



TENKHLEG ZUUCH

HOUSING PRICE INDEX CALCULATION
METHODOLOGY

A. General methodology

In Mongolia, the housing price index is calculated using hedonic regression and clustering method widely used internationally. Currently, two official housing price indexes have been updated on a regular basis. Tenkhleg zuuch LLC updates and uploads the housing price index calculated using hedonic regression on the Mongolbank website on monthly basis and the National Statistical Office updates and uploads the housing price index calculated using clustering method on the statistics database.

Several methods of calculating the housing price index are used internationally. These include:

1. Clustering method
2. Valuation-based methods
3. Hedonic regression method
 - a. Time-Dummy method
 - b. Replacement method
4. Re-trading method.

The research work of "Calculating the Housing Renting Price Index" by Bilguun.S, Davaakhuu.D, Khuslen.B, Tsolmon.O /Mongol Bank/ has studied the above-mentioned methods by comparing their definitions and procedures. It is concluded that the use of hedonic regression and clustering methods is more appropriate in calculating the housing price index in this study. Other methods are described as follows:

- For valuation-based methods, factors such as lack of information, and property valuation not being performed at a high-quality level in Mongolia affect them. For re-trading method, factors such as unavailability of data and numbers, and ineffectiveness in terms of estimates affect them.
- Hedonic regression and clustering methods are the most widely used methods domestically and internationally. Hedonic regression method has a disadvantage of having a complicated calculation, and the clustering method has a disadvantage of losing reliability when some clusters' apartments are too small in number.

Considering the methodology for calculating housing price index:

1. Clustering method: The simplest measure of change in housing prices is the average or median, which is the central trend of price distribution of apartments sold during the period. The housing price index is easy to calculate by the median price because the calculation of median does not need the data of the housing specifics¹.

¹ "Calculating the Housing Renting Price Index" by Bilguun.S, Davaakhuu.D, Khuslen.B, Tsolmon.O /Mongol Bank/

2. Valuation-based method: Valuation-based method is based on the ratio of the sales price and the valuation. If the sale price is the price the apartment sold at the time, the valuation is the valuation of the base period².
3. Re-trading method: This method considers the quality of the structure by comparing the prices of apartments sold more than once more within the scope of the study. The data required when using this method is only the price and sale date information. However, the frequency or cycle of apartment sales must be high.
4. Hedonic regression method: One method of calculating the housing price index is the hedonic regression method that determines the apartment price based on the amount of marginal value willing to be paid for 1 additional unit of housing specifics.

B. Calculation methodology of the researcher

The housing price index was calculated using hedonic regression method based on the findings of the research work of "Calculating the Housing Renting Price Index" by Bilguun.S, Davaakhuu.D, Khuslen.B, Tsolmon.O /Mongol Bank/. The parameters used in the calculation have been extracted from the database of "Tenkhleg zuuch" LLC on a monthly basis.

Hedonic regression method is also divided into the time-dummy variable method and the replacement method, and the former method was chosen for the calculation of the housing price index. If we look at the calculation methodology in details, it is calculated using the following formula:

Time-dummy variable method: The apartment quality is considered to be unchanged over time or the following limitations are applied to each variable of characteristics.

$$\beta_k = \beta_k^0 = \beta_k^t$$

Where: β_k^t – pre-coefficient of kth characteristic in time t

For the time-dummy variable method, the log-line model is widely used. The advantage of this method is that the index value is derived from the pre-coefficient of the dummy variable.

$$\ln p_i^{0,t} = \beta_0 + \delta^t * D_i^t + \sum_{k=1}^K (\beta_k * z_{k,i}^{0,t} + \varepsilon_i^t)$$

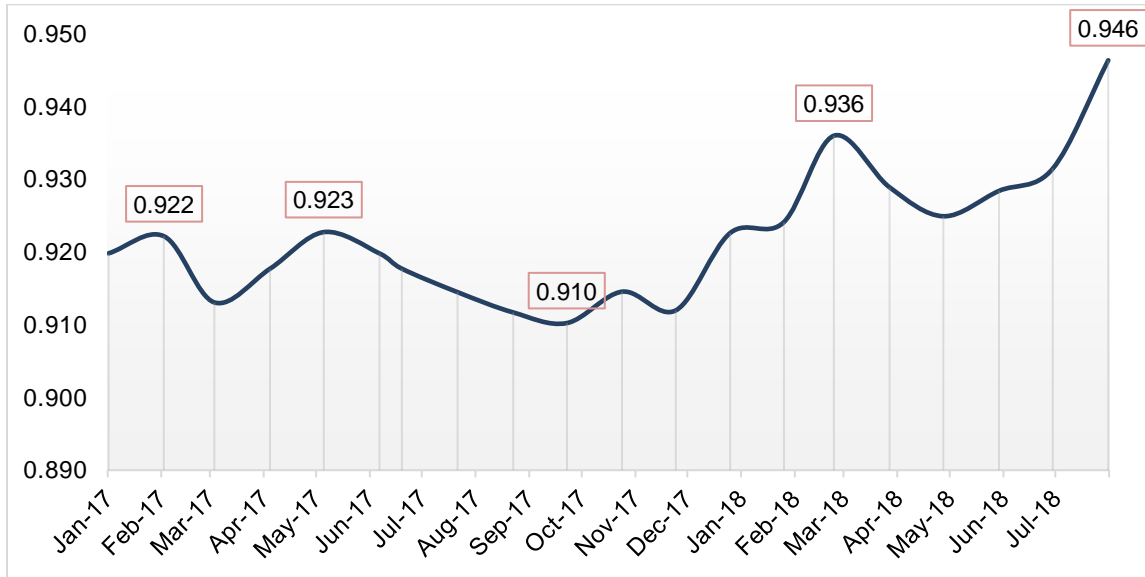
Where: $p_i^{0,t}$ – ith apartment price at times 0 and t; D_i^t is the dummy variable with the value of 0 at base (t=0) and the value of 1 at time t; $z_{k,i}^{0,t}$ is the kth characteristic of the ith apartment at times 0 and t.

² "Calculating the Housing Renting Price Index" by Bilguun.S, Davaakhuu.D, Khuslen.B, Tsolmon.O /Mongol Bank/

The housing price index is calculated as follows:

$$P_{TD}^{0t} = e^{\delta t}$$

Tenkleg zuuch LLC has been estimating and publishing the housing price index since 2013 on a monthly basis making the apartment prices information of this year as the base of calculation.



In Mongolia, housing price index dependent on social, economic and other factors is expected to increase from October 2017, according to the researcher's estimation. The largest increase in the housing price index was in 2014 and 2015, and the researchers consider this to be related to the economic situation and the policies and programs undertaken by the government at that time.