COMPOSITIONAL APPROACH TO THE ASSESSMENT OF DEPRECIATION FOR PROPERTY VALUATION PURPOSES: 'AN EXPLORATIVE ANALYSIS'

[1]MURITALA, A. O., [1]AJIBADE, N. A., [1]OLOJEDE, I. O., [1]ADELEKE, M. A., [2]ONIFADE, A. O.
[1]Department of Estate Management and Valuation, the Oke- Ogun Polytechnic, Saki, Oyo State. [2]Department of Architectural Technology, the Oke- Ogun Polytechnic, Saki, Oyo State.

Abstracts

A method that is commonly adopted in situations where market evidence is unavailable is the Depreciated Replacement Cost method. As the name suggests, this involves estimating the Replacement cost of the property as new and making allowances for accrued depreciation, which is the subject matter of the valuation. The provision for depreciation is important because it allows for the estimation of value that reflects the current state of the property. The determination of such depreciation for valuation purposes has been a subject for a number of empirical studies. There is however no consensus within the valuation profession as to which approach to estimating accrued depreciation addresses the key elements that are of concern to estate surveyors and valuers viz; age, level of condition and functional obsolescence. This paper proposes one such approach that incorporates all these elements in the estimation of accrued depreciation for valuation purposes. The approach first considers separately, the individual causes of depreciation and uses different methods to estimate accrued depreciation for each of the causes of depreciation. Total accrued depreciation is then estimated by first taking account of curable physical depreciation and then age and functional obsolescence. The approach proposed presents a basis for a more comprehensive discussion and a subsequent application of a common methodology that valuers can adopt to estimate depreciation.

Keywords: *Depreciation, Depreciated Replacement Cost, Obsolescence, Accrued Depreciation, Property Valuation.*

Introduction

The opinion of value of real estate or property for a particular purpose and at a particular moment in time could be arrived at through a number of methods viz; the income or investment, the cost, residual, market comparison and the profit methods. The choice of a method depends on the purpose and basis of valuation as well as the data or information available to the valuer. The purposes for which valuations may be undertaken include sale/purchases, insurance, rating, compensation, mortgage, auction, accounting among others. The purpose of a valuation will clearly influence the basis that would be adopted in estimating value. The basis of valuation could be one of the following; Open Market Value (O.M.V), Forced Sale Value and Valuation subject to statutory rules.

The method of valuation that is commonly adopted in situations where market evidence is unavailable is the Depreciated Replacement Cost. The allowance made for depreciation is important as it allows for the estimation of value that reflects the current state of the property. There are a number of approaches by which depreciation either for accounting or valuation purposes can be estimated. Each method has its inherent advantages and problems. For instance, a method that is commonly adopted among accountants is the straight-line or age-life method. Though it is simple and easy to adopt, it has the disadvantage of not correctly modeling the true impact of depreciation during the life of an asset.

It is imperative to note that unlike the depreciation adopted for accounting purposes, the valuer, in adopting depreciation in the DRC method, is supposed to arrive at a value that represents the current market value of the property. This requirement obviously rules out the possibility of adopting such simplistic methods as the straight-line method of depreciation.

The approach that is adopted in many valuation exercises is to examine the property in question and take notes of its age, level of maintenance and obsolescence. The valuer then, makes a judgment using his professional expertise, to finally arrive at the rate of depreciation. In doing this, valuation professionals may rely on different models or mathematical relationships to guide them in estimating the rate of depreciation. There is however, no consensus on the model or approach which when used will help reduce the level of variations in the opinion of appraisers. This paper seeks to propose an approach which can in a long way guide professional valuers in the process of estimating the level of depreciation for any particular property.

Literature Review

Baum (1991) defined depreciation as a loss in the existing value of property and attributes the causes to physical deterioration, functional obsolescence or aesthetic obsolescence. Mansfield (2000) also noted that property-based depreciation is the result of two negatives processes; physical deterioration and obsolescence. Barreca (1999) classifies depreciation into three classes: namely physical depreciation, functional depreciation and other economic losses. These perceptions of depreciation obviously have something in common and that is the fact that depreciation is the result of physical deterioration, functional and economic obsolescence.

This position is quite consistent with the provision in the international valuation standard Guidance notes on valuation practice. The Guidance notes provide that valuers in using the Depreciated Replacement Cost should make a deduction from the Replacement Cost of the building to allow for age, condition and functional obsolescence. The only difference between the provision in the Guidance notes and the view expressed by the authors is that, the former treats age as a separate cause of depreciation whiles the authors incorporate age into the other causes of depreciation. Interestingly however, there is a general consensus on the causes of depreciation at least at a very broad level.

The methods for estimating depreciation for valuation purposes have been the focus of a number of empirical studies. A method that is very common and is widely used both in the valuation and accounting professions is the age-life method, also known as the straight-line method. However, in a study by Hulten and Wycoff (2001), they conclude that for all four types of properties (that is offices, retail stores factories and warehouses) the straight-line method should be rejected and that an alternative path that of depreciation that is initially more accelerated than straight-line (that is convex to the origin) should be accepted.

Also, Follain and Malpezzi (2003) in a study that relates specifically to single-family residential units draw similar conclusion to that of Hulten and Wycoff (2001). Jones et al (2005) in sharp contrast to the results of Hulten and Wycoff and Follain and Malpezzi find in their study that relates specifically to single-

family housing that the depreciation model should be concave to the origin and allow for the depreciation rate to be small at first and more pronounced later.
In a study on office buildings, Taubman and Rashe (1989) reach a similar conclusion to that of Jones et al. Connaday and Sunderman (1996) using a sample of single-family residential properties conclude that the path of depreciation that is supported by the empirical evidence is one that concave to the origin (that is initially less rapid than straight-line). They further state that of the standard paths of depreciation often suggested, the reverse sum of the years' digits path most closely approximates the path indicated as appropriate by the empirical results of their study.
It is evident from the above that although all the empirical studies rejected the path of depreciation implied by the straight-line method, there is no consensus as to what the right path should be. Two paths are suggested by these studies; one that is convex to the origin and another that is concave to the origin with both approximated by the sum of the years' digits and the reverse of the sum of the years' digits respectively. It is important to note the data used for these analyses were from particular areas and different property types and thus the results cannot be universally applied.

Development of the Model

It is important to state from the outset that the model being proposed is not meant to be a substitute to the use of the valuer's experience and judgment. Rather it is meant to serve as a tool that will guide valuers in their use of such experience and judgments and also to necessitate a call for debate and discussions that will aim at improving the quality of service delivery. In developing the model, the three components of depreciation of interest to the valuer viz; age, level of maintenance and obsolescence are considered separately. Total accrued depreciation of an asset is then expressed as a function of these three components. How do these interact to give total accrued depreciation? To what extent do these contribute to total accrued depreciation of an asset and how should this be accounted for? These are the critical questions that engage the mind in developing the model. To begin with, we consider the three components of depreciation individually;

Age

Most assets have limited lives, which imply that there will come a time when such assets will be no more. For such assets, it stands to reason that no matter how well they are maintained, they will waste away at some point. Thus the impact of time on the life of an asset in terms of depreciation is inevitable.

It is important to note that although the lapse of time is necessary for the other causes of depreciation to take effect, time by itself is a cause of depreciation and must therefore be given a separate treatment. This becomes evident when one considers the fact that there are some aspects of physical deterioration that are incurable. These kinds of incurable depreciation elements are better taken account of under the age component.

There are quite a number of methods of estimating depreciation that use the age and the useful economic life of an asset. These include the age-life, sum of the years' digits and the reverse sum of the years' digits among others. Useful economic life of assets varies and depends on a number of factors such as quality of construction and type of construction material used as well as the location characteristics of the property.

Currently, there appears to be no empirical evidence that indicates the useful economic life of buildings in Nigeria but such evidence exists in countries such as the United States by Wenzlick (1953), Corgel and Smith (1981). These studies put the effective economic lives of buildings in specific location at between 75 and 88 years. In certain circumstances, it becomes necessary to use the effective age of a property rather than its actual age. For instance, a property may have an actual age of 5 years but may be so intensively used that its effective age could well be over 7 years.

The use of effective age becomes more compelling when a property wears out faster or slower over time compared to other similar properties. The age-life method estimates accrued depreciation on the premise that an asset will depreciate by the same amount every year. This method though straightforward and simple has been found not to correctly model the path of depreciation over the life of the asset. The question to pose is whether relying on such a method will assist the valuer to estimate accurately the market value of an asset. The age-life otherwise known as Straight-line depreciation is given by the formula below;

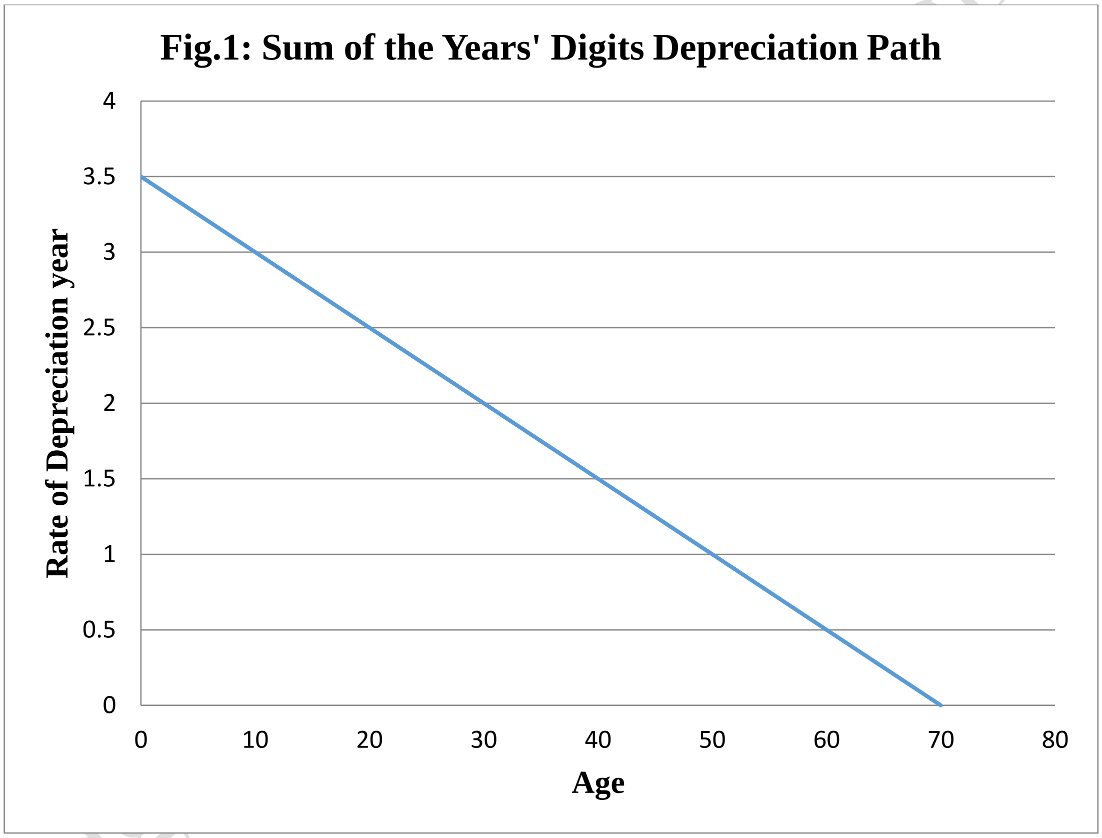
Accrued Depreciation = (Age/Useful Economic life)* Replacement Cost.

The sum of the years' digit is another age based method which estimates depreciation on the premise that an asset will depreciate at a higher rate during the initial years of the asset's life than at latter years. The path of depreciation implied by this method as shown in figure 1 is supported by the empirical studies conducted by Hulten and Wycoff (2001) and Follain and Malpezzi (2003). It is given by the formula;

Accrued Depreciation = N (N-1) /1 - Life (Life+1)

Where N is the number of years remaining at any particular time given as (Life+1)-Age

Rate of Depreciation against Age

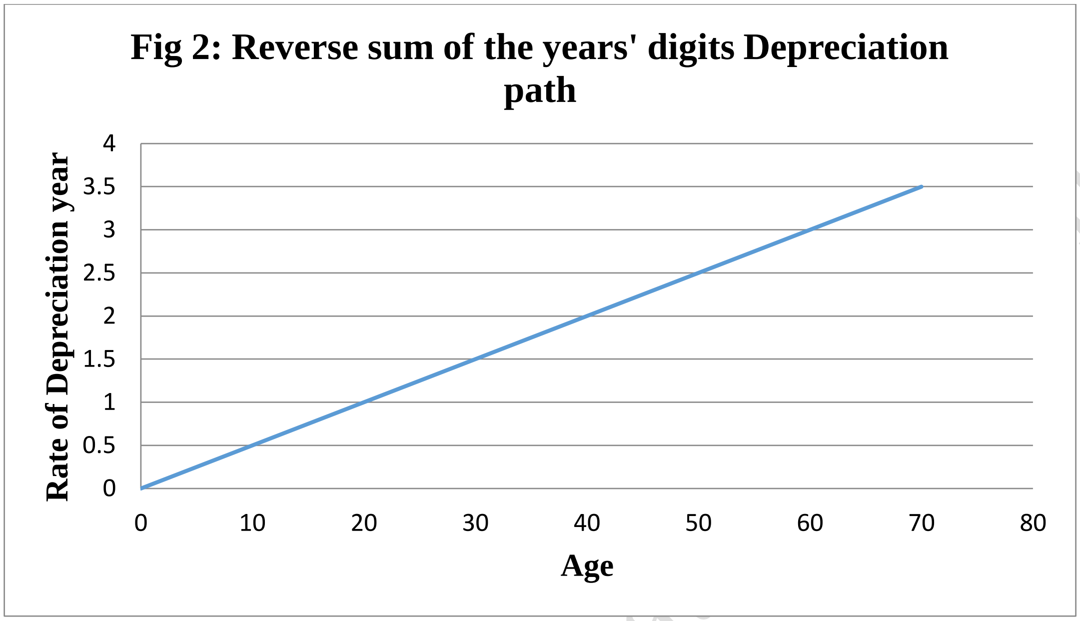


Source: Authors' Analysis, 2020.

A third method that also incorporates the age variable is the Reverse Sum of the Years' digit. This method presupposes that depreciation is slower initially and more pronounced later. The path of depreciation implied by this method as depicted in figure 2 below is supported a number of empirical studies. See Jones et al (1981), Taubman and Rashe (1989) and Connaday and Sunderman (1996). This is given by the formula below;

Accumulated Depreciation =Age (Age+1)/ life (life+1)

Rate of Depreciation against Age.



Source: Authors' Analysis, 2020.

It is evident from the above that the method of depreciation that closely models the impact of depreciation over the life of an asset is either the sum of the years' digits or the reverse sum of the years' digit. It must be noted that the empirical studies relied on mostly based on data from the US and may therefore not be a true representative of the Nigerian situation. There is therefore the need to carry out studies based on data from the Nigerian market to determine which of these methods is supported by empirical evidence. Until this is done, a consensus will have to be reached on which of these methods should be adopted in valuation practice in Nigeria.

For the purposes of this paper however, the reverse sum of the years' digits is the assumed path of depreciation adopted. Does age tell the entire story about depreciation? Before we answer this question, let's consider the following; two very similar properties are put up in the same year. One is well kept whiles the other is poorly maintained. If we base the estimate of depreciation solely on the age variable, the two properties will undoubtedly have the same amount for accrued depreciation. But is this really tenable given the fact that the conditions for the two properties are different, certainly, not tenable.

How can we account for the differences in the conditions of the two properties? This leads us to explore the other causes of depreciation; namely physical deterioration and obsolescence.

Physical Deterioration

Physical deterioration as a cause of depreciation is the result of wear and tear from usage and deterioration with age among others. It is important to note that there are two aspects of physical deterioration that need to be distinguished. These are curable and incurable deterioration. For the purposes of this paper whenever physical deterioration is used it means the curable component of deterioration. The incurable component of physical deterioration is taken care of under the age variable. This is to allow for a more explicit estimation of curable deterioration. This approach was adopted by Brueggeman and Fisher (2001). There is no doubt that assets wear and tear in line with usage. What is critical however is how such occurrences can be accurately accounted for in the estimation of accumulated depreciation for valuation purposes.

A common approach is to identify the defects in the assets which when rectify will restore the asset into a state that is comparable to a similar asset that is new. Such defects are quantified and the amount expressed as percentage of the replacement cost as new of the property to arrive at the rate for physical depreciation.

Obsolescence

As noted by Mansfield (2000), the scope of obsolescence is wide, embracing factors that relate to the structures themselves, the particular site the property occupies and its surrounding area, the statutory and regulatory framework and more subjective, aesthetic issues. What this means is that there is no real consensus on what the term refers to. Baxter (1971), for instance defines obsolescence as a value decline that is not caused directly by use or the passage of time. Mansfield (2000), who quoted Raftery (1991), states that since obsolescence is a function of human perception and decision, the categorization of obsolescence must depend on the person making the assessment. This, in Mansfield's view potentially increases the difficulties because the opinions of investors, occupiers and researchers may be widely divergent and unlike physical depreciation, cannot be objectively evaluated. Notwithstanding the apparent difficulty in defining obsolescence, it can be grouped into two main types; functional and external obsolescence.

For the purposes of this paper however, we shall deal with only functional obsolescence for the simple reason that it is this type of obsolescence that according to the IVS Guidance notes should be taken account of in valuations. The merit or otherwise of this position could be the subject of a debate. Functional depreciation is defined by Barreca (1999) as the loss in value (i.e. depreciation) resulting from a relative deficiency of the asset to function for its intended purpose. Such a deficiency could be the result of changing consumer expectations and the availability of new and more efficient designs among others.

It should be obvious that an objective estimation of functional depreciation will be very difficult if not impossible. This is because achieving a consensus on the extent to which a property is deficient in functioning as intended will be unlikely. The suggestion here is to leave this to the judgment and experience of the appraiser. Functional obsolescence is usually a gradual process and requires time to fully become evident in a property. This makes it quite closely related to age though such a correlation is not automatic. In other words, an asset can be very old but still very functional.

An approach that has been adopted in the estimation of functional obsolescence is to estimate the extra cost that is incurred in using the property in question as compared to using a similar more efficient property (Brueggeman and Fisher 2001). The correct estimate of functional obsolescence through this approach depends largely on the appraiser's experience in the market, his knowledge of the existence of more efficient properties and his appreciation of the functionality of properties.

Total Accumulated Depreciation

Up till this stage, depreciation has been looked at in terms of its causes. What is ultimately important in the estimation of value via the cost method is total accrued depreciation. How do we estimate total accrued depreciation given the fact that none of the methods discussed so far incorporates all the causes of depreciation. The approach being proposed here is to combine the impact from the various causes of depreciation. That is to say whatever rate is arrived at as accumulated depreciation should take account of age, condition of the property (i.e. level of maintenance) and functional obsolescence. In estimating total accumulated depreciation, we first estimate the depreciation rates for the individual causes of depreciation. In this instance, the reverse sum of the years' digits is adopted for age and functional obsolescence whiles physical depreciation (curable) is estimated using the schedule of maintenance approach. The second step is to combine these rates by taking into account the contribution of each of these to total depreciation. This involves first accounting for the curable physical depreciation before any reduction is made for incurable physical depreciation and functional obsolescence. Such an approach as explained by Brueggeman and Fisher (2001) is important because the estimate for incurable items must be based on the assumption that all curable items are repaired.

Total Accrued Depreciation will then be given by:
1-((1-x)*(1-y))
Where x is the rate of depreciation for curable physical deterioration and
y, rate for age and functional obsolescence

Illustration
To illustrate how the approach being proposed could work, consider a property that is 20 years old and would require about 10% of Replacement cost as new to fix all curable defects.
Functional Obsolescence is estimated at 5% of cost. Total accumulated depreciation can be calculated as follows;

Table 1: Accumulated Depreciation from functional obsolescence.

S/N	Item	Depreciation for Subject Property	Remarks
1.	Age	11.48%	The Property is 20 years old. The method adopted here is the reverse sum of the years' digits and using 60 years as the useful economic life span.
2.	Functional Obsolescence	5%	Extra cost incurred as a result of property inefficiency is estimated

			at 5% of cost over the remaining life of the property.
3.	Level of Maintenance	10%	Based on schedule of repairs, 10% of cost will be required to put the property in a condition as new.

Source: Authors' Analysis

Total Depreciation = 1-((1-0.1)*(1-0.1648))

= 0.2483

= 24.83%

A strict application of the model will imply that a property's value will fall to zero after its economic life. This may in reality not be the case particularly if the property has been well maintained. The use of the valuer's judgment in such a case becomes very crucial. A case can also be made for the incorporation of residual value in the estimation of the age component of depreciation; that is the value the asset will have after its useful economic life.

Conclusion

The proper estimation of depreciation for valuation purposes within the cost approach to value estimate is of crucial importance not only in arriving at correct estimate of value but also has the potential to reduce the variation that usually exist between values declared by valuers on the same property. The three causes of depreciation of interest to appraisers are age, level of maintenance and functional obsolescence. The approach that this paper supports is one that explicitly incorporates all these elements in the process of estimating depreciation. Such an approach provides perhaps the valuer's best estimate of accumulated depreciation for any particular property. We, however, suggest that a further study and discussion be carried out to explore the possibility of developing or adopting a single model that will allow for a more objective estimation of functional obsolescence and age.

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