COMPUTATION OF VARIANCE IN RATEABLE VALUE - A REVIEW

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Abstract

Valuation has been defined as both art and science of estimating the worth of interest in a property at a particular point in time and for a specific purpose. While the science is more of exactitude; the art is more of guess works based on the knowledge and experience of the valuers on subject property of valuation. To this extent, there are tendencies that there would be variance in the compared values of a property as submitted by two or more valuers having undergone the process of property valuation. Several studies on non-statutory valuation have used different techniques and approaches for the computation of valuation variance that are either weak, none-reflection of the definition of variance or inconsistency in the approach. This study therefore reviewed the various techniques and approaches of computing the variance of rateable value; a statutory valuation using extant literatures, decided cases and related case studies on variance of rateable value. The findings show that out of the seven techniques that were identified, the margin of variance technique seems to be a strong technique as it reflects the definition of variance. Furthermore, it shows that there are four approaches to the determination of margin of variance and the approach that is consistent in its application was recommended for the computation of rateable value variance.

Keywords *Rateable value, Variance, Techniques, Margin of variance.*

INTRODUCTION

Valuation ratio measures the accuracy of the assessed value in relation to the market value in mass appraisal approach to determining assessed value (Doerner and Ihlanfeldt, 2014; International Association of Assessing Officers [IAAO], 2010, 2013a, 2013b). However, in the discrete individual approach in rating valuation, the accuracy of the assessed valued is measured in terms of the correctness of the assessment among assessors (Almy, 2001; Kelly, 2013). This, which is done by comparing the assessed value on the valuation list with the objector's value during the display of the valuation list (Bond and Brown, 2012; Brown, 2013). The comparing of two of more valuation estimates is referred to as variance in valuation (Adegoke, 2016; Babawale, 2013a, 2013b; Bello and Thomas, 2015; Crosby, 2000; Crosby, Lavers and Murdoch, 1998; Hager and Lord, 1985; Iroham, Oluwatobi and Oloke, 2015; Munshifwa *et al*., 2016). In order to have a holistic view of the subject matter, previous studies on non-statutory valuation and statutory valuation were compared before limiting the focus of this study to ratable value.

Techniques such as range, inter-quartile range, mean deviation, standard deviation, coefficient of variation and Margin of variance have been adopted to measure variance in valuation (Adair *et al*, 1996; Ayedun, 2009; Bello et al., 2015; Boyd and Irons, 2002; Hager et al., 1985). The

adoption of other techniques, other than margin of variance to establish variation in valuation does not reflect the definition of variance in valuation (Atilola *et al.*, 2017; Babawale, 2008; Bond et al., Brown, 2012). According to Skitmore, Irons and Armitage (2007), valuation variance determines the inter-valuer variability. The study of Boyd et al., (2002) seems to be the only empirical study to the best of the researchers' knowledge that their computation of the margin of variance reflects inter-valuer variability; definition given by Skitmore *et al*., (2007). However, the determination of the denominator in the equation used Boyd et al., (2002) to compute the margin of variance is questionable. This was rightly noticed in Atilola *et al.*, (2017) that the inconsistency in the determination of the denominators when computing the margin of variance, which resulted into different margin of variance. This could result to inconsistency in determining margin of variance. Thus, this study would enhance the technique(s) and approaches of determining a fair margin of variance by asking the questions: what are the appropriate techniques for computing valuation variance and what is the best approach to computing valuation variance.

Methodology

Data for this study were sourced by secondary means via documentary review of related literature as postulated by Tobi, (2014). The quantitative data so obtained were further analysed by the use of tables from which inferences, deductions and conclusions could be drawn. The drawing of conclusions from the qualitative data is the result; according to Miles and Huberman, (1994).

Techniques used for Determining Valuation Variance in Previous Studies

The techniques that are often used in determining the degree of valuation variance include range, inter-quartile range, mean absolute error, average error, deviation from mean, standard deviation, coefficient of variation and margin of variation (Adair *et al*., 1996; Ayedun, 2009; Babawale, 2008; Bello et al., 2015; Boyd et al., 2002; Hager et al., 1985; Munshifwa *et al.*, 2016; Nasir, 2006). The detail of each of the techniques is given below:

Range

Range as a method of determining variance is the difference between the highest and lowest value in a sample or population. It is usually expressed as:

$$Range = Hv - Lv \quad \textbf{(1)}$$

Where:
Hv = Highest value
Lv = Lowest value

This technique was used by Ogunba and Ajayi (1998) and Ayedun (2009) to assess the differences in values among a group of valuers in their studies. If range is to be used in property rating valuation to determine the discrepancy in assessed value, the highest and lowest values between the rateable value on the draft valuation list and the objector value. Range as a technique for determining variance in valuation is straightforward and easy to understand. However, the result is often influenced by extreme values (Kothari, 2004).

Inter-quartile range

The interquartile range as a means of determining variance in valuation, tries to overcome the problem of extreme values that is associated with the range. The interquartile range cuts off the top and bottom by 25% of values, and calculates the range on the remaining 50% value. However, interquartile range suffers from the losing out half of the data. Nevertheless, the technique was exploited by Ogunba et al., (1998) to evaluate variances in valuation.

Average error and mean absolute error

The average error and mean absolute error is one of the methods adopted in the measurement error (Babawale and Ajayi, 2011). These techniques could be used to determine variance in rateable value.

The average error could be used to measure the percentage difference between rateable value on the draft valuation list and the objectors' rateable value. It assesses bias towards under-valuation or over-valuation. This could be the best method for evaluating equity in assessment. In the rating valuation environment, the average error can be expressed as:

$$Average\ Error = \frac{\sum(VLRV - ORV)}{n} \quad \textbf{(2)}$$

Where:
VLRV = Valuation List Rateable Value
ORV = Objector rateable value
n = Number of rateable hereditaments observed

The mean absolute error is used to identify the degree of error that occurred. In rating valuation, the mean absolute error is used to assess the error that occurred between the assessed value on the draft valuation list and the objector's claim. This can be expressed as:

$$Mean\ Absolute\ Error \sum / \frac{(VLRV - ORV)}{n} / \quad \textbf{(3)}$$

The average error and the mean absolute error are almost the same in their approach. In the latter, the absolute value is taken by ignoring the negative sign, while in the former, it is considered. These methods of evaluating variance in valuation was used by Crosby (2000), Babawale (2008) and Babawale et al., (2011).

Mean deviation
Mean deviation is one of the methods used in determining the discrepancies. It is computed by first determining the mean of all valuations and subtracting each valuation from it and, dividing it by the mean in terms of percentage. From the result obtained, the percentages will be compared to a benchmark that has been previously established. For instance, in the study of Parker (1998) ± 10% was set as the benchmark for determining the variation. Other studies that have used mean deviation to assess valuation variance include Adair *et al.* (1996), Bello et al., (2015) and Udobi, Egolum and Ugonabo (2016). A similarity to the mean deviation is the use of control value to establish variance as done in the works of Hager et al., (1985). Mean deviation is usually expressed as:

$$Mean\ Deviation = \frac{(MV - IV)}{MV} \quad \textbf{(4)}$$

Where:
MV = Mean of the valuation
IV = Individual valuation

Standard deviation
Standard deviation is defined as the square-root of the average of squares of deviation (Field, 2010; Kothari, 2004). Standard deviation is an extension of mean deviation. It is the square root of the squared-sum of the mean deviation divided by the number of occurrences. It is commonly denoted by the symbol 'σ' and it is expressed as:

$$\sigma = \frac{\sqrt{\sum Fi(Xi - X)2}}{\sum Fi} \quad \textbf{(5)}$$

Where:
σ = Standard deviation
∑Fi = Total frequency
Xi = Mean
X = number

Standard deviation is method of measuring dispersion of valuation from the mean. It measures the fitness of the mean i.e., how well the mean represents the data. A small standard deviation relative to the mean value itself is an indicator that data points are close to the mean. The opposite is the case when the standard deviation is large (Field, 2010). Studies conducted by Ogunba et al., (1998), Ayedun (2009) and Ayedun, Ogunba and Oloyede (2011) made use of standard deviation in their data analysis.

Coefficient of Variation
Coefficient of variation is the determination of the relative variation of the sample average of the data, the standard deviation expressed as a ratio of the mean (IAAO,

2013a; 2013b). Coefficient of variance is expressed as:

$$Coefficient\ of\ Variance = \left(\frac{SD}{M}\right)100 \quad \textbf{(6)}$$

Where:
SD = Standard deviation
M = Mean

A recent study of Bello et al., (2015) used this method to determine the variance in valuation that exists in commercial properties. This is often being used as one of the medium for ratio studies in the United States of America (IAAO, 2013b).

Margin of Variation

The margin of variation is often referred to as a margin of error or a bracket in the legal domain. The term 'margin of error' was first used in Singer and Friedlander Ltd v John D Wood and Co (1977), to establish what should be the acceptable level of discrepancies either between valuation and market price or, between valuation and valuation (Babawale, 2013a; Ogunba and Iroham, 2010). In valuation variance studies, variance is often referred to a margin of variation or percentage of variation (Boyd et al., 2002). This medium of determining discrepancies in valuation values has been used in many studies, such as the works of Hutchison *et al.*, (1996), Gambo and Anyakora (2013) and Ayedun *et al.*, (2015), among many others.

In valuation accuracy study, it is usually expressed as:

$$Margin\ of\ error = \left(\frac{MP-VE}{MP}\right)100 \quad \textbf{(7)}$$

Where:
MP = Market Price
VE = Valuation Estimate

In rating valuation, however, it is the value of the property as it appears on the valuation list that is compared with the objector's value (Munshifwa *et al*., 2016). So, it can be expressed as:

$$Margin\ of\ Variance = \left(\frac{VLRV - ORV}{VLRV}\right)100 \quad \textbf{(8)}$$

Where:
VLRV = Valuation list rateable value,
ORV = Objector's rateable value.

From the discussion on the techniques of determining variance in valuation, seven methods were identified. However, only the margin of variation seems appropriate for the determination of variance in assessment rates and it is the only one adopted in this study for the following reasons:

Firstly, the range has been criticised for being influenced by extreme values. So, when the extreme values are so significant, the result will show a large range. The opposite is, however the case when the extreme values are not distant. The inter-quartile range as a method of determining variance in valuation is rejected in this study because of the 25% cut off top and bottom values. The implication of a cut-off is that the number of valuations under interrogation has been reduced by half. By this, the analysis is not comprehensive in terms of the information that were verified. More so, the real value of the range would be reduced, by not showing the true picture in terms of the monetary value that the range depicted. For these reasons they are not suitable for the evaluation of variance in assessment rates.

Secondly, those methods relying on the mean such as, standard deviation, mean deviation and, coefficient of variation, are not advisable because the mean used for the evaluation is questionable. Equally, adding up of the sampled valuations and dividing with the number of samples to obtain the mean is worrisome. Thus is true, since all valuation figures carry some error or uncertainty. Therefore, adding the valuations together to determine the mean may suggest or generate a notion that the mean is true. The mean in the above techniques is similar to the controlled value used by Hager et al., (1985), which has been heavily criticised. The essence of determination of variation is to know the discrepancies that exist in

valuations. That is why Skitmore et al. (2007) have called it an inter-valuer variability. Therefore, an evaluation that is based on mean or control value is not inter-valuer variation.

As regard the average error, this method determines bias, that is, whether there is over-valuation or under-valuation. In assessment of rates variance the goal is not to determine valuation bias, as there is no 'correct valuation' upon which the assessment can be based. For this reason, the method is not considered appropriate techniques for determining valuation variance in this study. Based on the rejection of the average error, the mean average error too cannot be endorsed for the evaluation of rateable value variance because the platform for its use is similarly questionable.

Computation of margin of variance

Computation of the margin of variance is the determination of the variance existing between two or more valuations. An issue that may hinder effective use of margin of variation for determination of objection and appeal cases is its calculation (Atilola et al., 2017). If wrongly computed, it may cause more confusion than the problem it is meant to solve. The introduction of the doctrine of margin of error is to help ascertain the accuracy of valuation to the market price or correctness of valuation to valuation (Ayedun, 2009; Fisher, Miles and Webb, 1999; IAAO, 2010).

So, in valuation accuracy studies, the correct value is usually the market price, in which case, the error that exists is in the valuation. This is measured in relation to the market price (see equation 8). This term can hardly be used for variance in valuation because, it is only comparing valuation opinions, and none of the valuations can be said to be right or wrong until a court or tribunal of competent jurisdiction rules on it (see the Interchase Case). In other words, it would be difficult to determine the denominator. As regard the numerator, there is no issue since it is usually an absolute value.

The issue raised above is illustrated with two previous empirical studies. One of these examples is variation in rateable value as depicted by Munshifwa *et al.*, (2016) and the second is on mortgage valuation variance of Boyd et al., (2002) which are revealed in Table 4.1 and Table 4.2 respectively.

Table 4.1 Column 4, is the margin of variance arrived at by the authors using the objector's rateable value (ORV) as the denominator. Column 5, in Table 4.2, however, shows the margin of variance, when the denominator becomes the valuation list rateable value (VLRV). In other words, the computation of column 5 is in line with equation (8), whereas column 4 is a modification to equation (8). The modification to equation (8) is referred to as equation (9) and it is expressed as:

$$Margin\ of\ Variance = \left(\frac{VLRV - ORV}{ORV}\right)100 \qquad \textbf{(9)}$$

Where:
VLRV = Valuation list rateable value,
ORV = Objector's rateable value.

From these two margins of variance, it could be observed that there is wide range in the percentage of variation, most especially in properties 1, 2 and 4. This could be a subject of intense argument between the solicitors and/or valuers representing both parties in objection or appeal case of objection or appeal, when different approaches are used to determine variance. The court or the tribunal may be confused in taking decision on this matter as a result of the two margins of variance on the same property. Such a dilemma may call for legal clarifications from a superior court of competent jurisdiction. The basic disadvantage in this situation is that the time taken to appropriately decide on correct valuation may be very long. This was the situation in determining the appropriate decapitalisation rate in the UK, about the Imperial College case, where it took a good 11 years to resolve the appropriate decapitalisation rate (Bond et al.,2012).

It is worth noting here that, the decision on the correctness of an assessment rate is not just an arithmetic exercise, but part of the legal provisos for the preparation of valuation list. The valuation list is a fiscal document for rating administration. The soundness of this document goes a long way to influence the efficiency of the rating system.

It could be argued that in most objection and appeal cases that pertain to the correctness of the rateable value, the objector's values are often lower than what is on the draft valuation list (Muhammad and Ishak, 2013; Munshifwa *et al.,* 2016). Those that believe in this school of thought will recommend that equation (9) should be used. However, the contrary was the case with Kimbells Ltd v Payne (VO), where the ratepayers believed that £350 was achievable as rateable value, but the Lands Tribunal decided was that £250 was a fair rateable value. So, when the ORV is greater than the VLRV, then how is the margin of variance computed?

Table 4.1 is the information presented by Munshifwa et al., (2016) to establish that variance due exists in rating valuation. The information was further evaluated in Table 4.2 using different approaches of computing margin of variance that have been seen as alternative techniques of determining variance. The computation in Table 4.2 reveals that the different approaches produce different outcomes.

Table 4.1: Evidence of valuation variance in rating

Cases	**Assessed Rateable Value (K)**	**Objector's Value (K)**	**Difference (%)**
Property 1	725,600	497,800	46
Property 2	7,778,000	5,438,100	43
Property 3	2,183,100	1,979,700	10
Property 4	3,330,400	2,000,000	67
Property 5	2,366,000	1,800,000	31

Source: Adopted from Munshifwa *et al* (2016)

Table 4.2: Determining the margin of variance using two approaches

Cases	**VLRV (k)**	**ORV (k)**	**Using equation "9" (%)**	**Using equation "8" (%)**	**Range in margin of variance**
Property 1	725,600	497,800	46	31	16
Property 2	7,778,000	5,438,100	43	30	13
Property 3	2,183,100	1,979,700	10	9	1
Property 4	3,330,400	2,000,000	67	40	27
Property 5	2,366,000	1,800,000	31	24	7

Source: Authors' improvement on outlay from Munshifwa *et al* (2016)

A contrast to Munshifwa et al. (2016) rateable value variance, is that of Boyd and Irons (2002). The study assessed 5 valuation report figures in a mortgage valuation already in litigation. The value estimates of valuers V, W, X, Y and Z were $500 million, $490 million, $380 million, $441.5 million and $450 million respectively. The result for the computation of margin of variance among the 5 valuation figures are shown in Table 4.3. The approach used for this computation was different from the earlier two established in Table 4.2. The same approach was used for column V and column W, while different approach for column X and Y of Table 4.3. The approach used by Boyd and Irons (2002) is expressed as equation (10).

$$Margin\ of\ Variance = \left(\frac{VLRV - ORV}{VLRV\ or\ ORV\ whichever\ is\ smaller}\right)100 \quad \textbf{(10)}$$

Where:
VLRV = Valuation list rateable value,
ORV = Objector's rateable value.

Table 4.3: Margin of variance from five valuers

Valuer	**V**	**W**	**X**	**Y**	**Z**
V	-				
W	2.0	-			
X	31.6	28.9	-		
Y	13.3	11.0	16.2	-	
Z	11.1	8.9	18.4	1.9	-

Source: Adopted from Boyd *et al* (2002)

The approach used by Boyd *et al.,* (2002), reflects the numerator in equations (8) and (9) but the denominator differs from the two preceding equations. In the tenth equation, the denominator is the smaller figure between VLRV and ORV. With this approach, it can then be posited that another approach could be used. The postulated approach here is the use of a higher value as the denominator. This is represented in equation (11) as:

$$Margin\ of\ Variance = \left(\frac{VLRV - ORV}{VLRV\ or\ ORV\ whichever\ is\ higher}\right)100 \quad \textbf{(11)}$$

Where:
VLRV = Valuation list rateable value,
ORV = Objector's rateable value.

To demonstrate further the inconsistency of results from the use of different approaches to the computation of the margin of variation, the data in Boyd *et al*., (2002) was exploited and equations (8), (9), (10), and (11) were used to calculate the variance, as shown in Table 4.4. The result from Boyd *et al*., (2002) is in column two, while column 3 is the approach used by Munshifwa *et al.* (2016). Column 4 and 5 are the likely alternative approaches proposed.

The approach used in column 5 in determining the margin of variation, is similar to that of Ayedun (2009). The approach used by Ayedun (2009) follows the pattern of Hager *et al.,* (1985), where the variance in valuation was determined by reference to a controlled value or mean of the valuation. In the Hager *et al.,* (1985) study, for instance, the denominators are the control value and not the highest or lowest valuation. This concept is based on the assumption of margin of error calculation.

If the acceptable benchmark of ±10% margin of variation posited by Parker (1998), Gambo et al., (2013) and Atilola (2018) is to be adopted as the decision rule, values from column 2 and column 3 only lie within the 30% of the benchmark, while 50% fell within this benchmark in column 4 and 5. In addition, it is only by combining 'VW' and 'YZ' that the outcome of the evaluation could reveal the same result in all the columns. The reason for this is that, the difference between 'V' and 'W' (500 – 490) is 10 and that of 'Y' and 'Z' (450 – 441.5) is 8.5 – both not significant. Since the values of 'V' and 'W' and, that of 'Y' and 'Z' are close to each other, the same outcome is produced irrespective of the approach used.

Table 4.4: Approaches of computing Margin of variance

Combination	Equation (10)	Equation (9)	Equation (11)	Equation (8)
VW	2.0	2.0	2.0	2.0
VX	31.6	31.6	24.0	24.0
VY	13.3	13.3	11.7	11.7
VZ	11.1	11.1	10.0	10.0
WX	28.9	28.9	22.4	22.4
WY	11.0	11.0	9.9	9.9
WZ	8.9	8.9	8.2	8.2
XY	16.2	13.9	13.9	16.2
XZ	18.4	15.6	15.6	18.4
YZ	1.9	1.9	1.9	1.9

From the outcome of the discussions on the two empirical data in the previous studies that were explored, one may conclude that there are about 4 approaches to calculating the margin of variation as shown in columns 2, 3, 4 and 5 of Table 4.4. These are represented by equations (8), (9), (10) and (11), respectively. In order to maintain consistency in the way the variation is computed for rating valuation purposes, the best approach is the adoption of the concept of margin of error because of its consistence in application and it reflects the definition of variance (see equation 8).

However, when the values to be compared are more than two, as in the case of the Meyer, the approach proposed in column 5 of Table 4.4 seems to be the best option. Nonetheless, if other approaches or the one recommended are to be used, it should be implemented as a rule of general application within the rating jurisdiction or area. This will give more reliability to the valuation list.

Conclusion

In conclusion, the study has shown that there are various techniques of evaluating variance in valuation and the most appropriate is the margin of variance. The deficiencies in the techniques used by previous studies were highlighted.

The computation of variance in rateable value seems not to be common as compared to the commercial valuation. Nevertheless, there are about four approaches that could be used; the study submitted that the use of equation 8 seems to be the best approach because of its consistence in its application.

The study has been able to identify the inconsistency in the computation of variance in valuation in previous studies of Boyd *et al*., (2002) that is one commercial valuation and in particular the study of Munshifwa *et al.,* (2016) that was on rateable value. Thus, a consistent approach to the determination of variance in rateable value is suggested.

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