decision. For instance, a person's preference for attributes of a property being acquired may be such that he may be willing to pay a significantly higher price for a property than the majority of the potential buyers in the market. The lender is usually concerned with what the market price would result to in case of default, hence the appraiser must make an independent estimate of the most probable price that a property would bring if it were sold under competitive market conditions. Incidentally, to Kummerow (2011) the market has the same problem as the valuer—how to discover prices of heterogeneous assets where there are few similar transactions and many property characteristics influence prices. For any individual property at a particular point in time, different prices are possible due to different circumstances of sale, differing buyer preferences, different buyer information sets and other factors. We may call this variation random error because the causes are not known. Adetiloye (2013) contend that most times real estate value is equivalent to the market value at any point in time. However, for this to hold the following conditions must be true: parties that are involved in the transactions are well informed, advised and act in what is considered their own best interest, i.e. foreclosing trading of lemon good; a reasonable time is allocated for it in the open market for expression of interest; payment is made in cash or its equivalent; financing if any, is on the terms of available financing methods; and finally, the price represents a normal consideration for that type of property and unaffected by other special condition (Brueggeman and Fisher, 2005). These preconditions align with the five point requirements of Royal Institute of Chartered Surveyors (1995) for a property to command 'open market value'.

The objective of this paper is to discover possible answers to the following questions: What constitute the value to be exchanged? What is an appraisal process? What are the reasons for real estate valuation? What are the conceptual issues in property valuation? Is there an 'optimal' value of a property and an estate to the society in general or to an individual investor? Is the property

priced in monetary terms or some intrinsic characteristics? What are the valuation techniques adopted in theory and practice? The rest of the paper is arranged in this aforementioned order.

2. THE APPRAISAL PROCESS

The basic objective of an appraiser is to establish the market value, meaning the most probable price that would be paid for a property under competitive condition. The appraiser would have to carry out due diligence in an attempt to produce an intrinsic value for the property. It requires that the appraiser begin by examining all "interrelated multiple factors" with an assessment of global, national, regional, and local economic conditions, stressing income, population, employment, and interest rate trends, which form determinants of demand for the property in question. In other words, for investments in assets of real estate, it is logical and systematic to carry out global macroeconomic fundamentals, industry fundamental and the company fundamentals in the process of conducting a 'just' valuation for an investment purpose (Eke and Ashamu, 2009). Supply is also examined by assessing the relative cost of land and the associated factors of production (wage, capital). The current market equilibrium conditions are arrived at by examining the current availability (inventory) of housing units, absorption rate, rental vacancies, and trends in rents to gauge the likelihood of any short-run price movements that may affect the estimate of value. The appraiser also examines the submarket, usually encompassing the neighbourhood, including nearby retail, educational, and religious facilities, to establish any premiums that might be paid for the property because of its proximity to those facilities (Brueggeman and Fisher, 2005). Floyd and Allen (2008) provide six systematic procedural steps employed by appraisers to arrive at an estimate of value and convey that value to the appraisal user. These steps are summarized thus: definition of the problem; data selection and collection; highest and best use analysis; application of the three approaches to value- that is sales comparability, income, and cost; reconciliation of value indications into a final value estimate. Adetiloye (2013) regards the property appraisal process as systematic namely: legal and physical identification of the property, properly delineated by beacons and identified with a document of title; the right to be value must be identified .i.e. if it is a freehold or leasehold etc.; specification of the purpose of appraisal; need to specify the value estimate; gathering the market data for analyse; finally adopting relevant technique to appraise the value.

3. REASONS FOR VALUATION AND THE EFFICIENCY OF REAL ESTATE VALUE

Many reasons underpin the purposes behind property valuations. First, most valuations are done to secure or make borrowing decision fall through. The true value of a property helps the lender to arrive at reasonable judgment on the term of contract with the borrower. Another reason for valuing a property is to make a comparison with the market price. This helps to decide whether a property is under or –overpriced. Undervaluation occurs when the same property is judged to be less than it would be before an independent appraiser. The question that is seldom put forth is to

what extent does valuation represents or "a good proxy for open market price". The open market price reflects all available information.

The efficiency of the property market is indicated in its valuation and hence a reflection of how information is treated. The following non-exhaustive lists are examples: open market value; current value; redevelopment value; insurance value; mortgage value; stock exchange value; and going concern value. Brown and Matysiak (2000) contend that of the values above 'open market value' is most important from investment point of view. Royal Institute of Chartered Surveyors (1995) describes open market value to represents "an opinion of the best price at which the sale of an interest in property would have been completed unconditionally for cash consideration on the date of valuation". The test of valuation, as proxy for prices, is concerned with how group of valuers, as well as buyers and sellers, interpret the same information under open market conditions.

4. CONCEPTUAL ISSUES IN VALUATION

This section discusses the types of value in the literature

(a) Reservation Price or investment value: this is the maximum price a buyer would pay or minimum price a seller would accept on a property of interest. Investment value is unique. Investment value is unique to potential buyer or seller. It can also differ between users of real estate based on differences in tastes and preferences, risk perceptions, wealth, and tax circumstances (Miller and Geltner, 2005).

b) Exchange value: This is the most probable price that the property is "realistically likely to sell at in the open market". Arriving at market value using this technique usually appeals to appraisers.

c) Liquidation Value: This is the price that a property is likely to sell for if sold in less than normal market condition, such as under "distress auction for a limited time". It is a quick sale scenario, requiring tapping into thinner markets of ready buyers, which tends to result in lower prices

d) Market Value: This is the highest price a willing buyer would pay to a willing seller, when both are fully informed and acting in freedom, "without duress or unusual financing". Brown and Matysiak (2000) say that "in a well-functioning market we can take market value as representing true value. Market value is also the present value of the property", and thus the following relationship hold:

Market value = True value = Present value

The theory of market value 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 (Kummerow, 2011).

e) Going concern value or Use value: Going concern value represents the value of the property in association with the existing businesses operating on the property. The concept recognizes that it is sometime difficult to separate real estate value from the value generated by its occupants. This is common for properties, such as hotels, hospitals, and some industrial properties. It is common that

"part of the value of a property may be derived from sources other than the original use to its "highest and best use". The current use thus provides a value estimate for a given user.

f) Equilibrium value: This is usually applied when issue of efficient pricing is involved, that recognizes all available information. Market value could represent the equilibrium value, however real estate markets may not be perfectly efficient in the sense that "market value may not fully and immediately reflect all the publicly available information.

h) Highest and best use: This concept describes the value on a property as value due from the expected use of it and its future income. According to Miller and Geltner (2005), it is defined by the American Institute as "the reasonably probable and legal use of vacant land or improved property, which is physically possible, appropriately supported, financially feasible, and that results in the highest value" as of the date of the appraisal. Determination of highest and best use ultimately depends upon the judgment and skills of the analyst who must determine "what could this site be best used for if vacant?"

4.1. Concept of Present Value and Time Value of Money

The finance discipline is primarily concerned with the voluntary transfer of wealth between individuals and across time in the market. It involves creditors lending money to borrowers with interest in return for future repayment, or an investor purchasing an ownership claim from an entrepreneur's venture in exchange for future profit (Megginson *et al.*, 2007). It suffices to state further that the transference of wealth can be in the present form or in the future form Two basic reasons adduced for today's choice are: inflation and compensation for postponed consumption. Individuals postpone current consumption by transferring same resources to borrowers are expected to do that at a risk adjusted opportunity cost of time preference. Even in the absence of any inflation or uncertainty about the future, a return on investment should be expected, even from riskless investment (Miller and Geltner, 2005). Because mortgage lenders advance the purchase of a property at present with future repayment commitment, an understanding of the behavior of the cash flow and currency value across time should be analysed.

Estimating future value and present value: In the investment literature, the relationship between the future value (FV) and present value (PV) for a single period is generalized as follows:

$$PV(1+r)^n = FV_n \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (1)$$

Where r is the opportunity cost of capital, n is the period of investment, $(1+r)^n$ is the compounding factor, the present value *(PV)* is established by adjusting the above formula as follows:

$$PV = FV_n/(1+r)^n \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots(2)$$

Where $1/(1+r)^n$ is the discount factor

Estimating Multi-period cash flow: The same principle above is applicable where the cash flow occurs at different time, through the life of the investment. The present value of the investment is presented as follows:

$$PV = a_1/(1+r) + a_2/(1+r) + a_3/(1+r) + \dots \quad \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots(3)$$

A summation of this expression can be written as:

$$PV = \sum_{x=1}^{x=n} \frac{a_x}{(1+r)^x} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots(4)$$

Rental payment in practice is rarely in arrears but in advance. This phenomenon can make significant difference in terms of value of the lease. Thus, there is a simple relationship between cash flow received in arrears and in advance. One is merely the present value of the other:

$$PV_{Arrears} = \frac{PV_{Advance}}{(1+r)} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots(5)$$

By rearranging equation 3, where interest rate is constant, lease payment received in advance can be converted into arrears by multiplying by (1+r) as follows:

$$PV_{Advance} = (1+r) \sum_{x=1}^{x=n} \frac{a_x}{(1+r)^x}$$

$$\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots(6)$$

Annuities and Sinking Fund: An attractive feature of real estate investment is that it produces series of constant cash flows. Where the series is recognized together, it is useful to apply annuity formula as follows:

$$PV = \frac{a\left[1 - (1+r)^{-n}\right]}{r} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots(7)$$

Where PV is the present value of regular series of cash flow a, r is the interest rate and n is number of years. The sinking fund is the reverse of annuity in that it attempts to build up a capital sum at a point in the future. It is often required in real estate business to make a payment for some capital equipment, a major acquisition, or for future repairs or the replacement of the capital loss in a lease (Brown and Matysiak, 2000). By re-arranging the annuity formula, we arrive at the sinking fund as follows:

$$FV = \frac{a\left[(1+r)^n - 1\right]}{r} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots(8)$$

Where FV is the future value of the sinking fund, it is also possible to discover how much to invest each year in order to build up a fund, by rearranging for a the annual amount to give:

$$a = \frac{FV}{\left[(1+r)^n - 1\right]} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots(9)$$

The most realistic situation in practice is for cash flow to occur at different time period other than on annual term, as payment received throughout the year must be worth more than a single rental payment at year end. That is, rent received under a lease can occur quarterly or monthly as

well as in advance. Thus, given that m represents the number of discounting period per year, the present value of an annuity for n years can be written as follows:

$$V = \frac{a}{m}\left[\frac{1-\left(1+\dfrac{r}{m}\right)^{-mn}}{\dfrac{r}{m}}\right] \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots(10)$$

This simplifies to:

$$V = \frac{a}{m}\left[\frac{1-(1+r_m)^{-mn}}{r_m}\right]\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots(11)$$

where r_m is the rate of interest for the m discounting periods in a year.

4.2. Traditional Valuation Models and Approaches

Theoretically, the value adduced to a property is a function of quality and quantity. Quantity is about physical dimension of the real estate (space), while quality is rather subjective. Both criteria have inputs in the various approaches to the valuations of real estate described below:

a. Market or Sales comparative Approach: This exercise entails comparison of similar properties that have been recently in the open market transaction with the current subject property. This price mainly serves as a guide for the appraiser to take informed decision. Every property is unique, and any differences in properties influence the value adduced to the property under appraisal. The underlying theory of value of this approach is that the "value of the real estate is based upon the views of the typical buyer and seller of such property, independent of cost, to create or wear and tear (Miller and Geltner, 2005). This means that the observed prices used by valuers to infer value of a subject property by sales comparison include random variation. *Po*, the observed price, is equal to *Pμ+ε*, the mean of the possible price distribution, plus a random error. Usually *Pμ* or *ε*, are unknown, only the *Po*, the transaction price is known (Kummerow, 2011). Thus, due to heterogeneity of "hedonic characteristics", valuers now develop models of price differences. For instance, 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 (Kummerow, 2011). The primary criticism of the sales comparative approach is that it is subjective, both in terms of selecting comparative sales and with regards to the types of adjustments that are made to determine value. In practice, number of comparables are usually limited to three or four properties, and separate adjustments are made for specific property characteristic (Calhoun, 2001)

b. Cost Approach: An appraiser arrives at the market value by systematically estimating the cost of production. Estimation of the market value through this approach involves carrying on the

following process: estimating the value of the site as though it is vacant; next, estimating the cost to produce the improvements; next, subtracting depreciation, and finally adding the site value at highest and best use. The underlying value theory here assumes that the ''value of the property is inherent in the cost to create the property based on land acquisition and building costless wear and tear and depreciation (Miller and Geltner, 2005).

c. Income Capitalization Approach: The income approach involves the appraiser estimating the market value by estimating the income that the property is expected to generate, then discounting the income stream to arrive at the present value. Appraisers generally employ different techniques to convert future incomes into present value estimate. The techniques used to relate income expectations to market value estimates include gross income multiplier (GIM) analysis, net income capitalization (NIC), and discounted cash-flow analysis (DCF) (Floyd and Allen, 2008). Here, the underling theory "assumes that the value of the property is based upon the typical investor's yield requirements, current financing possibilities, and the property risks" (Miller and Geltner, 2005).

The GIM approach assumes a prevailing relationship between prices investors are willing to pay for properties and the gross income the properties are expected to produce as follows:

Gross Income Multiplier = Value/ Gross Income..…………………………………….(12)

The NIC technique recognizes that the value of an income property depends on "net" rather than "gross" income. The net income is converted into a present value estimate using a capitalization rate rather than a multiplier:

Capitalization rate = Net Income/ Value …………………………………………..(13)

Value can be derived by adjusting the formula in 13 above as follows:

Value = Net Income/ Capitalization rate …………………………………………...(14)

d. The Hedonic Models: This is a statistical approach based on multiple factor regression models with larger samples which attempts an answer to the question: What price to pay or accept for the subject property? The model relates the dependent variable i.e. the sales price with all variables of interest as explanatory variables "based on quantity and quality attributes of a large sample of similar properties. The samples are often selected using a combination of geographic distance as well as key attribute ranges such as size". A sample of the model given by Miller and Geltner (2005) is:

Sale Price = a + b₁(Building size) + b₂(Lot Size) + b₃(age) + …..+bₙ(x) + residual………(15)

$$Sale\ Price = a + b_1(Building\ size) + b_2(Lot\ Size) + b_3(age) + \ldots + b_n(x) + residual \ldots\ldots\ldots(15)$$

Where: a = is the constant term such as the land value. It might not be essential to have constant term unless the analyst is sure of omitting a key and stable influence such as land.

b = the regression coefficient, which is the estimate of the influence of variable x on value

c = explanatory variables from each observation such as building size, lot size, and age, as shown above. Other variables could be used such as the number of bedrooms or bathroom

n = this represents other regression coefficients

residual = the average unexplained portion of selling prices for the sample of homes used in the estimation procedure.

It is important that any model's functional form conforms appropriately to the behavior and characteristic of the property, the buyer and the seller, such as accounting for possibility of non-linearity and covariance between independent variables. Asteriou and Hall (2011) admit that "one of the most important problems in econometrics is that we are never certain about the form and or specification of the equation we want to estimate".

The main difficulty with Hedonic method is the need to have "detailed information on the property characteristics". Even when data on property characteristics are available, these may not be ideal measures of the attributes of houses over which consumer preferences are defined. Also, the available hedonic characteristic tend to be limited to the features of individual houses, and may not provide adequate measures of important difference in neighborhoods and other environmental factors or externalities affecting the market value of a property (Calhoun, 2001).

e. Mean or Median Transaction Prices: This method consist of an index which simple computes and provides easy to understand summaries of sales activity within relatively localized areas such as area codes (Calhoun, 2001). However a widely acknowledged shortcoming of this model is the failure to control for difference in the composition of the sample and the relative quality of properties transacting from period to period. It makes it difficult to separate out difference in prices that occur because of actual appreciation in housing values from differences in the characteristics of the properties that are being sold. This shortcoming is what then led to the search for "constant quality" house price indexes based on hedonic and repeat-sales methods (Calhoun, 2001).

f. Repeat-sales method: Repeat-sales method uses the observed sales price of the same properties at different point in time to "create a sample of price differentials that can be used to estimate the appreciation rate of houses". If one can assume that the properties on the repeat sale sample have not undergone significant physical improvements or deterioration between the observed sales, then using price differential for the same properties automatically controls for the impact of quality on the estimated index of appreciation (Calhoun, 2001). Multiple regression methods are used to account for the fact that not all the properties in the sample are sold or re-sold at the same date, but the only data required are the transaction prices and respective dates.

g. Hybrid methods: (Calhoun, 2001) argues that various attempts have been made to improving on both the hedonic and repeat-sales methods of house price index construction, sighting the investigative study of Case *et al.* (1991) of hybrid of hedonic and repeated sale methods, utilizing repeat transactions when available, but otherwise "using hedonic information to control for differences in quality and to confirm that no significant physical changes have occurred for properties with repeat observations. (Goetzmann and Spiegel, 1995; 1997) introduced the distance-weighted repeat-sales (DWRS) method which is another variant hybrid method of "spatial dimension". The spatial dimension does "not necessarily refer to location per se: rather it corresponds to the correlation among appreciation rates for individuals properties that may be closer or farther apart in their geographic space or "characteristic" space".

h. The Options Model: This approach attempts to recognize that the value of land is not limited to the value of its current use. In other words, the total value of land includes an option component reflecting the value of the option to convert the land to a different use in the future. This option has an infinite life and an exercise price equal to the cost of conversion to the new use. All things being equal, the easier it is to convert the land to other use, the greater the option value, and hence the higher the sales price (Hull, 2006). Aside, the option value will also vary positively with the possibility and magnitude of upside-use opportunities, and will vary negatively with such constraints on these opportunities as regulation and building codes (Miller and Geltner, 2005). Each of the possibilities can be considered as a call option. Intuitively, the value of a site can be broken down into two components - the current use value and the future value:

Site value = current use value + Future use value or option value ………………………… (16)

Both the current use value and future value requires some form of present value analysis considering the returns and appropriate risk adjusted discount rate necessary to arrive at investment value. It is noted that valuing real options is not something that can easily be done using Black-Scholes option-pricing model, which was the standard pricing formula for financial securities, and assumes finite life for the option. A real option is the right but not the obligation to undertake certain business initiatives, such as deferring, abandoning, expanding, staging, or contracting a capital investment project. For example, the opportunity to invest in the expansion of a firm's factory, or alternatively to sell the factory, is a real call or put option, respectively. Real options are generally distinguished from conventional financial options in that they are not typically traded as securities, and do not usually involve decisions on an underlying asset that is traded as a financial security. Valuing real option relies more on the use of decision trees, binomial lattice and Monte Carlo simulation method.

i. The Equivalent Yield Model: Brown and Matysiak (2000) describe this model "as probably the most common method used for valuing commercial properties and for analyzing current transactions". Developed from the basic principles of present value and annuities, the model is in two parts. The first part consist of the current income up to the next rent review, while the second part "occur at the review when the income is replaced by the current estimate of rental value, which is then assumed to remain constant in perpetuity". Where γ equals the equivalent yield, R and a the current rental value and passing income respectively and n, the number of years to the next review, the property value can be estimated thus:

$$V = \frac{a}{\gamma} + \frac{R-a}{\gamma(1+\gamma)^n} \qquad \text{..(17)}$$

The first step usually is to make an estimate of the equivalent yield from comparable properties that have recently been sold, to be able to estimate the property value.

j. The Constant growth model: Otherwise called the Gordon growth model, it assumes that annual income from the property ownership is constant growth infinitum. Brown and Matysiak (2000) assert that the model is especially important in an inflationary environment, "as one of the reasons

for investing is to maintain the purchasing power of investments in real terms". In a mixed asset portfolio, property remains the most potent force against inflation, as hedging instrument. The present value of the constant growth model assumes that an investment that generates an initial income of a at the end of first year, grows at a constant rate of $g\%$ p.a., so that at the end of the second year it takes on a value $a(1+g)$, and subsequently in the third year the income is $a(1+g)^2$, and so on. The present value is represented below:

$$V = \frac{a}{(1+r)} + \frac{a(1+g)}{(1+r)^2} + \frac{a(1+g)^2}{(1+r)^3} + ... \to \infty \quad \text{...(18)}$$

Simplifying this gives:

$$V = \frac{a}{(1+r)}\left[1 + \frac{(1+g)}{(1+r)} + \frac{(1+g)^2}{(1+r)^2} + \frac{(1+g)^3}{(1+r)^3} + ... \to \infty\right] \quad \text{.................................(19)}$$

The geometric expression in the squared bracket represents the term of constant growth. The entire expression is represented as follows:

$$V = \frac{a}{(1+r)}\left[\frac{1}{1 - \frac{(1+g)}{(1+r)}}\right] \quad \text{...(20)}$$

The expression outside the squared brackets is from equation 19. Multiplying both of equation 20 gives:

$$V = \frac{a}{r-g} \quad \text{..(21)}$$

The final expression is subject to $r > g$; and that the investor expects a constant growth in income infinitely.

k. Periodic growth or Equated yield model: In markets where inflation rate is relatively stable in some period, making rental income to be reviewed at interval of say five to ten years, a step-wise move in growth rate would ensue (Brown and Matysiak, 2000). Each of the rental flows can be regarded as an annuity, fixed for the period between each review. The rent at each review is just the initial rent, a, inflated by the growth rate, $g\%$, over the intervening period. With the aid of annuity formula, the present value of the income stream is expressed as follows:

$$V = \frac{a\left[1-(1+r)^{-p}\right]}{r} + \frac{a(1+g)^p}{(1+r)^p}\frac{\left[1-(1+r)^{-p}\right]}{r} + \frac{a(1+g)^{2p}}{(1+r)^{2p}}\frac{\left[1-(1+r)^{-p}\right]}{r} + \ldots\ldots \to \infty$$

……….(22)

The expression can be better simplified in a geometric expression by factoring out an expression for an annuity, which is common to each review:

$$V = \frac{a\left[1-(1+r)^{-p}\right]}{r}\left[1 + \frac{(1+g)^p}{1+r)^p} + \frac{(1+g)^{2p}}{(1+r)^{2p}} + \frac{(1+g)^{3p}}{(1+r)^{3p}}\ldots\ldots \to \infty\right]$$ ……………….(23)

If such is substituted in the valuation formula, and by simplifying the expression, a simpler version is obtained:

$$V = \frac{a\left[1-(1+r)^{-p}\right]}{r}\left[\frac{(1+r)^p}{(1+r)^p-(1+g)^p}\right]$$

……………………………………………………………(24)

Simplifying this gives the equated yield model formulae:

$$V = \frac{a}{r}\left[\frac{(1+r)^p-1}{(1+r)^p-(1+g)^p}\right]$$ ……………………………….........(25)

This formulae is also subject to the constraint that $r > g$ like in equation 10

Valuers usually refer to this as the equated yield model where the required rate of return is also known as the equated yield.

5. LITERATURE REVIEW OF THEORY OF REAL ESTATE VALUE

A formal theory of value is needed in order to articulate researchers' contemporary view of what a property is worth. It is only when the true economic value of an asset is ascertained that it is "possible to determine whether a property is under or overpriced" Brown and Matysiak (2000). It is also noted in theory of information efficiency that "a property may be …, worth more to one person than to another merely because of the way each individual assess the importance of relevant information". Miller and Geltner (2005) put the issue succinctly that value concept are always "theoretical in nature while price is usually factual", insisting that value is by nature an opinion and in the absence of a perfectly competitive market, there can be no certainty about the "true absolute" or "resolutely true" value. Similarly, cost is however factual in nature, implying that construction cost and other various cost of production, may or may not impact value. Since property investment is concerned with acquiring real assets that worth more than their cost, proper valuation need to be carried out, and there is the need for a well-functioning market.

Ratcliff (1972) proposed a restatement of valuation theory emphasising that valuation is a prediction of human behaviour under uncertainty. He discussed "transaction zones" pointing out that depending on negotiation skills, any one of a range of prices might emerge from a sale process.

Ratcliff drew a bell shaped probability distributions of property prices in attempt to establish the actual property price (Ratcliff, 1972). Squirell (1985) also expanded on Ratcliff's concept of uncertainty in property prices.

Kummerow (2011) reviewed hedonic price models and conclude that they represent the insight that people buy a bundle of characteristics of properties, not a simple, one-dimensional source of utility as many factors influence the prices people pay for real estate. These models are written as: *Price=coefficients *characteristics + error.*

The coefficients are weights—dollars per unit of characteristic. The characteristics are features of the property that have an effect on utility to buyers. The theory of hedonic pricing is that people's willingness to pay reflects their valuation of bundles of hedonic characteristics, rather than a single one-dimensional generic good (Kummerow, 2011). Academic literature abounds with thousands of hedonic pricing models where price as a function of hedonic characteristics is estimated by multivariate regression. "Since hundreds of variables have been found to be significant in various studies, it is clear that these markets are complex and it is not a surprise both buyers and valuers express some uncertainty about prices. Interaction effects and non-linear relationships between prices and hedonic variables complicate the issues. Pre-test biases, misspecification and measurement errors are common in published models, leading to large standard errors and poor out of sample prediction" (Kummerow, 2011).

Kummerow (2011) also contends that academic authors have mostly used pricing models in levels rather than differences, estimating prices directly from property characteristics, rather than including comparable sales prices in the model. Usually a large but not very homogeneous sample of sales prices is used to estimate best fitting coefficients in a hedonic price model.

Watkins (1999) contends that "estimating prices for submarkets is more accurate than using larger aggregations of sales". The sales comparison approach of Colwell *et al.* (1983) provides a rationale for even more disaggregation. Kummerow and Galfalvy (2002) error trade-offs story suggests disaggregating to a few comparable sales, as is customary in valuation practice.

6. CONCLUSION

Real estate refers to assets that are not movable such as land and all permanent improvements attached therewith, with the ownership rights associated thereto. The increasing importance of real estate to the social, political and economic life of various economies has craved the indulgence of researchers into dearth of information for proper valuation of properties. In many businesses, properties form significant part of their portfolio, and most property portfolio decisions are based on valuation, not prices; while in the absence of active sales market decisions about valuation becomes critical. If on the average, valuers are unable to arrive at reliable estimates of market prices the properties to sold, the industry could be in disarray. This paper has reviewed several literatures on valuations and pricing issues, appraisal process, conceptual issues in valuation, traditional valuation models and approaches. Common traditional valuation approaches discussed include: market or sales comparative approach, cost approach, income capitalization approach, the

hedonic models, mean or median transaction prices, repeat-sales method, hybrid methods, the options model, the equivalent yield model, the constant growth model, and periodic growth or equated yield model. Finally, some current thoughts in the literature were reviewed.

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