VALUE-BASED WEIGHTS IN RESIDENTIAL PROPERTY PRICE INDEX AGGREGATION: EVIDENCE FROM UZBEKISTAN

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ABSTRACT

Aggregation weights determine how stratum-level housing price movements are transmitted to a national residential property price index. In markets with strong price and transaction heterogeneity, alternative weighting schemes can produce different aggregate signals even when the underlying stratum indices are unchanged. Methods: The study uses 28 stratum indices for Uzbekistan over 2024Q1-2026Q2. The same stratum-level indices are aggregated in parallel using three schemes: value-based proxy weights, transaction-count weights and equal weights. Value-based weights combine notarial transaction counts with annual average asking prices and are applied to the following year. Annual changes in the weight structure are summarized using a half-L1 distance diagnostic. Results: The total weight of primary-market apartments increased from 19.41% in 2024 to 26.95% in 2026, while the share of individual houses declined from 50.32% to 44.62%. Across alternative aggregation schemes, the largest difference between value and transaction-count weighting was 1.061 index points in 2026Q2, and the largest difference between value and equal weighting was 1.671 points in 2025Q3. The weight-composition diagnostic rose from 0.0506 in 2025 to 0.1414 in 2026. Conclusion: Weight selection is a material methodological component of national RPPI compilation. Parallel aggregation provides a transparent sensitivity test, while annual monitoring of weight composition can identify structural shifts that warrant methodological review.

1.Introduction

Residential property markets are heterogeneous across dwelling types, market segments and geographic areas. A national residential property price index (RPPI) is therefore constructed by combining lower-level stratum indices, and the weights used in this aggregation determine how strongly each part of the market contributes to the national result.

International RPPI guidance discusses expenditure, sales-value and stock-value concepts as economically meaningful bases for aggregation (Eurostat et al., 2013). Eurostat house-price index practice likewise relies on transaction expenditure information from an earlier period when constructing weights.

In Uzbekistan's current RPPI compilation, stratum weights are derived from the number of notarial purchase-and-sale transactions and annual average asking prices observed in the listing database. Because the price component is an asking price rather than a realized transaction price, the resulting measure is interpreted here as a value-based proxy weight. This distinction is important: the weight is designed to approximate economic importance, but it is not equivalent to an observed transaction-value weight.

The study asks a practical index-number question: how much does the national RPPI change solely because a different weighting scheme is used? The design therefore holds the 28 underlying stratum indices fixed and changes only the aggregation weights. Three alternatives are compared over 2024Q1-2026Q2: the operational value-based proxy weights, transaction-count weights and equal weights. A second objective is to monitor how the composition of operational weights changes from year to year.

2. Methods

For stratum s and year y, the value component is constructed as the product of the number of notarial housing transactions and the annual average asking price used for weighting:

$$V_{s,y} = N_{s,y} \times \bar{P}^{L}_{s,y} \quad (1)$$

where $N_{s,y}$ is the number of notarial purchase-and-sale transactions and $\bar{P}^{L}_{s,y}$ is the annual average listing price for the stratum. The superscript L emphasizes that the price is obtained from listings. The share derived from year y is used as the weight for quarters of year y+1:

$$w^{V}_{s,y+1} = V_{s,y} / \Sigma_j V_{j,y} \quad (2)$$

The value-based proxy weight incorporates both market activity and price level. A segment with many relatively inexpensive transactions can therefore receive a different national weight from a segment with fewer but more expensive transactions. Listing counts themselves are not used as aggregation weights because they reflect platform exposure rather than the economic value of housing transactions.

Before aggregation, each stratum index is rebased so that the fourth quarter of the previous year equals 100. The national within-year aggregate is:

$$J_t = \Sigma_s w_{s,y} J_{s,t}, \quad \Sigma_s w_{s,y} = 1 \quad (3)$$

The aggregate is then chained to the level of the index in the previous year's fourth quarter:

$$I_t = I_{(y-1,Q4)} \times (J_t / 100) \quad (4)$$

The contribution of stratum s to the aggregate change on the 100-based scale can be represented as $C_{s,t} = w_{s,y} \times (J_{s,t} - 100)$.

To identify the effect of weight choice, three parallel aggregation schemes are used. Equal weights assign 1/S to each stratum. Transaction-count weights use each stratum's share in the number of notarial transactions. Value-based proxy weights use the product of transaction counts and annual average listing prices:

$w^E_s = 1/S$ (5)

$w^N_{s,y+1} = N_{s,y} / \Sigma_j N_{j,y}$ (6)

$w^V_{s,y+1} = (N_{s,y} \bar{P}^L_{s,y}) / \Sigma_j (N_{j,y} \bar{P}^L_{j,y})$ (7)

Because the same 28 stratum indices enter all three calculations, differences between the resulting national series can be attributed to the aggregation weights rather than to different lower-level price movements. Sensitivity is summarized as $\Delta_t^{(V-N)} = I_t^V - I_t^N$ and $\Delta_t^{(V-E)} = I_t^V - I_t^E$.

Annual structural change in the operational weights is monitored with a half-L1 distance:

$VTO_y = 0.5 \times \Sigma_s |w_{s,y} - w_{s,y-1}|$ (8)

The VTO measure ranges from 0 to 1. A value of zero indicates that the weight vector is unchanged from the previous year, while higher values indicate a larger redistribution of aggregate importance across strata.

3. Results

The first result is a visible change in the segment composition of the operational value-based weights. Primary-market apartments increased their combined national weight from 19.41% in 2024 to 26.95% in 2026. Over the same period, individual houses declined from 50.32% to 44.62%, while secondary-market apartments remained comparatively stable and accounted for 28.43% in 2026.

Table 1. Segment composition of value-based proxy weights, 2024-2026

Segment	2024 (%)	2025 (%)	2026 (%)
Primary-market apartments	19.41	22.30	26.95
Secondary-market apartments	30.28	28.66	28.43
Individual houses	50.32	49.04	44.62

The second result concerns national-index sensitivity. Table 2 reports the same 28 stratum indices aggregated using value-based proxy weights, transaction-count weights and equal weights. The exercise therefore isolates the pure aggregation effect of weight choice.

Table 2. National RPPI sensitivity to alternative weighting schemes

Quarter	Value I^V	Transactions I^N	Equal I^E	^V-I^N	I^V-I^E
2024Q1	98.496	98.270	99.485	+0.226	-0.989
2024Q2	100.559	100.484	100.569	+0.076	-0.009
2024Q3	99.274	99.528	98.837	-0.253	+0.437
2024Q4	101.671	101.719	101.110	-0.048	+0.561
2025Q1	103.184	103.683	102.353	-0.499	+0.831
2025Q2	102.715	103.016	101.667	-0.301	+1.048
2025Q3	103.351	104.006	101.680	-0.655	+1.671

Quarter	Value I^V	Transactions I^N	Equal I^E	^V-I^N	I^V-I^E
2025Q4	101.872	102.193	100.953	-0.321	+0.919
2026Q1	105.448	106.155	104.984	-0.707	+0.464
2026Q2	106.772	107.832	106.004	-1.061	+0.768

In 2026Q2, the national RPPI under value-based proxy weighting was 106.772. Using transaction-count weights on the same stratum indices produced 107.832, so the value-weighted result was 1.061 index points lower. Equal weighting produced 106.004, which was 0.768 points below the operational value-weighted result.

The maximum difference between value-based and equal weighting occurred in 2025Q3: 103.351 versus 101.680, a gap of 1.671 index points. The comparison shows that the national signal is not determined only by the direction of stratum-level price movements; it also depends on how much economic importance each stratum receives in aggregation.

The annual weight-composition diagnostic reinforces this result. VTO_2025 equals 0.0506, while VTO_2026 equals 0.1414. Thus, the redistribution of weights across strata was materially larger in 2026 than in 2025. The diagnostic does not by itself identify whether the change is desirable or undesirable, but it provides a compact trigger for reviewing the underlying transaction and price components of the weights.

4. Discussion

The sensitivity analysis demonstrates why weights should be treated as an explicit methodological parameter rather than a routine final step. Even when every stratum index is held constant, alternative weights can change the national RPPI by more than one index point in some quarters. The result is especially relevant for a heterogeneous market because high-priced segments and high-transaction segments need not be the same segments.

Value-based proxy weights have a clear economic rationale: they combine market activity with a price component, allowing expensive segments to contribute more than their transaction counts alone would imply. At the same time, the use of asking prices means that the weights are proxies rather than observed transaction-value shares. This creates a methodological boundary that should be documented transparently. If more complete transaction-value data become available, the operational weights can be benchmarked against those data without changing the sensitivity framework developed here.

Equal weighting is not proposed as a production alternative. Its role is diagnostic. By giving every stratum the same weight, it reveals how much of the national index is generated by the economic-weight structure rather than by an arithmetic average of stratum movements. Transaction-count weighting provides a second benchmark that retains market activity but removes the listing-price component. Together, the two alternatives help decompose the consequences of the operational weighting choice.

The VTO measure adds a temporal monitoring dimension. A larger annual value indicates that the market importance assigned to strata has shifted more strongly. In practice, an unusually large VTO can prompt a review of whether the change reflects genuine market

restructuring, data-source changes, or instability in one of the inputs used to form proxy values. It is therefore best interpreted as a diagnostic signal rather than a normative threshold.

The analysis is limited to the weight schemes and results available in the source calculation. It does not establish that one alternative is statistically "correct" in an absolute sense, and it does not compare the proxy weights with comprehensive realized transaction-value weights. The contribution is instead a controlled sensitivity design: by keeping the 28 stratum indices fixed, it quantifies the national effect attributable specifically to aggregation weights.

5. Conclusion

Aggregation weights transmit the economic structure of the housing market into the national RPPI. For Uzbekistan, the operational value-based proxy weights combine notarial transaction counts with average asking prices, and their composition changed noticeably between 2024 and 2026. The share of primary-market apartments increased, while the share of individual houses declined.

Parallel aggregation shows that these weight choices matter quantitatively. The largest value-versus-transaction-count difference reached 1.061 index points in 2026Q2, and the largest value-versus-equal-weight difference reached 1.671 points in 2025Q3. The annual VTO measure also indicates a stronger redistribution of stratum weights in 2026 than in 2025.

For RPPI production, the practical implication is to accompany annual weight updates with a standardized sensitivity check and a transparent diagnostic of weight-composition change. This does not replace the economic rationale for the operational weights; it makes the effect of that rationale measurable and auditable.

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References:

Eurostat, International Labour Organization, International Monetary Fund, Organisation for Economic Co-operation and Development, United Nations Economic Commission for Europe, & World Bank. (2013). Handbook on residential property price indices. Publications Office of the European Union.

National Statistics Committee of the Republic of Uzbekistan. (2026, July 13). O‘zbekiston Respublikasida uy-joy bozori narx indekslarini hisoblash metodologiyasidagi o‘zgarishlar to‘g‘risida [On changes in the methodology for calculating housing market price indices in the Republic of Uzbekistan].

Eurostat. (n.d.). House price and sales index (prc_hpi_inx): Metadata. European Commission. Retrieved September 9, 2026