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DETERMINING THE MAGNITUDE OF LAND SIZE ADJUSTMENT IN REAL PROPERTY VALUATION

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ABSTRACT

This paper presents the development of a quantitative technique to determine the magnitude of land size adjustment, based on the ratio between Cumulative Paired Difference of land Price indication (CPDP) and Cumulative Paired Difference of land Size (CPDS). The proposed technique was then empirically tested to evaluate land size adjustment of market comparison data for the purpose of valuing a real property on Jalan Otto Iskandardinata in East Jakarta. The results of empirical test suggest that the magnitude of adjustment produced using Relative Paired Difference (RPD) based technique are coherent with subjective-based adjustment yet is able to reveal the inconsistency of subjective adjustment. Therefore, the developed technique presented in this paper is more advantageous than subjective-based adjustment in terms of improving proportionality and reducing inconsistency when determining the magnitude of land size adjustment. Theoretically, this paper contributes to appraisal literature by allowing analysis of multiple data simultaneously as well as better reflection on price dynamics. Early adoption or implementation at KJPP AKR suggests that the developed technique also serves as a double-checking tool to evaluate the homogeneity and balanced selection of market comparison data.

Keywords: land valuation, relative paired difference, size adjustment.

1. INTRODUCTION

Although adjustments are necessary when conducting valuation using market approach, in order to achieve satisfactory comparability between a valuation object and market comparison data, the standards (methods and/or techniques) are still far from adequate (Normadian, Harjanto, Makhfatih, 2019).

Among practitioners, the magnitude of land size adjustment is often determined subjectively, which is very likely being exposed to the risk of bias. This is probably due to limited quantitative techniques available for use, since site size adjustment received little attention in the appraisal literature (Rabianski, 2005).

Guntermann and Thomas (2006) and Price (2019) presented examples regarding how land size adjustment might be calculated, where the magnitude of the adjustment is a multiplication between the size-difference of two land sites and an adjustment factor (stated in monetary term or a percentage of such monetary base). However, the way of determining such adjustment factor is vague, if not far from clear. In practice, it is frequent that the percentage of adjustment factor is dependent on the valuer’s “wisdom”.

The works of Boykin (1996; 2001) started to consider and showed more explicit link to land price when making adjustment due to difference in land size.

The logic and the importance of accommodating price when making adjustment is reinforced by Spool (2012; 2018), where he presented paired sales analysis. The key point of Spool’s idea is comparing the unit price (such as price per square foot) when making adjustment due to the presence or absence of a certain attribute (or feature). Spool argued that even though paired sales analysis may be considered as the most appropriate method for determining how much the adjustment should be, very few appraisers do it.

It is therefore the purpose of this paper to develop a quantitative technique to determine the magnitude of land size adjustment, in which the ideas coined by Boykin and Spool are accommodated, and then applying the developed technique in a real property valuation setting, followed by an empirical test to evaluate the credibility of the proposed technique.

2. RESEARCH METHOD

2.1 Track of Scientific Work

As highlighted by Rabianski (2005), literature on site size adjustment is very limited, if not scarce. The technique presented in this paper can be traced back and compared to the work of Boykin (1996; 2001) and Spool (2011; 2018), which can be described as follows:

Boykin's concept

Let S_1 and S_2 be the land size of market comparison data, in which $S_2 > S_1$. If the price difference between these two sites is ΔP, then the price difference per unit is equal to:

$$\frac{\Delta P}{S_2 - S_1} \qquad (1)$$

If a valuation object has a size of S_3, where $S_1 < S_3 < S_2$, then the adjustment applicable for the valuation object is:

$$\frac{S_2 - S_3}{S_2 - S_1} \times \Delta P \qquad (2)$$

The foundation of Boykin's concept is similar to the technique presented in this paper, in terms of involving a difference in price, a difference in size, and the ratio between these two. However, the dissimilarities between Boykin's theory and the technique presented in this paper are explained below (see also table 1):

1) Boykin's concept seems only applicable for comparing two size-dissimilar assets; while the technique in this paper can compare multiple size-dissimilar assets.
2) Boykin's theory implies that the size of the valuation object can be stated as the percentage of the size difference of the market comparison data, thus the adjustment can be made proportionally; in contrast, the "pairing" procedure in the technique presented in this paper allows interactions among differences in market data (either plus or minus sign), which will be accumulated at the end of the procedure.

Table 1. Key Dissimilarities with Boykin's Theory

	Boykin's	**RPD-based**
Number of market comparison data	2	Multiple
Principle for adjustment	Proportion	Pairwise, Interacting effect

Spool's concept

Spool's core idea is comparing the unit price (i.e. sales price per square foot) when making adjustment, where the difference in unit price exists due to the presence or absence of a certain [physical] attribute attached to the valuation object as well as the market comparison data.

Let's take a look at the following example to understand Spool's idea. Suppose that we are comparing two property objects, where one of these objects (e.g. object 1) owns attribute A while the other is standard. If the unit price of object 1 is p_1 and the unit price of object 2 is p_2, then the adjustment made due to the presence or absence of attribute/feature A is $p_1 - p_2$.

Similar to Boykin's, the shortcoming of Spool's idea is the concept allows only a comparison of two objects at a time and will be problematic if applied for multiple comparison. Despite this shortcoming, the contribution of Spool's logic on adjustment-making theory is notable.

The author of this paper shares Spool's reasoning in his model of site-size adjustment, in the following ways:

1) Pairwise, meaning that the developed model also paired two market comparison data at a time.
2) Relative, meaning that the magnitude of adjustment is expressed in a relative way, i.e. unit price

The developed technique presented in this paper modifies and further extends Boykin's model yet fits into the frame of Spool's concept.

2.2 Proposed Technique

Suppose that there are *n* market comparison data in which P_i is the unit land price and S_i is the land size of a market data. A particular market data is then paired with its "peers" in order to calculate the difference in both price and size. This step is repeated until all market data have been paired. Thereafter, we will be able to define *Relative Paired Difference* (RPD) as the cumulative land price difference divided by cumulative land size difference, or stated as:

$$RPD = \frac{CPDP}{CPDS} = \frac{\sum_{i=1}^{n}\sum_{j=1}^{n-1} P_i - P_{i+j}}{\sum_{i=1}^{n}\sum_{j=1}^{n-1} S_i - S_{i+j}} \qquad (3)$$

For each market data, the magnitude of adjustment (A_i) is then expressed as a multiplication between RPD and the land size difference between a market data (S_i) and the valuation object (S_{VO}), in other terms:

$$A_i = RPD \times (S_i - S_{VO}) \qquad (4)$$

2.3 Empirical Testing

The proposed technique was applied to: 1) determine the magnitude of land size adjustment of a valuation object towards the collected market comparison data, and 2) to evaluate the consistency of the magnitude of land size adjustments previously determined subjectively by the valuer.

The valuation object is a vacant land of 840 m2 in size, freehold title, and is located on Jalan Otto Iskandardinata in East Jakarta region. The surveyors collected five market comparison data along Jalan Otto Iskandardinata, as stated in table 2. Due to confidentiality reason, the details of the valuation object as well as market comparison data cannot be revealed, thus only exposing directly relevant information to the analysis.

Table 2. Market comparison data

Market Data	Property Type	Land Size (m^2)	Building Size (m^2)	Legal Certificate
Data 1	Land & Building	225	675	Freehold (SHM)
Data 2	Land & Building	257	250	Freehold (SHM)
Data 3	Land & Building	1,518	300	Freehold (SHM)
Data 4	Land & Building	4,868	12,992	Building Right (SHGB)
Data 5	Land & Building	400	500	Building Right (SHGB)

Source: Database of KJPP AKR

In order to get *Net Land Price Indication*, the valuer followed the extraction structure (as indicated by table 3) by first applying discount to each market data and then subtracting the building value (if applicable). Next, the valuer also made adjustment with regards to legal documents if a market data has different type of legal document. Table 4 shows land unit price indication after aforementioned adjustments. Hence, unit land price indication as presented in table 4 become the data that is subject to further adjustments (including land size adjustment) before the valuer comes up with his/her opinion of asset value.

Table 3. Extraction structure for Net Land Price Indication

	Data 1	Data …	Data n
Offered Price			
(Discount)			
Indicated Transaction			
(Building Value)			
+/- Adjustment concerning legal document			
+/- Other adjustments			
NET LAND PRICE INDICATION			

Source: KJPP AKR valuation template (adapted)

Table 4. Land Unit Price Indication

Market Data	Land Unit Price Indication (in Million IDR, rounded)
Data 1	33.1
Data 2	31.0
Data 3	28.0
Data 4	29.8
Data 5	31.3

Source: Database of KJPP AKR

3. RESULTS

Using data displayed in table 4, we are then able to calculate the paired difference in P and S, as shown in table 5 and 6 respectively. Kindly note that the plus and minus signs are merely the consequences of the pairing order. When being used consistently throughout the calculation, these plus and minus signs would have a "balancing effect", in the sense that data with opposite signs will counter each other.

Table 5. Paired Difference of Price (in Million IDR)

	P1	**P2**	**P3**	**P4**	**P5**	**Sum**
P1	*	2.1 (= 33.1-31.0)	5.1	3.3	1.8	12.2
P2		*	3.0	1.8	- 0.3	3.9
P3			*	- 1.8	- 3.3	- 5.1
P4				*	- 1.5	- 1.5
P5					*	
					Total	9.5

Table 6. Paired Difference of Land Size (in m^2)

	S1	**S2**	**S3**	**S4**	**S5**	**Sum**
S1	*	-32 (= 225-257)	- 1,293	- 4,643	-175	- 6,143
S2		*	- 1,261	- 4,611	-143	- 6,015
S3			*	- 3,350	1,118	- 2,232
S4				*	4,468	4,468
S5					*	
					Total	- 9,922

RPD is then calculated by dividing the total value in table 5 with the total value in table 6, where the RPD is 9.5 Million/-9,922 = -958. In order to determine the magnitude of land size adjustments, we simply take the absolute value of RPD (i.e. 958) and then multiply it by the size difference between the valuation object and each of the market comparison data $(S_i - S_{VO})$ as shown in table 7.

Table 7. The Magnitude of Land Size Adjustment

Data	**Size difference compared to valuation object**	**Adjustment (IDR)**	**Stated as % of land price**
1	-615	- 588,949	-1.78%
2	-583	- 558,305	-1.80%
3	678	649,281	2.32%
4	4028	3,857,380	12.93%
5	-440	- 421,362	-1.35%

Thereafter, the author compares the magnitude of land adjustment using RPD against subjective adjustment made by the valuer (see table 8).

As observed in the working paper, the valuer subjectively adjusted difference in site size by multiplying the size difference $(S_i - S_{VO})$ with a certain coefficient, let's say k. This k coefficient can be $\frac{1}{2500}$, $\frac{1}{5000}$ or any other fraction, is entirely the discretion of the valuer. The output of this mathematical operation is a fraction (often stated in terms of percentage) and then directly multiplied with the price indication of a market comparison data. Hence, although the site size adjustment is linked to the price, the relation with the price itself is rather weakly justified, in the sense that the percentage hardly reflect the price dynamic of the market comparison data being selected.

The results suggest that RPD-based adjustment has been able to reveal the inconsistency of subjective land size adjustment. The inconsistency can be explained below.

Let's have a look at data 4 in table 8. As the land size of data 4 is larger than data 1 and 2, the magnitude of the adjustment should be smaller than the percentage of adjustment previously applied on data 1 and 2. However, it was found that the valuer applied larger percent of adjustment on data 4, which seems against the common sense in size adjustment.

Table 8. Comparison between RPD-based and Subjective Land Size Adjustment

Data	**RPD-based Adjustment**	**Subjective Adjustment**
1	-1.78%	-2%
2	-1.80%	-2%
3	2.32%	3%
4	12.93%	16%
5	-1.35%	-4% (revised to -2%)

After being implemented for a while at KJPP AKR, a senior valuer commented regarding the use of the technique below:

"*RPD may also function as a double check of the homogeneity of market comparison data, whether or not the data mix is well balanced*".

As any other technique, RPD also has weaknesses. An identifiable weakness is *symmetricity*, which means when the Cumulative Paired Difference of Land Size (CPDS) or Cumulative Paired Difference in Price (CPDP) is near or equal to zero. CPDS or CPDP near or equal to zero means that the interacting effects of difference in land size or price diminish each other. This shortcoming can be solved by: 1) taking the absolute value of paired differences, or 2) replacing one (or more) data to avoid symmetrical differences.

4. CONCLUSION

This technical note proposes a development of land size adjustment technique, which seems more advantageous to use than subjective adjustment. Although the main idea is comparable and relatable to Boykin's and Spool's theory, the mathematical operations of the technique presented in this paper is arguably distinct. The author empirically tested the technique to adjust the site size of five market comparison data (relative to the object of valuation) along Jalan Otto Iskandardinata in East Jakarta region. The results suggest that RPD-based adjustment produces coherent output compared to subjective adjustment, yet able to reveal an inconsistency (in this case, disproportionality) caused by subjective adjustment.

The theoretical contribution of this paper on appraisal literature is on the further development of the existing methods and/or techniques to determine the magnitude of site size adjustment, where simultaneous analysis of multiple market comparison data is enabled, leading to better reflection of price dynamics.

Pragmatically, the strength or contribution of the technique (found during early adoption or implementation at KJPP AKR) is that it also serves as a double-checking tool to examine the homogeneity and balance of selected market comparison data. Meanwhile, the weakness of the technique concerning symmetricity, can be overcame by taking the absolute value of paired differences and/or selecting another data to avoid symmetricity.

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