ARTICLES

The validity of owner-reported property cost as a measure of property values in a developing real estate market, Cameroon

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Abstract

The paucity of objective indicators of property values is pervasive in developing countries. This necessitates the use of proxy measures. However, there are huge gaps in knowledge on the validity of such measures. The main objective of the study reported here is to contribute to efforts aimed at closing these gaps. It does so by testing the validity of 'owner-reported property cost' as a measure of property value. Procedurally, a double log-linear model based on data from Cameroon is used to determine the tenability of 'owner-reported property cost' as a function of known covariates or attributes of property value (e.g., bedrooms, floors, building area and plot size). The attributes or traits are shown to be statistically significant (p =< 0.000) predictors of 'owner-reported property cost'. It is concluded that the owner-reported cost of a property constitutes a valid proxy-measure of its value. Four potential practical applications of the model incorporating this proxy measure and relevant covariates are discussed. First, researchers can use the model where there is a dearth or absence of conventional measures. Second, planning authorities can use it to assess building permit fees and/or real property taxes. Third, the model can be used as a parametric building cost estimator. Finally, the model can serve as a proxy equation that can be used by valuation surveyors to estimate the replacement or reproduction cost of buildings in relevant submarkets.

Keywords: building valuation, building permit, hedonic model, housing trait prices, owner-reported real property cost

1 Introduction

For a long time, the problem of data paucity has encumbered real estate research in Africa and other developing regions. However, the last two decades have witnessed some improvements, resulting in a significant increase in such research. Thus far, most of the studies have focused on Nigeria (e.g., Megbolugbe, 1986; Arimah, 1992; 1996), Ghana (e.g., Fiadzo *et al.,* 2001; Anim-Odame *et al.*, 2006; Owusu-Ansah, 2012) and Egypt (e.g., Daniere, 1994), where some considerable effort has been dedicated to collecting and storing real estate data. Throughout most of the continent such data are either non-existent or of woefully poor quality. Yet, accurate

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real estate data are necessary to facilitate the development planning process. This is especially true with regard to urban development. As Malpezzi and associates (1998, p. 235) contend, any list of urban indicators, short or long, must include information on real estate. One of the most important pieces of information is real estate value. Ideally, this value corresponds with the price a piece of real property (e.g., a house) would command in a competitive or open market setting. This value has also been defined as the amount for which a property should exchange between a willing buyer and willing seller (Mocciaro Li Destri *et al.*, 2012). This definition makes one crucial assumption, namely that both the buyer and seller have complete information on the property and are acting willingly and knowledgeably. This and other relevant assumptions are nullified in African countries, where useable information famine is a defining characteristic. Therefore, strictly speaking, one cannot meaningfully talk of 'real property values' in Africa. Hence, real estate researchers must settle for proxies such as 'owner-reported cost/value' as opposed to direct measures of real property values. However, these proxies are of no use unless they have been vetted for their validity. This is essentially the underlying premise of the study reported in this article.

The use of proxies in real estate research is not new in Africa and other developing regions. Some researchers employ primary and/or secondary data that indirectly measure property value. Such data are elicited through questionnaires or collected by national or regional government data collection agencies (see, e.g., Arimah, 1996; Anim-Odame *et al.*, 2006; Owusu-Ansah, 2012). Far less utilised are non-conventional data and commensurate sources, yet such data and sources are pervasive throughout the developing world. For instance, in Cameroon, a dominant source of data on real property is real estate developers, who report the data as part of the building permit application process.

The accuracy of these data, it must be noted, is unverified or unverifiable, by agents of the state or other interested parties. This raises several questions, among which the following ranks very high: Can nebulously inconclusive pieces of information from disparate building permit applicants help researchers and other concerned entities arrive at logically similar conclusions? To be of more direct relevance for the purpose of the present study, the question can be re-stated as follows: Can owner-reported real property data be considered accurate proxies for the property's true traits? This question speaks to the issue of validity and is central to the study. Specifically, the study evaluates the validity of the owner-reported cost of real property as an accurate measure of property value. The empirical referent of the study is Cameroon. In the next section, the article provides some background information on the study setting and data sources. This is followed by a brief discussion of the concept of construct validity, before previous works analysing housing trait prices, especially in developing countries, are studied. Then, the article focuses on important data and methodological issues of the study, before the author presents and discusses the main findings of the study.

2 Study setting, data and data sources

Study setting: Fako Division. For administrative purposes, Cameroon is divided into ten regions, 58 divisions (Fako being one such) and several subdivisions (Target Map, Online). During the German colonial era, and earlier on during the postcolonial period, Fako Division, shown as Figure 1, was known as Victoria Division, with divisional headquarters in Victoria (present-day Limbe). Today, Fako Division, with its headquarters in Limbe, comprises a total area of 2 060 km^2.

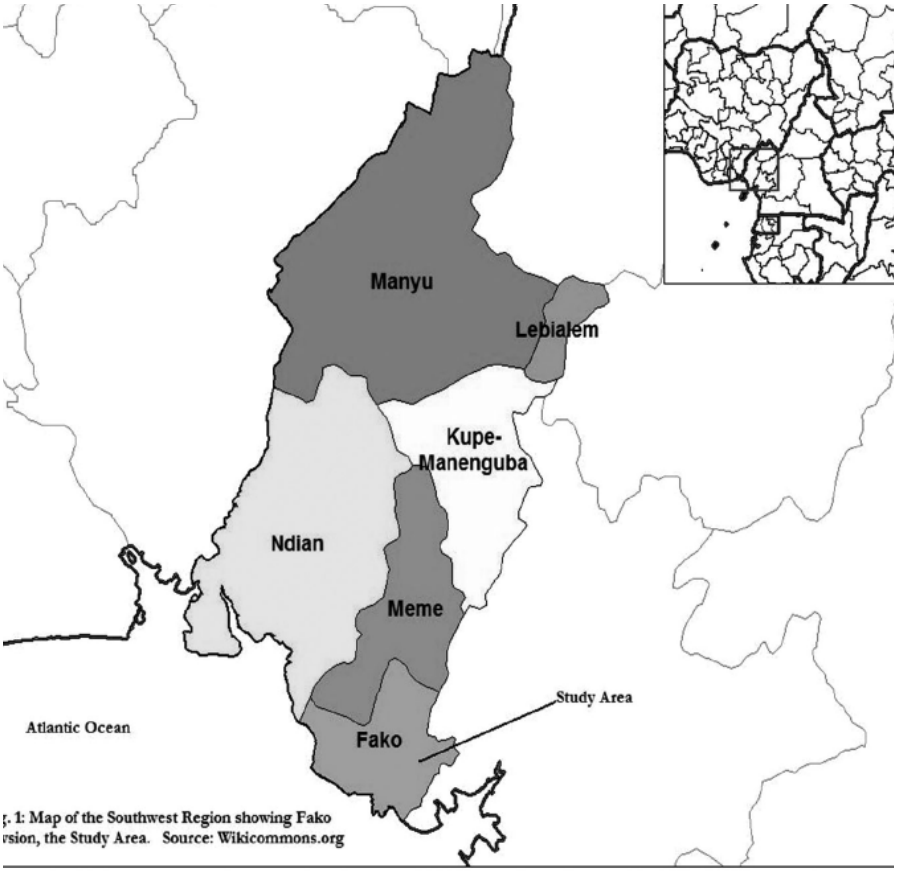

Figure 1: Study area
Source: Wikicommons.org

Current statistics on Cameroon, especially at the sub-national level, are difficult to come by. The only available statistics date back to the mid-1980s. Table 1, which shows relevant statistics for Fako Division, indicates that the region is divided into four sub-divisions, namely Buea, Limbe, Muyuka and Tiko. The division has a density of 119 persons per square kilometer (Target Map, Online). The South West Region, of which Fako Division is a part, has a density of 31 persons per square kilometer. The division's major towns (with a population of at least 15 000 inhabitants) include Limbe, Buea, Tiko, Muyuka and Mutengene. The most recent official population statistics for these towns were recorded in 2005 and are shown in Table 1.

Table 1: Demographic and related statistics for Fako Division as at 2005

Sub-division	Area (Sq. km)	Density (Pers/sq. km)	Main town(s)	Population
Buea	970	70	Buea	90 088
Limbe	185	226	Limbe	84 223
Muyuka	300	126	Muyuka	28 046
Tiko	605	94	Tiko	60 796
			Mutengene	41 063
TOTAL	2 060			304 216

Source: BCREP (Bureau Central des Recensements et des Population, 2010).

The real estate market in Fako. As in other parts of Cameroon, it is undeveloped and therefore saddled with a multitude of problems. The limited scope of this article permits only a brief discussion of the land and housing sub-sectors and their commensurate problems. The government of Cameroon has had a formal comprehensive land law in place since 1974. Notwithstanding, land policy in the country continues to be mired in difficulties, as opportunities to maximise its utility are squandered by the state. A recent study jointly commissioned by the North-South Institute (NSI) and the Canadian International Development Agency (CIDA) lamented the Cameroonian government's inability to capitalise on land's capacity as a revenue source (see Khan, 2010). By law, urban-based real property owners and other entities benefiting from basic public infrastructure are required to pay 1/10th of one per cent (0.1%) of the owner-declared value of their property as taxes annually. Similarly, the law levies an income tax of five per cent (5%) on rental property. The tax is supposed to be paid directly by the tenant of such property.

The failure to systematically and strictly enforce real estate taxation policies in Cameroon has created an endless string of problems. For instance, real property, which is standard collateral for bank and mortgage loans in other countries, is seldom utilised in Cameroon. This is mainly because, by law, land in Cameroon can serve as collateral only if the owner is up to date with property tax-payments. Yet, another problem is that no litigation on land can be entertained in a court of law unless the owner has regularly defrayed all applicable taxes. In practice, as hinted earlier, these lofty laws are seldom enforced, and never with any regularity. One reason for this is the absence of a sound and logical basis for assessing such taxes in the country. Thus, land developers/owners continue to carry out transactions on land for which no taxes have been paid. Typically, these parties pay only the land certificate application processing and related charges.

As for the housing subsector, it is almost devoid of commercial and other institutional developers. Almost all privately supplied housing units are developed by individuals as opposed to the state or formally organised building contractors. This is true of Fako Division and of Cameroon as a whole. Here, as Njoh (1992, 2000) notes, housing units are typically developed by the owner, with the help of family members, friends, paid labourers and journeymen, working under the owner's supervision or that of a relative. Housing units are developed informally or formally. Units falling under the former category are in violation of one or more provisions of the building code in force and typically do not have an approved building plan. In contrast, building units in the latter category have approved building plans and conform to the relevant provisions of the building code. Although it is difficult to determine exact figures because of the absence of official and/or accurate records, a significant number of housing units in Fako Division have no approved building plans. One reason for this is related to the fact that the processes and requirements for obtaining a building permit in the division (and throughout the country) are cumbersome, time-consuming and prohibitively costly (Njoh, 1992, 2000). Amongst the many items potential housing developers must submit as part of the building permit application dossier, is an estimate of the total cost of the proposed building. The cost of approving the plan is computed as a proportion of this cost, which is essentially the unit's 'owner-computed cost'. Usually, this is the only available figure reflecting the cost of the building, due to the difficulty involved in keeping track of other expenditures on the unit – building works are often done in a piecemeal fashion and over extended periods in Cameroon. The importance of the estimated cost of the unit is therefore not limited to its use as the basis for determining the plan approval cost. Rather, it serves as the basis for computing the amount for compensating a property owner in instances of 'compulsory acquisition and compensation', or when the state must destroy the property to develop some public infrastructure (e.g., a road).

Despite its real or potential utility, owner-reported cost has never been scrutinised for its validity. Consequently, the extent to which this cost reflects the 'true value' of a piece of real property is unknown. Also unknown is the relationship of this cost to established covariates of property value. The study reported here seeks to shed light on these and cognate issues, and is particularly interested in the validity of 'owner-reported cost' (of property) as a function of established property traits in the housing market.

3 Computing real property trait prices

One of the best-known approaches to computing housing trait prices employs the hedonic model, which computes the price of a commodity as a function of its various traits. Contrary to popular opinion, A.T. Court, an automobile industry analyst, was not the first to employ a hedonic model to estimate price as a function of commodity attributes. Rather, according to recent evidence uncovered by Colwell and Dilmore (1999), the first application of this model was in land economics, and dates back to 1922, some 17 years before Court's application, and is credited to G.C. Haas, an agricultural economist.

The model has since been used in many fields: in housing, the model has been incorporated into a hedonic price regression framework/approach (also known as the hedonic price index) developed by Lancaster (1966) and refined by Rosen (1974). Ramanathan (1989) draws attention to notable works that employ this approach: Ridker and Henning (1967) employ the model to examine how air pollution affects the value of property; Grether and Mieszkowski (1974) use it to analyse real estate values in the New Haven Metropolitan area of the United States (US), while Ramanathan, Ramm and Smallwood (1975) employ it to study the impact on residential values of proximity to solid waste disposal sites in four communities in Los Angeles, California. Other works employing this approach include Malpezzi, Chun and Green (1998), Guidry and Do (1998), Rutherford and Thomson (1999) and Tu and Eppli (1999).

Within the framework, implicit prices are assigned to a vector of attributes for a class of differentiated products. In this regard, the hedonic price regression framework recognises the multi-dimensional nature of housing. As Knight, Dombrow and Sirmans (1995, online) note, the hedonic regression methodology recognises that housing is a composite product. While the attributes are not sold separately, regressing these attributes on the sales price of the composite product yields the marginal contribution of each attribute to the sales price.

A general specification of the hedonic price mode, as applied to urban housing markets, states the following (Megbolugbe, 1992, 1986): in a competitive housing market, the equilibrium implies that there is a relationship between housing prices, *P*, and a set of attributes that can be indexed from *1* to *n*, characterising the housing units, *Z.* This relationship is captured by the following mathematical equation:

$$P(Z) = P(Z_1, \ldots\ldots, Z_n) \qquad (1)$$

Within this framework, housing attributes are classified into three major categories including a) structural attributes, *S* (e.g., number of bedrooms, bathrooms, kitchens, garages, the wall type, building area and lot size); b) neighbourhood attributes, *N* (e.g., access roads, availability of utility services such as water, electricity, parks and public services); and c) locational attributes, *L* (e.g., socio-economic and political factors such as access to economic opportunities, social status of the community, political stability and viability). Taking account of these attributes, equation (1) can be restated thus:

$$P = F(S, N, L) \qquad (2)$$

To obtain the marginal change in the total price of a housing unit associated with a change in any given attribute, simply compute the partial derivative of the hedonic function with respect to that attribute, holding all other attributes constant. The partial derivatives in this case are equivalent to marginal prices in standard market analysis in terms of the information they provide. Clearly, these mathematical procedures and the results they evoke are well established. It is therefore safe to employ such results as the basis for evaluating the validity of proposed real property measures or indicators. A word on the concept of validity is necessary before employing it here.

4 The concept of validity

The concept is commonly used in the social sciences, but especially in psychology and sociology (see, e.g., Cronback and Meehl, 1955; Hagan, 1997; Messick, 1998; Western and Rosenthal, 2003; Brown, online; Babbie, 2013). The concept comprises four different but overlapping components, including face, content, criterion and construct validity (Hagan, 1997; Babbie, 2013; Brown, online). Face validity speaks to the extent to which an indicator's professed ability to measure some phenomenon satisfies our commonsense knowledge of that phenomenon. In other words, as Hagan (1997) suggests, face validity requires that the following question be addressed: Does the indicator/instrument appear, on its face, to accurately measure what it claims it is measuring? Or, to cite Babbie (2013, p. 151): Does the indicator 'jibe with our common agreements and our individual images concerning a particular concept?' In the context of the present discussion there is considerable consensus regarding the determinants of real property value. Therefore, assessing the face validity of any proposed measure should not be an insurmountable task.

Content validity has to do with elements comprising an indicator designed to measure a phenomenon. More specifically, content validity 'refers to how much a measure covers the range of meanings included within a concept' (Babbie, 2013, p. 152). Criterion validity speaks to the strength of association between an indicator of some phenomenon and a well-established outside measure of that phenomenon. Also known as predictive validity, criterion validity is based on external conditions (Ibid). For its part, construct validity can be defined as the degree to which a measure accurately gauges attributes of a phenomenon under investigation (Cronback and Meehl, 1955; Western and Rosenthal, 2003). In practice, ascertaining construct validity invariably requires a response to the following question about an indicator: Does the indicator, in fact, gauge what it professes to gauge? Whenever this question elicits a response in the affirmative, it must be concluded that the indicator constitutes a valid measure of the phenomenon in question.

The question of validity, therefore, speaks to the extent to which a measure of any phenomenon can be considered apropos. Validity is of interest in social scientific research not only for its own sake. Rather, its importance derives from its ability to validate purported measures of constructs. In particular, it can help researchers address the following question: How is the indicator related to known measures of the phenomenon in question? To meaningfully address such questions, it is necessary to posit a theoretical and empirical relationship between the indicator and the known attributes of the phenomenon. In the case at hand, 'owner-reported cost' of any real property is posited as a valid indicator of the property's 'true' value.

The question raised in this connection relates to how to establish the validity of this indicator. In psychology and sociology, where questions of validity are frequently tackled, ascertaining validity often involves various steps (Western and Rosenthal, 2003: 608): a) determining the extent to which values of the chosen indicator correlate with other established measures; b) demonstrating a pattern of correlations; c) showing that the values of the indicator and the established measures are associated in theoretically predictable ways. These steps were emulated to determine the extent to which the 'owner-reported cost' of a property is a function of the property's trait prices. Note that validity does not depend strictly on actual measurements. Rather, as Hagan (1997) argues, it involves a degree of thoughtfulness because there is seldom any criterion against which to compare the measurements. The same does not necessarily hold true for the case at hand, because measurements or indicators of property values are well established. It is against the most prominent of these indicators that the validity of 'owner-reported cost' as a function of real property traits is tested.

The process by which this test is conducted is guided by the following hypotheses.

1. A positive association is expected between the 'owner-reported cost' of a piece of real property and the property's quantifiable traits.

   Reasoning: Well established in developed countries, this link is expected to be tenable in Cameroon, because quantifiable real property (e.g., housing) traits such as number of bedrooms/storeys and lot size are objective, and therefore less likely to be affected by cultural proclivities.

2. Qualitative housing traits such as location (urban vs. non-urban) and building use (residential vs. commercial) are expected to have no impact on 'owner-reported' property cost.

   Reasoning: It is true that a premium is placed on these qualitative attributes – especially the location – of real property in Western countries, but in African societies such as Cameroon real property is valued more for factors unrelated to location. Prominent among these factors are its origin (e.g., inheritance) and sentimental relevance (e.g., burial ground of forebears).

3. 'Owner-reported property cost' is predictable based on knowledge of established real property attributes.

   Reasoning: Although not verified or verifiable by agents of the state, it is reasonable to expect 'owner-reported cost' to be randomly distributed. Certainly, property owners are likely to devalue their property as a tax-burden minimisation strategy. However, there is no reason to believe that property owners would want to devalue their property to the point that the reported cost appears ridiculous even to the untrained eye. Thus, *ceteris paribus*, 'owner-reported costs' are likely to be tied to the actual cost, and, by extension, to established property traits in some logical fashion.

Before subjecting these hypotheses to statistical tests, it is necessary to shed light on important data and methodological aspects of the study.

5 Data and methodology

The main source of the data employed in the study is the building plan register – a document maintained by town planning departments in Cameroon. The document is used for recording information on plans submitted as part of the application for a building permit dossier. The document contains, *inter alia*, the following data:

The submission date of the application;
A registration number of the building plan (assigned by the planning office);
The area of building plot;
The total floor area of the proposed building;
The number of bedrooms in the building;
The use/purpose of the proposed building (e.g., residential or commercial);
The number of floors/storeys in the building; and
The total estimated cost of the building.

In addition, the document contains the name of the owner of the proposed building (i.e., building permit applicant) and remarks to the effect that the plan was approved or rejected (i.e., whether the permit was granted or denied).

The data, collected in the summer of 2010, entailed simply copying all pages of the register containing information on building permit applications registered between January 1990 and December 1998. The author's first-hand knowledge of the residential housing development domain in Cameroon suggests the following: it typically takes ten to 15 years from the time a building permit application is approved to when the building is actually completed. To conceal the identity of applicants, given that information on building permit applications is treated as confidential in the country, their names were concealed before copying the relevant pages of the building plan register. Only plans for which building permits were granted were included in the study. All accounted for, 385 buildings were included in the survey.

Variables and measurement: Seven variables, one dependent (DV), and six independent (IVs) were included in the study. Four of the IVs are quantitative while two are qualitative. The DV is the estimated or 'owner-reported' cost of the building in millions of francs CFA (Cameroon's local currency).[1] The IVs include: 1) number of bedrooms (BEDRMS), measured numerically from *1* to *n*; 2) number of floors (FLOORS), *1* to *n*; 3) area of the building (BLDAREA); and 4) size of the building plot not occupied by the building (YARD), measured in square meters.

1 $1 = approximately 464 frs CFA as of March 2014.

The latter variable is derived by subtracting the area of the building from the area of the plot. While it is conceivable that the size of the lot on which the building is located has a significant impact on the cost of the building, its effect includes that of the building's area, which is subtracted from that of the plot as a whole, to avoid accounting for this particular trait more than once. The fifth and sixth IVs are qualitative, and include the property's location and use. These binary variables were treated as dummies. Location took on the value '1' (urban) for a property located within a three-kilometre radius of Limbe Township, and '0' (non-urban) otherwise. Limbe, the divisional headquarters of Fako Division, is second only to Kumba as the most populous township in the Southwest Region. The second dummy variable, USE took on the value '1' if the property was for residential purposes and '0' otherwise.

6 Model specification

The general specification of the hedonic price model as applied to urban housing markets was stated earlier [see equation (1)]. The equation incorporates three major categories of variables, namely structural, neighbourhood and social attributes. Equation (2) is a simplified version of the model. A modified version, specified for a developing housing market (see Megbolugbe, 1986, p. 537), is as follows:

$$(P^{\lambda}-1) = \alpha_i = \sum_{i-1}^{m} \alpha_i Z_i^{\lambda} + e \tag{3}$$

Where P is price, the Z_i are housing traits or attributes, and P^{λ} and Z^{λ} represent Box-Cox transformations, α_i are parameters of the model while e is a standard stochastic error term. For a sample of n observations on the untransformed dependent variable, the likelihood function can be seen as the product density of each observation. To obtain estimates of λ, α_0, and α_i, we maximise this function or its log. To obtain the maximum likelihood estimates, any Ordinary Least Square (OLS) regression computer program can be used. By redefining equation (3) above, we obtain:

$$P^{\lambda} = X\beta + e \tag{4}$$

Where the likelihood estimates of the bs are the OLS estimates for the dependent variable, P^{λ}, and the estimate σ^2 for a given λ.

Note that equation (4) is a simple regression model. It is common practice in econometrics to use the regression model to capture the relationship between the sale price of housing units to their attributes (cf, Ramanathan, 1989). More commonly, a multiple regression model of the following form is used:

$$Y_t = \alpha + \beta_1 X_{t1} + \beta_2 X_{t2} + \dots \beta_k X_{tk} + u. \tag{5}$$

Where X_t and Y_t are the t[th] observations *(t = 1 to T)* on the independent variables, respectively; α and β are unknown parameters to be estimated; u is the stochastic term; the subscript t refers to the observation number and varies from 1 to T.

An important objective in the present study is to identify a suitable model for estimating housing trait prices for a developing housing market. A possible model is the log-linear regression model, which can be stated using the variables examined in the study as follows:

$$\text{COST} = \alpha + ß_1 \ln \text{BLDAREA} + ß_2 \ln \text{BEDRMS} + ß_3 \ln \text{FLOORS} + ß_4 \ln \text{YARD} + ß_4 \ln \text{LOCATION} + u \quad (6)$$

I. Differentiating equation (5) above, partially with respect to X_{ti}, we obtain

II. $\delta Y_t/\delta X_{ti} = ß_i$. (7)

Therefore, the regression coefficient $ß_i$ can be interpreted as follows: keeping the values of all other variables constant, if X_{ti} is increased by one unit, Y_t is expected to also increase, on average by $ß_i$ units (if $ß_i$ is negative, Y_t will decrease by $-ß_i$ units) Thus $ß_4$ in equation (6) above can be interpreted as follows: given two houses with the same building area and number of bedrooms, the one with an additional floor is expected to cost, on average, $ß_4$ million CFA francs more.

Alternatively, we can take logarithms of both sides of the multiple regression model presented above and adding an error term thus, obtain the following model (presented below as Model III):

$$\ln Q = \ln Q_0 + ß_1 \ln P_1 + ß_1 \ln P_2 \ldots ß_n \ln P_n + u \quad (8)$$

Substituting P_1, P_2 ... P_n in (6) for the variables examined in the present study, we obtain the following equation:

$$\ln \text{COST} = \alpha + ß_1 \ln \text{BLDAREA} + ß_2 \ln \text{BEDRMS} + ß_3 \ln \text{FLOORS} + ß_4 \ln \text{YARD} + ß_3 \ln \text{LOCATION} + ß_3 \ln \text{USE} + u \quad (9)$$

To estimate (6), we transform Q, P_1, P_2 ... P_n and by using the logarithmic transformation. The resulting equation assumes the form of a standard (linear) multiple regression model.

7 Results

The study reveals that most of the plans approved in study area were for single-family detached units, as opposed to multi-family units. These are generally characterised by shared amenities such as bathrooms, kitchens and latrines. The average number of rooms was 6.44 with a standard deviation of 3.465. The maximum number of floors for the buildings approved during the study period was four. It was also revealed that the approved buildings were generally large. In this regard, the average gross building area was found to be 267.024 m^2, with a standard deviation of 237.056 m^2. The floor area ratio (FAR) for the study area was recorded as 0.363 with a standard deviation of 0.321. An important finding of the study has to do with the estimated cost of approved buildings in the area. In this connection, the average estimated cost of the proposed buildings was \$6,367,212.7.

Recall that this figure is not based on a professional government valuation surveyor's computation. Rather, it has been computed based on figures provided by building permit applicants. The central hypotheses of the study posit that for any given building, such a figure can be considered a valid representation of its 'true value'. The main findings of the study provide a preponderance of evidence to support these hypotheses. Before creating the test models, a zero-order correlation coefficient matrix for all the quantitative variables in the model was generated. This was necessary to ensure that the resultant model was not saddled with multicollinearity-related problems. The data produced from this process are summarised in Table 2.

Table 2: Zero-order correlation matrix of quantitative variables in the model

III. VARIABLE	COST	BLDAREA	BDRMS	FLOORS	YARD
IV. COST	1.000				
V BLDAREA	0.149**	1.000			
VI. FLOORS	0.503**	0.194**	1.000		
VII. BDRMS	0.394**	0.258**	0.407**	1.000	
VIII. YARD	0.034**	0.332**	-0.015	0.006	1.000

** Sig. $p < 0.000$.

As the table shows, no pair of variables is highly correlated, suggesting that the model is free of any multicollinearity problem.

To test Hypothesis 1 of the study, a double loglinear model was generated. The model can be summarised as follows:

LnCOST = 13.140 + 0.154LnYARD + 0.068LnBLDAREA + 0.299LnBDROOMS

t: 3.463** 1.316 3.721***

\+ 1.266LnFLOORS + 0.133LnUSE + 0.097LnLOCATION . …...…. (10)

t: 9.102*** 0.877 1.417

Adj. R^2: 0.320; F-value: 31.133 (sig.: 0.000); **$p <= 0.001$; ***$p <= 0.000$.

A cursory inspection of the model shows that owner-provided cost is positively associated with established housing traits. This is in line with the link posited in Hypothesis 1. Also, note that the owner-provided cost is positively associated with three of the quantifiable attributes of a building in a statistically significant ($p<=0.001$) manner. The three attributes include plot size (YARD), number of bedrooms (BDROOMS) and number of storeys (FLOORS). With the exception of the lack of a statistically significant link between owner-provided cost (COST) and building area (AREA), the findings lend credence to the expectation articulated in Hypothesis 2.

A perusal of the model reveals further useful information. First, it has an adjusted R-squared value of 0.320 (or 32%). This value, a measure of goodness of fit, is very telling; it suggests that established housing attributes/traits account for no less than 32 per cent of the variability in owner-reported building development cost. Second, the F-value associated with the model is 31.133, which is statistically significant at the 0.000 level. This provides further reason to believe, as per Hypothesis 3, that knowledge of building traits constitutes a good basis for estimating the cost of a building, i.e., the (owner-provided) cost of any building can be computed once we know the cost of the various traits of the building. The model can also be used to compute the cost of any given trait once we know the cost of other attributes of the building. For instance, suppose we increase the number of floors in a given building in the region examined, while holding the other variables constant, the cost of the building is expected to rise by 1 266 frs CFA.

8 Discussion

The main contribution of this study is its validation of owner-reported cost of building development as an accurate proxy for gauging a building's value. The cost figures so reported have been shown to relate in a logical and theoretically explicable manner to established property parameters. Thus, it is safe to conclude that the figures have face, criterion, content and construct validity as proxy measures of property values. On the face of it, the owner-reported cost of a building appears acceptable as an accurate reflection of the building's value *ceteris paribus*. There is no logical reason to think that in stating a figure as the cost of the building, an owner pays no attention to the 'true cost' of the materials, or the manual and professional labour that went into developing the building. Alternatively stated, the elements comprising the owner-reported cost cover the range of items necessary for computing a real property's value. Thus, it is safe to conclude that the owner-reported cost of a building passes the content validity test as a measure of the building's value. Furthermore, owner-reported cost, as the main findings of the study show, strongly correlate with established covariates of property values. This suggests that owner-reported property cost possesses criterion or predictive validity as a measure of property value. The question of whether owner-reported cost possesses construct validity, i.e., whether it measures what it professes to measure, cannot be ignored. Based on the foregoing, the response must be in the affirmative.

The significance of the study's main findings can also be appreciated from other perspectives. For instance, the findings provide a basis for comparing housing conditions in developing countries. In this regard, they suggest that housing units in Cameroon compare favourably, especially with respect to size, with those in other developing countries. In this regard, the study reveals that the average number of rooms per unit was about seven rooms (more precisely, 6.44 with a standard deviation of 3.465), which is slightly less than the 8.78 rooms per unit (with a standard deviation of 4.91) for the City of Jos, Nigeria (Megbolugbe, 1986, p. 539), and slightly higher than the 5.67 to 4.78 rooms per unit (with a standard deviation of 3.13) registered for Bogota, Colombia, by Follain and Jiminez (1983, cited in Megbolugbe, 1986, p. 539).

The findings further provide reason for healthy skepticism regarding the transferability of models from developed to less developed real property markets. For instance, it found number of floors as having the largest numeric impact on the standardised cost of a building unit. Holding constant all other independent or predictor variables examined, an increase of 1 standard deviation in FLOORS alone will lead to an increase in COST of 1.266 standard deviations. This is unlikely to be the case in developed countries. Also, the fact that all the housing traits are positively associated with housing cost is inconsistent with the findings reported in developed countries such as the US (see, e.g., Ramanathan, 1989).

The near absence of multi-level structures serving as residential units is also not unique to the study area. Rather, it echoes earlier findings such as Megbolugbe's (1986, p. 539) study of Jos, Nigeria, where 96 per cent of units were of the single level variety. Apparently, the high cost of building vertically as opposed to horizontally accounts for the reluctance to build multi-level structures. As the resulting equation [see (10)] shows, the number of floors in a building has the greatest impact on the cost of the building.

It is also noteworthy that all the signs associated with the resulting model are positive. This finding is inconsistent with the results of at least one previous study. For instance, in a model relating the price of a housing unit to a number of its attributes, Ramanathan (1989, p. 158) found the sign associated with number of bedrooms to be negative. Normally, we would expect (at least based on intuition) that adding a bedroom would result in an increase of the unit's price or value. However, Ramanathan (1989) underscores the importance of interpreting said coefficient on the basis of all else being equal, i.e., the number of rooms increases while the other variables (e.g., area of the building and the number of bathrooms contained therein) are held constant. From this vantage point, it is easy to see how increasing the number of bedrooms, which means sub-dividing the same interior area of the building, can result in a decrease in the value of the property.

We must not, however, lose sight of the fact that the study reported by Ramanathan was conducted in a Western country. In Western cultures, not only are nuclear families the norm, but family units also tend to be smaller. In addition, resources tend to be plentiful, thereby skewing people's preference for fewer but larger rooms. The situation is reversed in non-Western cultures and/or developing societies such as Cameroon, where the limited availability of resources and larger (extended) families dictate a need for more, but smaller, rooms. In other words, houses with more rooms (of course, presumably up to a certain extent, not determined by this study) tend to command a higher value and price.

9 Policy implications and concluding remarks

The importance of the study reported here cannot be overstated. As mentioned earlier, knowledge of housing trait prices is useful in several respects: 1) such knowledge can help potential developers make sound decisions regarding their building plans; 2) it can provide planning authorities with a more logical and accurate basis for estimating the cost of proposed building projects. This will result in significant savings to building permit applicants. Otherwise, building permit applicants must spend large sums of money to remunerate professionals such as quantity surveyors; 3) knowledge of housing trait prices can help local planning authorities make informed decisions on how to increase the density of residential and other areas. Without such knowledge, decisions to encourage horizontal or vertical development are often made arbitrarily. Finally, information on the cost of housing traits is of enormous use to property owners. As it is, developers in Cameroon, for instance, are taking a considerable risk when they underestimate the cost of their properties in order to reduce the cost of a building permit. In the event of loss due to fire or compulsory acquisition by the state, property owners are likely to incur heavy losses, as compensation will be based on the inaccurate and low estimates on file in the planning office.

Biographical note

Ambe J. Njoh holds a PhD. in Planning Studies from University College London (UCL). He is interested in comparative urban studies and regional planning in Africa and has published widely on this theme in all the major urban studies journals. He is the author of about 100 peer-reviewed articles, technical reports, book chapters and 11 books. His most recent book focuses on urban planning and public health in Africa (Ashgate, 2013). Njoh is Professor of Urban and Regional Planning, and Director of the Urban & Regional Planning Program, School of Public Affairs, and Professor of Environmental Science and Policy, School of Geosciences at the University of South Florida, USA. He can be contacted at njoh@usf.edu

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References

Amenyah, I.D. and Fletcher, E.A. (2013). 'Factors determining residential rental prices', *Asian Economic and Financial Review*, vol. 3, no. 1, pp. 39–50.

Anim-Odame, W.K., Key, T. and Stevenson, S. (2006). Measures of real estate values from land registration and valuation systems in emerging economies: The case of Ghana. Paper presented at 'Shaping the Change' XXIII FIG Congress, Munich, Germany, October 8–13.

Arimah, B. (1992). 'An empirical analysis of the demand for housing attributes in a third world city', *Land Economics*, vol. 68, no. 4, pp. 366–379.

Arimah, B. (1996). 'Willingness to pay for improved environmental sanitation in a Nigerian city', *Journal of Environmental Management*, vol. 48, no. 2, pp. 127–138.

Babbie, E. (2013). *The practice of social research* (13th ed.), Wadsworth, Belmont, CA.

Brown, J.D. (Online). 'What is construct validity?', Available at jalt.org/test/bro_8.htm (accessed 10 June 2013).

City (online). 'The provinces of Cameroon as well as all cities and urban communes of over 15,000 inhabitants', Available at http://www.citypopulation.de (accessed 14 June 2013).

Colwell, P.F. and Dilmore, G. (1999). 'Who was first? An examination of an early hedonic study', *Land Economics*, vol. 75, no. 4, pp. 620–626.

Cronbach, L. and Meehl, P. (1955). 'Construct validity in psychological tests', *Psychological Bulletin*, vol. 52, pp. 281–302.

Daniere, A.G. (1994). 'Estimating willingness-to-pay for housing attributes: An application to Cairo and Manila', *Regional Science and Urban Economics*, vol. 24, no.5, pp. 577–599.

Fiadzo, E.D., Houston, J.E. and Godwin, D.D. (2001). 'Estimating housing quality for poverty and development policy analysis: CWIQ in Ghana', *Social Indicators Research*, vol. 53, no. 2, pp. 137–162.

Filali, R. (2012). 'Housing conditions in Tunisia: The quantity–quality mismatch', *Journal of Housing and the Built Environment*, vol. 27, no. 3, pp. 317–347.

Follain, J.R. and Jimenez, E. (1985a). 'The demand for housing characteristics in developing countries: Colombia and Philippines', *Urban Studies*, vol. 22, no. 5, pp. 421–32.

Follain, J.R. and Jimenez, E. (1985b). 'Estimating the demand for housing characteristics: A survey and critique', *Regional Science and Urban Economics*, vol. 15, no. 1, pp. 77–107.

Grether, D.M. and Mieszkowski, P. (1974). 'Determinants of real estate values', *Journal of Urban Economics*, vol. 1, no. 2, pp. 127–145.

Guidry, K. and Do, A.Q. (1998). 'Eminent domain and just compensation for single-family homes', *The Appraisal Journal*, vol. 66, no. 3, pp. 231–235.

Hagan, F.E. (1997). *Research methods in criminal justice and criminology* (4th ed.), Allyn & Bacon, Needham Heights, MA.

Khan, S. (2010). 'Domestic resource mobilization in sub-Saharan Africa: The case of Cameroon', A report of the North-South Institute (NSI), Ottawa, Canada.

Knight, J.R., Dombrow, J. and Sirmans, C.F. (1995). 'A varying parameters approach to constructing house price indexes', *Real Estate Economics*, vol. 23, no. 2, pp. 187–205.

Lancanster, K.J. (1966). 'A new approach to consumer theory', *Journal of Political Economy*, vol. 74, no. 2, pp. 132–157.

Malpezzi, S., Chun, G.H. and Green, R.K. (1998). 'New place-to-place housing price indexes for U.S. metropolitan areas and their determinants', *Real Estate Economics*, vol. 26, no. 2, pp. 235–274.

Megbolugbe, I.F. (1986). 'Econometric analysis of housing trait prices in a third world city', *Journal of Regional Science*, vol. 26, no. 3, pp. 533–547.

Megbolugbe, I.F. (1991). 'Hedonic indices and housing programme benefits', *Urban Studies*, vol. 28, no. 5, pp. 773–781.

Messick, S. (1998). 'Test validity: A matter of consequences', *Social Indicators Research*, vol. 45 (1-3), pp. 35–44.

Mocciaro Li Destri, A.M.L., Picone, P.M. and Mina, A. (2012). 'Bringing strategy back into financial systems of performance measurement: Integrating EVA and PBC', *Business System Review*, vol. 1, no. 1, pp. 85–102.

Njoh, A.J. (1992). 'Institutional impediments to private residential development in Cameroon', *Third World Planning Review*, vol. 14, no. 1, pp. 21–37.

Njoh, A.J. (2000). 'Some development implications of housing and spatial policies in sub-Saharan African countries with emphasis on Cameroon', *International Planning Studies*, vol. 5, no. 1, pp. 25–44.

Owusu-Ansah, A. (2012). 'Examination of the determinants of housing values in urban Ghana and implications for policy makers', Journal of African Real Estate Research, vol. 2, no. 1, pp. 58–85.

Ramanathan, R. (1989). *Introduction to econometrics: With applications*, Harcourt Brace, New York.

Republic of Cameroon. (1986). *VIth Five-Year Economic, Social and Cultural Development Plan 1986–1991*, National Printing Press, Yaounde, Cameroon.

Rosen, S. (1974). 'Hedonic prices and implicit markets: Product differentiation in pure competition', *Journal of Political Economy*, vol. 82, no. 1, pp. 34–55.

Ridker, R.G. and Henning, J.A. (1967). 'The determinants of residential property value with special reference to air pollution', *Review of Economic Statistics*, vol. 49, no. 2, pp. 246–257.

Rutherford, R.C. and Thompson, T.A. (1999). 'What affects mobile home sale prices?' *The Appraisal Journal*, vol. 67, no. 3, pp. 233–237.

Target Map. (Online). 'Population density by administrative division', Available at http://www.targetmap.com/viewer.aspx?reportId=14067 (accessed 17 March 2014).

Tu, C. and Eppli, M.J. (1999). 'Valuing new urbanism: The case of Kentlands', *Real Estate Economics*, vol. 27, no. 3, pp. 42–51.

Western, D. and Rosenthal, R. (2003). 'Quantifying construct validity: Two simple measures', *Journal of Personality and Social Psychology*, vol. 84, no. 3, pp. 608–618.