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Professional Perspective on Contemporary Valuation Techniques in Tanzania: the case of Hedonic Pricing Method

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Abstract

The property valuation industry has embraced various approaches to improve accuracy and provide clients with up-to-date property market information. One such approach is the Hedonic Pricing Method (HPM), which values properties by considering how the public values neighborhood features. Despite HPM's growing influence in global South countries like Nigeria and South Africa, it has received little attention from professional valuers and researchers in Tanzania. This study emphasizes the need for valuers to understand clients' perceptions of property attributes to analyze and interpret the property market effectively. The study evaluates the awareness and adoption of HPM among professional valuers in Tanzania. Data was collected from distributed questionnaires to registered valuers, and statistical analysis was conducted using SPSS software. The findings indicate that most practitioners in Tanzania are unaware of HPM and have not used it in practice. However, they express interest in acquiring knowledge and applying HPM to interpret property values. The study concludes that, when other requirements of understanding and adopting contemporary valuation techniques are met, adoption of HPM will be achieved which will assist in bridging the gap between theory and practice to achieve sustainable property valuation practices.

Key words: HPM; Property Valuation; Sustainability; Neighborhood Attributes; Tanzania

Introduction

The development of modern property valuation practices is highly embedded in the idea that real estate properties are composite goods made up of a variety of distinct features that determine their worth (Abidoye & Chan, 2017). The value that is attached to the property or an asset is highly impacted by unique attributes (Camis-Esakov & Vandegrift, 2018), the uniqueness of the stakeholders (Chen & Jim, 2010), and the heterogeneity nature of the real estate properties (Zhang & Yi, 2017). Therefore, towards attaining valuation accuracy, researchers and professional valuers have developed various multifarious methods which can be used to ascertain the pecuniary value of non-market goods and services i.e., Travel Cost Method, Contingent Valuation Method, and/or the Hedonic Pricing Method (Dahal, et al., 2019).

One of the methods which have been used in practice (in developed economies) is the Hedonic Pricing Method (Huang, et al., 2017), which takes into consideration all marketable and non-marketable features with implications for the value of the property (Abidoye & Chan, 2017). The assumption of this model is, the property buyers pay for more than just the property itself (Liang, et al., 2018), but also other physical and spatial features (McCord, et al., 2018; Efthymiou and Antoniou, 2013; Conroy & Milosch, 2011). The model in practice is mostly used to develop value estimation from the features which indirectly affect its market price, hence trying to bridge the gap between conservative valuation models and modern practices.

The pioneers of the Hedonic Pricing Method (HPM) such as Lancaster (1966) and Rosen (1974) argued that the perfect knowledge of the model is beneficial at the macro-economic level (Fernandez and Bucaram, 2019) as it impacts policymakers, real estate investors, planners, computer scientists, and other stakeholders in housing market sector. At market equilibrium, the model covers structural attributes (Tian, et al., 2017; Yuan, et al., 2018; Lasszkiewicz, et al., 2019; Wen, et al., 2019), utility attributes (Kim, et al., 2015), environmental attributes (Dahal, et al., 2019; Fernandez and Bucaram, 2019; Lasszkiewicz, et al., 2019), accessibility attributes (Efthymiou and Antoniou, 2013), service attributes (Wen, et al., 2019), commercial attributes (Lin and Yang, 2019), and landscape (Wen, et al., 2015). The model can be used in consumer market research (Hirschman and Holbrook, 1982), assessment of property tax using ad-valorem (Berry and Bednarz, 1975), calculating consumer price indices (Moulton, 1996), valuation of electronic devices (White et al, 2004), and valuation of automobiles (Cowling and Cubbin, 1972).

For the past 10 years, Tanzania has been striving to increase the accuracy of property valuation practices through writing its first and implementation of the Valuation and Valuers Registration Act, (2016) and Regulations, formulation and Valuers Registration Board (VRB), adoption of International Valuation Standards (IVS), and International Financial Reporting Standards (IFRS) (Komu, 2017). Despite these and many other achievements in training, registering, and regulating harmonized property valuation practices in the country, there is a lag in the adoption of contemporary valuation practices theoretically and practically (Mwasumbi, 2014). This is evident in practice as little to no research has been conducted so far in the harmony of trying to adjust HPM with the local context environment to implement it in practice.

Komu (2017) underlines the failure of professional valuers to analyze the value of properties by evaluating their existing status and impacts on future values. The inability of professional valuers to factor valuation uncertainty can be bridged by the use of HPM through modeling neighborhood characteristics as a determinant of price or rent (Adair & McGreal, 1996). However, professional valuers are limited by the current state of information management and sharing between cooperating sectors which hinders their ability to use contemporary methods.

The objective of this study is to objectively assess the current state of professional valuers' understanding and use of HPM in Tanzania. The study also highlights the difficulties professional valuers face in putting the model into practice and the significance of doing so once they have acquired an understanding of HPM. To the best of our knowledge, Tanzania has not previously conducted a study with the same objectives, which intends to serve as a framework for streamlining contemporary property valuation methods.

Literature Review

Ridker and Henning (1967) suggested that it was the first analysis of HPM in property valuation when was applied to ascertain the effect of air quality in residential property valuation. However, later studies by Bruce and Sundell (1977) argued that the HPM application in real estate valuation was first introduced in the 1920s. The same stance was supported by Colwell and Dilmore (1999) reporting that the first application of HPM in property pricing appraisal goes back to as early as the 1920s when Haas (1922) employed the method to value farms in Minnesota, United States.

Nonetheless, it is still a matter of scholarly dissension as to whom exactly introduced HPM (Harath and Maier, 2010).

Studies by scholars (i.e., Houthakker, 1952; Oates, 1960; Becker, 1965; Muth, 1966; and Lancaster, 1966) were the first to adopt HPM in real estate appraisal through interpretation of the Court (1939) model which aimed solely on pricing index of automobiles. Later, Rosen (1974) developed the standard economic theory of HPM in property valuation as inspired by the aforementioned scholars. Rosen's study leads to the development of the hedonic equation and derivation of the implicit price of property characteristics as the partial derivative of the hedonic equation concerning that characteristic. Rosen's theory pioneered the adoption of HPM in real estate valuation around the world (i.e., Adair, et al., (1996); Tse and Love (2000); Paz (2003); Mbachu and Lenono (2005); Cebula (2009); Ge (2009); Selim (2008); Ong (2013); Mallick and Mahalick (2015); and Abidoye and Chan (2017)).

Various attempts have been made by scholars in developed economies for the past 100 years to review studies that adopted HPM in property valuation (Abidoye & Chan, 2017). The authors of these studies in the early years (before 1954, between 1955 and 1964, and between 1965 and 1977) in the United States applied HPM in rural farms, urban bare plots, single-family residential properties, and multi-family residential properties (Bruce & Sundell, 1977). However, it was noted that during that time, the adoption was less popular due to handling of model's mathematics manually, since there was an unavailability of computers (Harath and Maier, 2010). Further studies were conducted in Northern Ireland (Adair & McGreal, 1996), Spain (Paz, 2003), the United States (Sirmans, et al., 2005), and New Zealand (Ge, 2009).

The dire changes over the past 20 years around HPM (i.e., application and ensured impacts) in the entire property valuation practices have led to design increased efficiency and reforming monitoring. This has also been geared by the increased application of big data in computer applications and the use of. These changes call for attempts by both professional valuers and academia to pay attention to the achievements made by contemporary valuation techniques in the real estate realm. This study reviews HPM resources, the existing practices, and the perception of professional valuers toward property valuation reform. To the authors' knowledge, however, the number of studies that systematically investigate HPM and the progress it has made in property valuation in developing economies is limited.

The HPM has been widely used for valuing property prices based on locational factors, housing structure, and neighborhood features. This makes the method more flexible and intuitive compared to the most used traditional methods (i.e., market comparison, income method, and replacement cost method). The use of this method in recent development enables us to observe the impact of increasing or decreasing values of variables in the modeling process. The favorability of HPM over other methods by scholars (...) is limited by the evolving nature of the model itself and the changing nature of the real estate and the big data era. al in the new era (...). Therefore, the HPM in the new era has attracted and integrated the advanced theoretical achievements of many disciplines and is continually improving and innovating based on actual demand.

Most cited research articles and literature related to HPM in property valuation are conducted in developed economies with different environments to the economy of Tanzania. Studies have also been conducted in global south countries i.e., South Africa and Nigeria, as mentioned above, but these studies are still few to cover and cite ways in which HPM could be modeled in Tanzania's real estate industry. This study aimed at evaluating professional valuers' perception of HPM in Tanzania since the method is highly relied upon in modern research studies on sustainable property investment, development, and market. This will pave the way for extensions and innovations of the existing mainstream HPM and new techniques respectively in which researchers, economists, and professional valuers can deal with the heterogeneity of the real estate market in the wake of emerging global challenges i.e., climate change.

Methods

This study collected and analyzed data from professional valuers in Tanzania. The Valuers Registration Board's (VRB) category classification of professional valuers was used to determine the sample size, which was then determined using stratified random sampling. This was accomplished by classifying the population of fully registered valuers (FRV), provisionally registered valuers (PRV), and technician valuers (TV) into the three groups mentioned above. The study population consisted of 885 registered valuers, categorized as 240 FRVs, 601 PRVs, and 44 TVs. To estimate population parameters, random selection from each stratum was carried out and pooled into a single research sample. A total of (89) questionnaires were distributed by the researcher, and fifty (50) of those were completed and returned. More than the satisfactory response rate of 50% or more (Dillman, 2000) and between 18% and 60% (Morton et al., 2012), the response rate of 56.2% is present.

In addressing the study, the survey questionnaire of closed-ended questions was designed containing two sections. In the first part, the professional valuers were asked to provide information about their demographic characteristics in terms of educational qualifications, professional status, years of industry cognitive experience, and area of specialization, amongst other information. The following section of the questionnaire survey was for assessing the relationship between research and practice (Hemsley-Brown & Sharp, 2003), and for the awareness and readiness of Tanzanian valuers to adopt the use of HPM in Tanzania. The response of the respondents was received on a five-point Likert scale with options that range from 1 to 5, representing 'strongly disagree' to 'strongly agree', respectively.

To meet the study's research objectives, descriptive and inferential statistics and analysis methods were used. The statistical analysis methods used to analyze the acquired data and draw inferential conclusions from the questionnaire surveys are Mean Score (MS), coefficient of variation (COV), and chi-square test. These statistical analyses were carried out using SPSS software version 20.0 (SPSS Inc., Chicago, USA). Data was coded in Microsoft Excel (Microsoft, USA) before being imported into the SPSS software for analysis and certain calculations.

Findings and Discussion

Professional Valuers Profile

Table 1 below illustrates the profile of the respondents which determines the reliability of the information obtained from the survey. The technical certificate or ordinary diploma represented by 8% of the respondents is the lowest qualification required for practice in VRB, albeit this option is less common due to the tasks and functions allocated to it by legislation (Valuation and Valuers Registration Act, 2016). A total of 76% of the respondents possess a Bachelor's Degree, while only 16% of the respondents pursued Postgraduate studies, which implies that professionals are developing themselves academically at a staggering rate. Furthermore, almost all respondents, 96% indicated to have registered with the VRB, which is mandatory for one to practice in the country. In addition, 76% of the respondents have registered with a local real estate association (Association of Real Estate Profession in Tanzania – AREPTA), but only around a quarter of the respondents were members of both local and international valuation bodies (i.e., AfRES and RICS) which suggests that Tanzanian professional valuers have not broadened their practice beyond borders and collaborated with international valuation bodies to enhance practice.

In terms of years of professional experience which suggests additional empirical skills, knowledge, and understanding of the property market, findings illustrate a total of 58% of the professionals have been practicing in the industry for less than 6 years which indicates that they are new in practice. Also, 32% of the respondents have been practicing in the industry for between 7 and 12 years. The remaining 10% of the respondents possess over 13 years of industry experience. Since the majority of the professional valuers have below 6 years of industry experience, it can be reasonable to assume that most of them are middle-aged and fresh from school, hence are expected to have a good theoretical perspective of the current development in the real estate profession globally, especially of the likelihood of an affinity for the trending contemporary professional valuation practices.

Table 1: Professional Valuers Profile

Variable	Frequency (n)	Percentage (%)
<i>Educational Qualifications</i>		
Technician Certificate	3	6%
Ordinary Diploma	1	2%
Bachelor Degree	38	76%
Postgraduate Degree	8	16%
Total	50	100.0
<i>Membership Status with VRB</i>		
Technician Valuer	3	6%
Professionally Registered Valuer	28	56%
Full Registered Valuer	17	34%
Not Registered	2	4%
Total	50	100.0
<i>Membership in other Professional Bodies</i>		
AREPTA	38	76%
AfRES	6	12%
RICS	3	6%

None	3	6%
Total	50	100.0
<i>Years of industry experience</i>		
0-6 years	29	58.0
7-12 years	16	32.0
13-18 years	5	10.0
19 years and above	0	0.0
Total	50	100.0

Sources: Authors construct (2023)

Awareness of HPM in Tanzania

The findings of the study as illustrated in Table 2 below aimed at ascertaining professional valuers' awareness of HPM and other issues related to it as indicated in the literature review above. More than 46% of the professional valuers either strongly disagree or disagree to be aware of HPM, while 34% are neutral on the issue. On the frequency of use of HPM, no respondent (0%) of the professional valuers indicated adopting this technique in practice. This is contrary to the finding of Abidoye (2017) who concluded that HPM is one of the most widely adopted techniques for assessing environmental factors in the global south. Further, it is indicated that the low usage of these techniques may be connected to a lack of textbooks and research journals that reflect the significance of using the method in the Tanzania property market. More than 50% of the professional valuers indicated this by strongly disagreeing or disagreeing in the questionnaire survey. It is expected that professional valuers to be influenced to use various techniques and methodologies after they have been intensively researched and backed by models which reflect the local property market. However, in a situation where there is no collaboration between researchers and practitioners, professional valuers have to learn by themselves on the job by attending workshops, seminars, training, and conferences.

Furthermore, to findings further indicates that more than 70% of the professional valuers are willing to acquire the know-how of the HPM, whereas about 68% asserted their readiness to adopt the method in practice. This willingness of the professional valuers should be harnessed by the relevant academic institutions, professional bodies, and other real estate stakeholders, and this would expose professionals to global property valuation practices.

Table 2: Awareness of HPM in Tanzania

Statement	Level of agreement (%)					Mean score	Standard deviation
	SD	D	N	A	SA		
Professional valuers are aware of HPM	30.0	16.0	34.0	16.0	4.0	2.48	1.199
Professional valuers use HPM in practice	54.0	22.0	14.0	10.0	0.0	1.80	1.030
Were introduced to HPM while in school	34.0	20.0	20.0	16.0	10.0	2.48	1.374

VRB or AREPTA do organize conferences, seminars/workshops where HPM is discussed	42.0	22.0	16.0	6.0	14.0	2.28	1.429
The basics of HPM are well documented in valuation textbooks and journal articles	36.0	14.0	18.0	20.0	12.0	2.58	1.458
Valuers' willingness to acquire the know-how of application of HPM	12.0	4.0	14.0	12.0	58.0	4.00	1.414
Valuers will adopt HPM in practice after acquiring the know-how	8.0	4.0	20.0	18.0	50.0	3.98	1.270

Note SD – Strongly disagree, D – Disagree, N – Neutral, A – Agree, SA – Strongly agree
Sources: Authors construct (2023)

Further, the study tested the significant relationship between professional valuers' willingness to learn and adopt HPM in relation to their profile. The three distinctive features were educational qualifications, membership with professional bodies, and years of industry experience. This test aimed at obtaining a specific area to achieve objective transformation of property valuation practices towards modernity. Table 3 below illustrates the results of the chi-square test. On the willingness to learn the know-how of HPM, professional valuers with a membership of both local and international valuation bodies i.e., AfRES & RICS have significance with the acquisition of the skills and knowledge at 0.004 level of significance. This substantiates the findings of Abidoye, (2017) in Nigeria which concluded that membership with international professional bodies determines professional competence, hence valuation accuracy.

On the willingness to adopt, the membership of both local and international valuation bodies has strong significance with the influence on valuers' readiness to adopt HPM in practice at 0.007 level of significance. This implies that the more professional valuer cooperates with other stakeholders in Tanzania and the international arena, the more eagerness to adopt the HPM in practice. This is coupled with the years of experience in practice which accounts for a 0.006 level of significance because the longer professional valuers' practices, the more they are eager to try new hypotheses and implement them in practice.

Table 3: Chi-square Test

Variables	X^2 value	Degree of freedom (df)	p-value
<i>Willingness to learn HPM know-how</i>			
Highest educational qualification	9.908	12	0.624
Membership with VRB	4.823	8	0.776
Membership in AREPTA, AfRES, and RICS	29.217	12	0.004
Years of experience	24.631	12	0.033
<i>Willingness to adopt HPM</i>			

Highest educational qualification	11.182	12	0.513
Membership with VRB	3.413	8	0.906
Membership of AREPTA, AfRES, and RICS	27.272	12	0.007
Years of experience	25.364	12	0.006

Sources: Authors construct (2023)

The Prospect of Adopting HPM in Practice

This study successfully reported outstanding results on the perception of professional valuers in Tanzania. The argument is, if professional valuers acquire enough knowledge and skills, with the support of empirical studies, the adoption of contemporary valuation techniques will bring about a paradigm shift in the profession. In Table 4 below, professional valuers were asked to rank the benefits of learning the know-how of HPM and adopting the method in practice. It is with the view of the practitioners that, the adoption of contemporary valuation techniques i.e., HPM would transform Tanzania real estate practices with an MS of 4.20 value. The view corroborates with that of Malaysian professional valuers that optimized that the adoption of contemporary valuation practices transformed Malaysian property valuation practices (Abdullah, et al., 2020). Also, the adoption of HPM will be achieved and sustained when implemented and practices came 2nd with an MS of 4.16, and the use of contemporary valuation techniques being able to reduce the subjective interference nature of capturing all the factors during a valuation assignment was the 3rd with an MS of 3.78. This indicates that learning the know-how and adoption of HPM is viewed as significant to the profession, and can be sustained to improve property valuation practices in the country.

Table 4: Benefits of Adopting HPM in Practice

Factors	Level of agreement (%)					Mean score	Standard deviation	Rank
	SD	D	N	A	SA			
The adoption of HPM in Tanzania will add value and transform the valuation practice in Tanzania	2.0	4.0	10.0	40.0	44.0	4.20	.926	1 st
The adoption of HPM in Tanzania will be sustained when implemented and practiced	4.0	4.0	14.0	28.0	50.0	4.16	1.076	2 nd
The use of HPM can reduce subjective interference in property valuation practice	6.0	6.0	28.0	24.0	36.0	3.78	1.183	3 rd
The adoption of HPM will produce reliable estimates that will be acceptable to valuation report end-users and all stakeholders	4.0	16.0	18.0	24.0	38.0	3.76	1.238	4 th

The adoption of HPM is superior to the traditional valuation methods	6.0	12.0	34.0	14.0	34.0	3.58	1.247	5 th
The adoption of HPM can replicate human skills	2.0	16.0	32.0	24.0	26.0	3.56	1.110	6 th
The use of HPM will reduce the costs involved in carrying out valuation exercises	8.0	16.0	34.0	16.0	26.0	3.36	1.258	7 th

Sources: Authors construct (2023)

Conclusion

The current study aimed to evaluate the existing practices on how professional valuers views contemporary valuation practices, specifically HPM in Tanzania. The little awareness of the method and no use of it in practice indicates the need for a spontaneous shift in the profession. With the record of success in Ghana, South Africa, and Nigeria's property market, there is a need for urgent exploration and addressing of this matter in Tanzania which justifies the need for this study and future in-depth analytical studies. In addition, real estate practitioners are less involved in property valuation research, whereas academics affiliated with universities have been the highest contributors to property valuation research in Tanzania. This remark indicates a gap between the theoretical foundation of property valuation against the practices, and this could be one of the reasons for the real estate industry lagging in the adoption of contemporary valuation techniques. This gap must be filled to reduce the valuation inaccuracy and subjectivity nature of property valuation practices.

The main limitation of the current study is driven by the lack of prior studies in Tanzania which could pave the way for modeling and regression of the property price and its attributes. The issue would bring about the testing of traditional hedonic models towards depicting the fundamental link between these attributes and property prices (Hui, et al., 2012). Therefore, future studies, OLS regression, and spatial econometric modeling will be considered.

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Disclosure Statement

No potential conflict of interest was reported by the authors.

Notes on Contributors

Yusuph Iddi holds a bachelor's degree in land management and valuation from Ardhi University, Tanzania. His research interests include real estate valuation, land tenure, sustainable urban development, settlement development, climate science, and youth development. The author is also

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References

- Abidoeye, R. & Chan, A., 2017. Critical review of hedonic pricing model application in property price appraisal: A case of Nigeria. *International Journal of Sustainable Built Environment*, pp. 1-10.
- Adair, A. & McGreal, J. B. W., 1996. Hedonic modeling, housing submarkets and residential valuation. *Journal of Property and Residence*, 13(1), pp. 67-83.
- Baranzini, A. & Schaerer, C., 2011. A sight for sore eyes: Assessing the value of view and land use in the housing market. *Journal of Housing Economics*, 20(3), pp. 191-199.
- Benson, E., Hansen, J., Schwartz, A. & Smersh, G., 1998. Pricing residential amenities: The value of a view. *The Journal of Real Estate Finance and Economics*, 16(1), pp. 55-73.
- Breard, D., Boennec, R. & Salladarre, F., 2018. Accessibility, local pollution and housing prices. Evidence from Nantes Metropole, France. *Economie et Statistique. Economie & Statistique*, Issue 500-502, pp. 97-115.
- Bruce, R. & Sundell, D., 1977. Multiple regression analysis: history and application in the appraisal profession. *Real Estate Appraiser*, 43(1), pp. 37-44.
- Camis-Esakov, J. & Vandegrift, D., 2018. Impact of a light rail extension on residential property values. *Research in Transportation Economics*, Volume 67, pp. 11-18.
- Chen, W. & Jim, C., 2010. Amenities and disamenities: A hedonic analysis of the heterogeneous urban landscape in Shenzhen (China). *The Geographical Journal*, Volume 176, pp. 227-240.
- Conroy, S. & Milosch, J., 2011. An Estimation of the Coastal Premium for Residential Housing Prices in San Diego County. *The Journal of Real Estate Finance and Economics*, 42(2), pp. 211-228.
- Cordera, R., Coppola, P., dell'Ólio, L. & Ibeas, A., 2019. The impact of accessibility by public transport on real estate values: A comparison between the cities of Rome and Santander. *Transportation Research Part A, Policy and Practice*, Volume 125, pp. 308-319.

- Court, A., 1939. *Hedonic price indexes with automobile example. The dynamics of automobile demand*. New York: General Motors.
- Czembrowski, P. & Kronenberg, J., 2016. Hedonic pricing and different urban green space types and sizes: Insights into the discussion on valuing ecosystem services. *Landscape and Urban Planning*, Volume 146, pp. 11-19.
- D'Acci, L., 2019. Quality of urban area, distance from city center, and housing value. Case study on real estate values in Turin. *Cities (London, England)*, Volume 91, pp. 71-92.
- Dahal, R. et al., 2019. A hedonic pricing method to estimate the value of waterfronts in the Gulf of Mexico. *Urban Forestry & Urban Greening*, Volume 41, pp. 185-194.
- Domigos, D. & Anyfantis, F., 2011. The value of view through the eyes of real estate experts: A Fuzzy Delphi Approach. *Landscape and Urban Planning*, 101(2), pp. 171-178.
- Ge, J., 2009. Determinants of house prices in New Zealand. *Pacific Rim Property Residence Journal*, 15(1), pp. 90-112.
- Haas, G., 1922. *A statistical analysis of farm sales in blue earth county, Minnesota, as a basis for farmland appraisal (Masters thesis)*. *Applied Economics*. Minnesota: University of Minnesota.
- Huang, D. & Qu, C. L. B., 2015. Do bank loans and local amenities explain Chinese urban house prices? *China Economic Review*, Volume 34, pp. 19-38.
- Huang, Z., Chen, R., Xu, D. & Zhou, W., 2017. Spatial and hedonic analysis of housing prices in Shanghai. *Habitat International*, Volume 67, pp. 69-78.
- Kim, H., Park, S., Lee, S. & Xue, X., 2015. Determinants of house prices in Seoul: A quantile regression approach. *Pacific Rim Property Research Journal*, 21(2), pp. 91-113.
- Komu, F., 2017. *Property Valuation Systems and Methods in Tanzania: An Empirical Analysis*. Helsinki, Finland, FIG.
- Lancaster, K., 1966. A New Approach to Consumer Theory. *Journal of Political Economy*, 74(2), pp. 132-157.
- Larsen, J. & Blair, J., 2014. Price effects of surface street traffic on residential property. *International Journal of Housing Markets and Analysis*, 7(2), pp. 189-203.
- Liang, X. et al., 2018. The effects of locational factors on the housing prices of residential communities: The case of Ningbo, China. *Habitat International*, Volume 81, pp. 1-11.
- Ligus, M. & Peternek, P., 2016. Measuring structural, location and environmental effects: A hedonic analysis of housing market in Wroclaw, Poland. *Procedia: Social and Behavioral Sciences*, Volume 220, pp. 251-260.
- Mallick, H. & Mahalik, M., 2015. Factors determining regional housing prices: Evidence from major cities in India. *Journal of Property Residence*, 32(2), pp. 123-146.

- McCord, M. et al., 2018. House prices and neighborhood amenities: Beyond the norm? *International Journal of Housing Markets and Analysis*, 11(2), pp. 263-289.
- Mulley, C. et al., 2016. Residential property value impacts of proximity to transport infrastructure: An investigation of bus rapid transit and heavy rail networks in Brisbane, Australia. *Journal of Transport Geography*, Volume 54, pp. 41-52.
- Mulley, C., Tsai, C. & Ma, L., 2018. Does residential property price benefit from light rail in Sydney? *Research in Transportation Economics*, Volume 67, pp. 3-10.
- Muth, R., 1966. Household production and consumer demand functions. *Econometrica*, 34(3), pp. 699-708.
- Mwasumbi, A., 2014. External Influence on Valuation: Looking for Evidence from Tanzania. *Journal of Land Administration in Eastern Africa*, 2(2), pp. 224-234.
- Oates, W., 1969. The effect of property taxes and local public spending on property values: An empirical study of tax capitalization and the tiebout hypothesis. *Journal of Political Economy*, 77(6), pp. 957-971.
- Ong, T., 2013. Factors affecting the price of housing in Malaysia. *Journal of Emerging Issues Economics Finance Banking*, 1(5), pp. 414-429.
- Ridker, R. & Henning, J., 1967. The determinants of residential property values with special reference to air pollution. *Review, Economics, and Statistics*, 49(2), pp. 246-257.
- Rosen, S., 1974. Hedonic Prices and Implicit Markets: Product Differentiation in Pure Competition. *Journal of Political Economy*, 82(1), pp. 34-55.
- Selim, H., 2009. Determinants of house prices in Turkey: Hedonic regression versus artificial neural network. *Expert Systems with Applications*, 36(2), pp. 2843-2852.
- Sirmans, S., Macpherson, D. & Zietz, E., 2005. The composition of hedonic pricing models. *Journal of Real Estate Literature*, 13(1), pp. 1-44.
- Tse, R. & Love, P., 2000. Measuring residential property values in Hong Kong. *Property Management*, 18(5), pp. 366-374.
- Wen, H., Xiao, Y. & Zhang, L., 2017a. School district, education quality, and housing price: Evidence from a natural experiment in Hangzhou, China. *Cities (London, England)*, Volume 66, pp. 72-80.
- Wen, H., Xiao, Y. & Zhang, L., 2017b. Spatial effect of river landscape on housing price: An empirical study on the Grand Canal in Hangzhou, China. *Habitat International*, Volume 63, pp. 34-44.
- Wilhelmsson, M., 2002. Spatial Models in Real Estate Economics Housing. *Theory and Society*, 19(2), pp. 92-101.

Zhang, L. & Yi, Y., 2017. Quantile house price indices in Beijing. *Regional Science and Urban Economics*, Volume 63, pp. 85-96.