Turkish Hedonic House Price Index

by

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OUTLINE

- House Price Index for Turkey (THPI)
  - Data source
  - Methodology
- Measuring Quality Changes and Hedonic House Price Index (THHPI)
  - Motivation
  - Methodology
  - Results
THPI – Data Source
THPI – Data Source
THPI – Data Source
METHODOLOGY

- Stratified Median Price

- Strata can be formed by taking into account location, area, age, type of the properties

  Geographical location constituted the basis for stratification

- Grouping by location is practical

- Variation of prices by location is a key characteristic of housing markets
Weighting:

- Data on house sales in the previous year registered by the General Directorate of Land Registry and Cadastre are used as weights for aggregating the strata in constructing THPI.
- Weights are updated each year.
We also perform Tukey’s Hinges

\[ Q_3 + 3 \times (Q_3 - Q_1) > \text{median unit price} > Q_1 - 3 \times (Q_3 - Q_1) \]

Indexation:

- Chain Laspeyres Index

\[ I^{ty} = \sum_i \left( \frac{\omega_i^y p_i^{ty}}{\sum \omega_i^y p_i^{12(y-1)}} \right) \ast I^{12(y-1)} \]
THPI (2010=100)

35-month, 32.7%

27-month, 39.0%
Why THHPI?

- 2010
WHY THHPI?

➢ 2014
THPI Data Composition – Housing Characteristics

- Changes in quality directly affects house prices
- 39 variables in valuation reports

- Location
- Gross Area of Use
- Year of Construction
- Quality of Construction
- Number of Rooms
- Number of Bathrooms
- Number of Balconies
- Heating System
- Elevator
- Security
- Parking
- ...

[Diagram showing 39 variables]
THHPI- Method

- «Characteristic Prices Approach»
  - *log-linear regression*

\[
\ln p_n^t = \beta_0^t + \sum_k \beta_k^t z_{nk}^t + \varepsilon_n^t, \quad \forall i, t
\]

- \(p_n^t\): n property’s appraisal value in period t
- \(z_{nk}^t\): k\textsuperscript{th} characteristic of appraised property
THHPI - Method

- Same basic methodology with THPI
  - Same stratum with THPI
  - Chained Laspeyres method
  - Tukey’s Hinges method (outlier detection)
THHPI– Method

\[ p_t^i = \frac{\exp(\beta_{0t}) \exp[\sum_k \beta_{kt} z_{nk}^0]}{\exp(\beta_{00}) \exp[\sum_k \beta_{k0} z_{nk}^0]} \]

\( p_t^i \): price index for period t

\( z_{nk}^0 \): average k\textsuperscript{th} characteristics for the base period (all n properties’)

→ Holding characteristics constant => Quality adjusted price index
THHPI - Method

\[ P_i^t = \frac{\exp(\beta_0^t) \exp\left[ \sum_k \beta_k^t z_{nk}^0 \right]}{\exp(\beta_0^0) \exp\left[ \sum_k \beta_k^0 z_{nk}^0 \right]} \]

- \( P_i^t \): price index for period \( t \)
- \( z_{nk}^0 \): average \( k\)th characteristics for the base period (all \( n \) properties')

⇒ Holding characteristics constant => Quality adjusted price index

- January 2012, \( t=0 \)
<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Coefficients</th>
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<td>Gross Area of Use ($m^2$)</td>
<td>0.005</td>
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<td></td>
<td>(0.000)**</td>
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<tr>
<td>Quality of Construction</td>
<td>0.109</td>
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<td></td>
<td>(0.022)**</td>
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<tr>
<td>Year of Construction</td>
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<td></td>
<td>(0.001)*</td>
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<tr>
<td>No. of Bedrooms</td>
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<td>(0.017)*</td>
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<td>No. of Bathrooms</td>
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<td>(0.029)**</td>
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<td>No. of Balconies</td>
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<td></td>
<td>(0.017)**</td>
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<td>(0.045)**</td>
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<td></td>
<td>(0.028)**</td>
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<tr>
<td>Constant</td>
<td>5.655</td>
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<td>(2.040)**</td>
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THHPI – Significance by variables
### THHPI – 7 different models

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<td>✔</td>
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- **Beşiktaş**
  - B.evler
  - Bakırköy
- **Antalya**
  - G.Doğu
- **Pursaklar**
- **Altındağ**
  - Sincan
- **Başakşehir**
  - Beylikdüzü
While THPI was 178.8, THHPI was 160.6 in March 2015. The 18.2 pp difference can be attributed to quality improvements in the housing market.
Quality Change
**THHPI– 3 Main Cities**

<table>
<thead>
<tr>
<th>March 2015</th>
<th>THPI</th>
<th>THHPI</th>
<th>Quality Improvement</th>
<th>CPI</th>
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<tr>
<td>İstanbul</td>
<td>216.7</td>
<td>195.3</td>
<td>21.4</td>
<td>143.3</td>
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<tr>
<td>Ankara</td>
<td>157.0</td>
<td>153.1</td>
<td>3.9</td>
<td>143.8</td>
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<tr>
<td>İzmir</td>
<td>172.5</td>
<td>163.6</td>
<td>8.9</td>
<td>144.5</td>
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</table>
Quality Improvement Levels in Turkey (February 2015, ~57 months)

**Highest Quality Improvement**

- TRA1 (Erzurum, Erzincan, Bayburt) 21.6
- TR10 (İstanbul) 21.4
- TR32 (Aydın, Denizli, Muğla) 19.5
- TRC1 (Kilis, Adıyaman, Gaziantep) 19.2

**Lowest Quality Improvement**

- TR82 (Çankırı, Kastamonu, Sinop) -0.1
- TRC2 (Diyarbakır, Şanlıurfa) 2.7
- TR51 (Ankara) 3.9
- TR63 (Hatay, K.maras, Osmaniye) 4.0
Quality Improvement/ Price Increase (February 2015, ~57 months)

**Highest Ratio %**
- TR81 (Zonguldak, Bartın, Karabük): 33.3
- TRB1 (Bingöl, Elazığ, Malatya, Tunceli): 32.3
- TR32 (Aydın, Denizli, Muğla): 28.6
- TR21 (Edirne, Kırıkkale, Tekirdağ): 28.2
- TRA1 (Erzurum, Erzincan, Bayburt): 26.8

**Lowest Ratio %**
- TR82 (Çankırı, Kastamonu, Sinop): -1.0
- TRC2 (Diyarbakır, Şanlıurfa): 4.0
- TR51 (Ankara): 5.7
- TR72 (Kayseri, Sivas, Yozgat): 7.0
- TR63 (Hatay, Kahramanmaraş, Osmaniye): 7.0
Results

- Roughly, **1 out of 4** share of nominal house price increases in **Turkey**, in aggregate, and **1 out of 5** share on nominal house price increases in **İstanbul** are resulted from quality improvements.

- In 57 months period,
  - Real KFE: 35.7 pp, or %25.0
  - Quality Imp.: 18.2 pp, or %11.3
  - Pure Rise: 17.5 pp, or %12.3
THANK YOU

STATISTICS DEPARTMENT
## Average Characteristics

<table>
<thead>
<tr>
<th></th>
<th>İstanbul Jan.12</th>
<th>İstanbul Feb.15</th>
<th>Ankara Jan.12</th>
<th>Ankara Feb.15</th>
</tr>
</thead>
<tbody>
<tr>
<td>Price (‘000 ₺)</td>
<td>137.3</td>
<td>209.0</td>
<td>103.8</td>
<td>142.9</td>
</tr>
<tr>
<td>Gross area of use (m²)</td>
<td>96.39</td>
<td>89.96</td>
<td>117.19</td>
<td>118.15</td>
</tr>
<tr>
<td>Quality of construction</td>
<td>0.58</td>
<td>0.54</td>
<td>0.44</td>
<td>0.49</td>
</tr>
<tr>
<td>No. of bedrooms</td>
<td>2.52</td>
<td>2.39</td>
<td>3.02</td>
<td>3.02</td>
</tr>
<tr>
<td>No. of bathrooms</td>
<td>1.24</td>
<td>1.22</td>
<td>1.23</td>
<td>1.28</td>
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<tr>
<td>No. of balconies</td>
<td>1.11</td>
<td>1.02</td>
<td>1.68</td>
<td>1.64</td>
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<tr>
<td>Security</td>
<td>0.15</td>
<td>0.16</td>
<td>0.04</td>
<td>0.05</td>
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<tr>
<td>Heating</td>
<td>0.91</td>
<td>0.87</td>
<td>0.91</td>
<td>0.86</td>
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<tr>
<td>Elevator</td>
<td>0.45</td>
<td>0.52</td>
<td>0.34</td>
<td>0.44</td>
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</table>
Discussion

Share of New Apartments

%  
40  
38  
36  
34  
32  
30  
28  
26  
24  
22  
20  

2010  2011  2012  2013  2014

- TR
- İstanbul
- Ankara
- İzmir

30.9
30.1
26.9
21.7
39.2
36.0
33.8
31.2
Discussion
Discussion
Discussion