



**TÜRKİYE CUMHURİYET
MERKEZ BANKASI**

Is There a Housing Bubble or a Quality Boom in Turkey? Evidence from Hedonic Price Adjustment

by

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OUTLINE

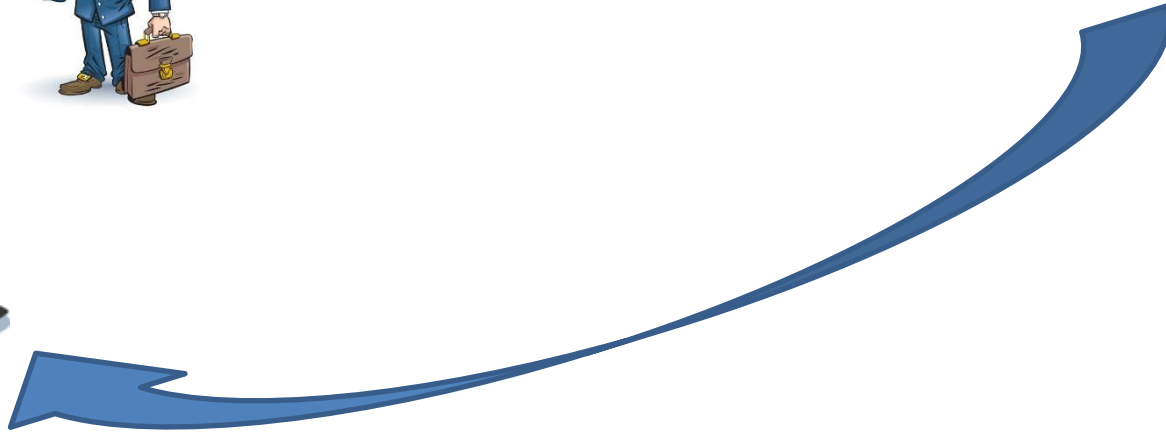
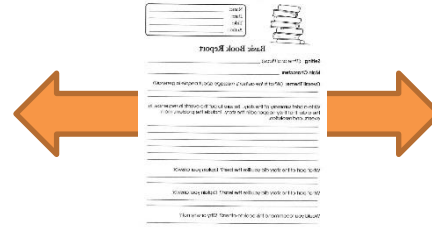
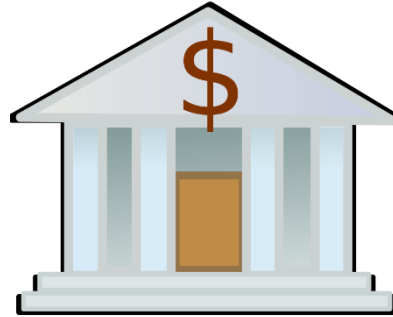
- House Price Index for Turkey **(THPI)**
 - Data source
 - Methodology
- Measuring Quality Changes and Hedonic House Price Index **(THHPI)**
 - Motivation
 - Methodology
 - Results

THPI - Data Source

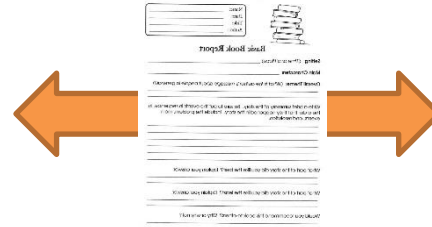
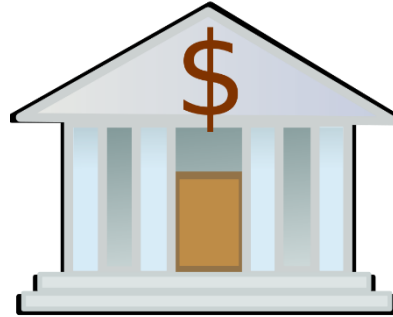
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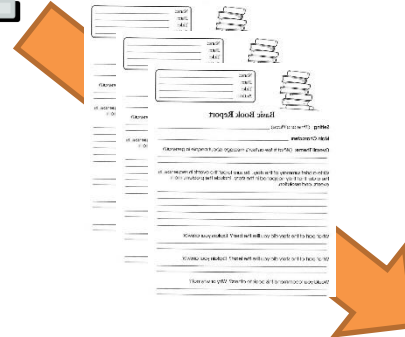
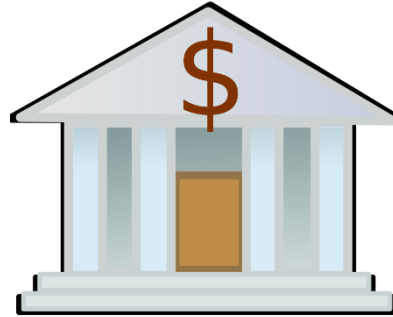
THPI - Data Source



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**

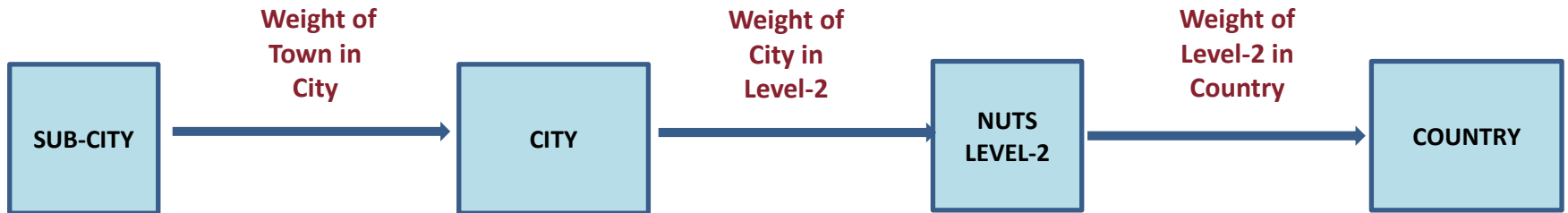
Geographical location constituted the basis for stratification

- **Grouping by location is practical**
- **Variation of prices by location is a key characteristic of housing markets**

WEIGHTING

➤ 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



EXTREME VALUES AND INDEXATION

➤ We also perform Tukey's Hinges

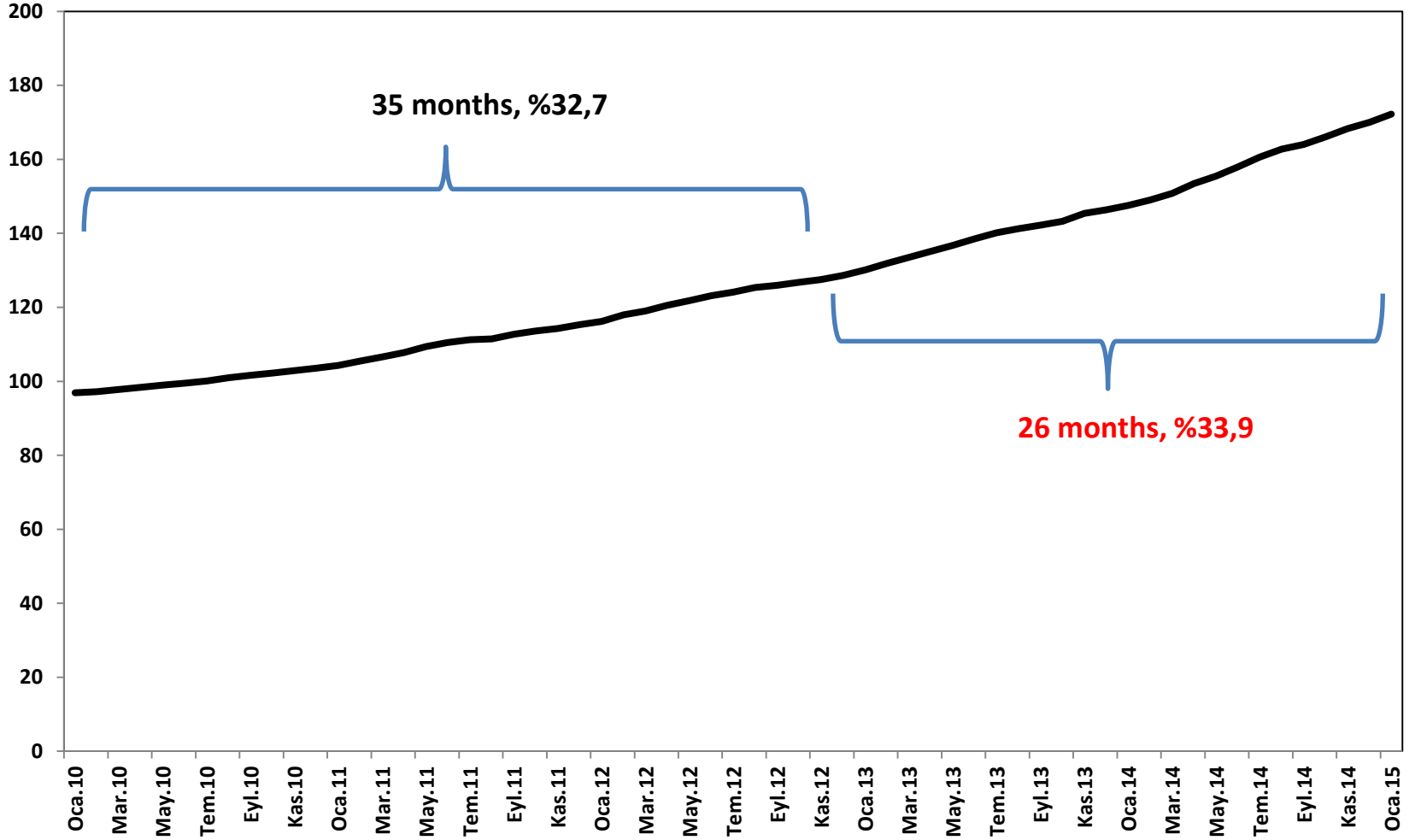
$Q3+3*(Q3-Q1) > \text{median unit price} > Q1-3*(Q3-Q1)$

➤ **Indexation:**

• Chain Laspeyres Index

$$I^{ty} = \sum_i \left(\frac{\omega_i^y p_i^{ty}}{\sum \omega_i^y p_i^{12(y-1)}} \right) * I^{12(y-1)}$$

HPI (2010=100)



Why HHPI?

➤ 2010



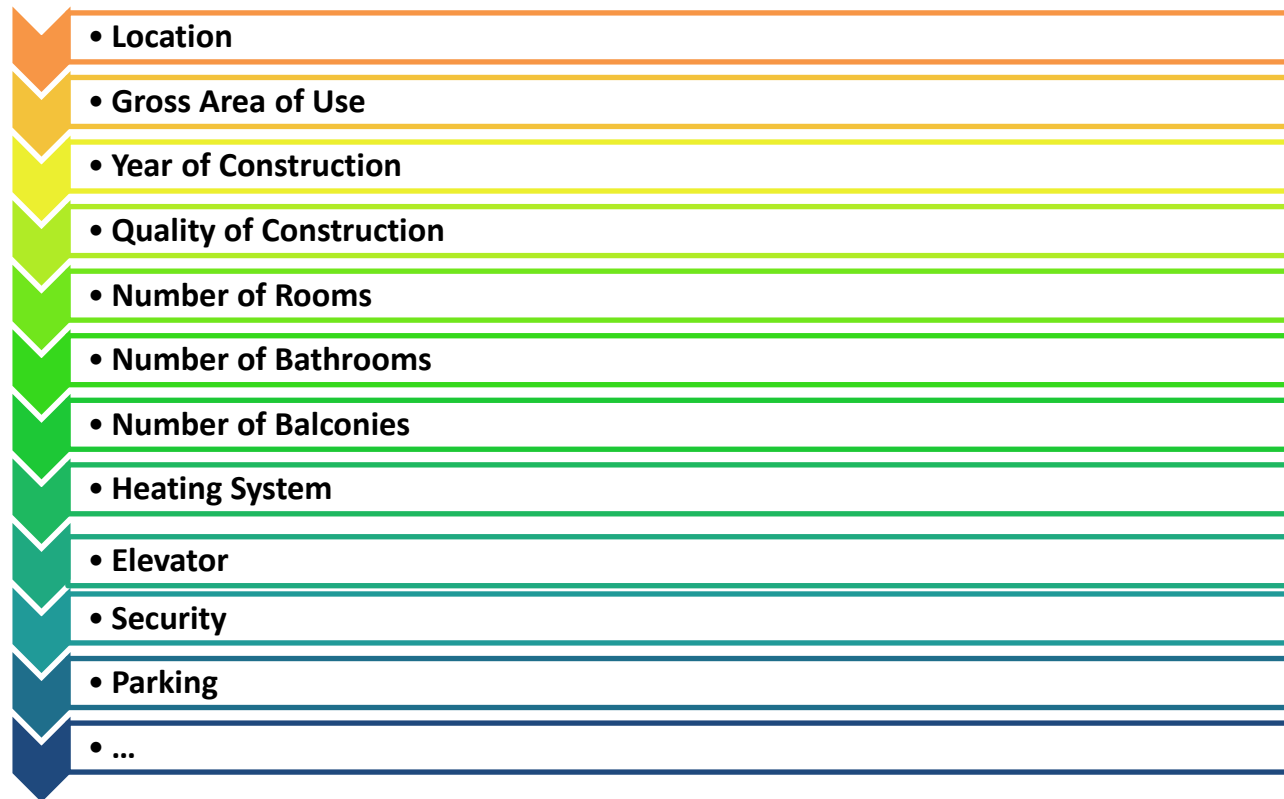
WHY HHPI?

➤ 2014



HPI Data Composition– Housing Characteristics

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



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 : kth characteristic of appraised property

THHPI- Method

- Same basic methodology with HPI
 - Same stratum with HPI
 - Chained Laspeyres method
 - Tukey's Hinges method (outlier detection)

THHPI- Method

$$P_i^t = \frac{\exp(\widehat{\beta}_0^t) \exp[\sum_k \widehat{\beta}_k^t \overline{z_{nk}^0}]}{\exp(\widehat{\beta}_0^0) \exp[\sum_k \widehat{\beta}_k^0 \overline{z_{nk}^0}]}$$

P_i^t : price index for period t

$\overline{z_{nk}^0}$: average kth characteristics for the base period (all n properties')

→ Holding characteristics constant => Quality adjusted price index

THHPI- Method

$$P_i^t = \frac{\exp(\widehat{\beta}_0^t) \exp[\sum_k \widehat{\beta}_k^t \overline{z_{nk}^0}]}{\exp(\widehat{\beta}_0^0) \exp[\sum_k \widehat{\beta}_k^0 \overline{z_{nk}^0}]}$$

P_i^t : price index for period t

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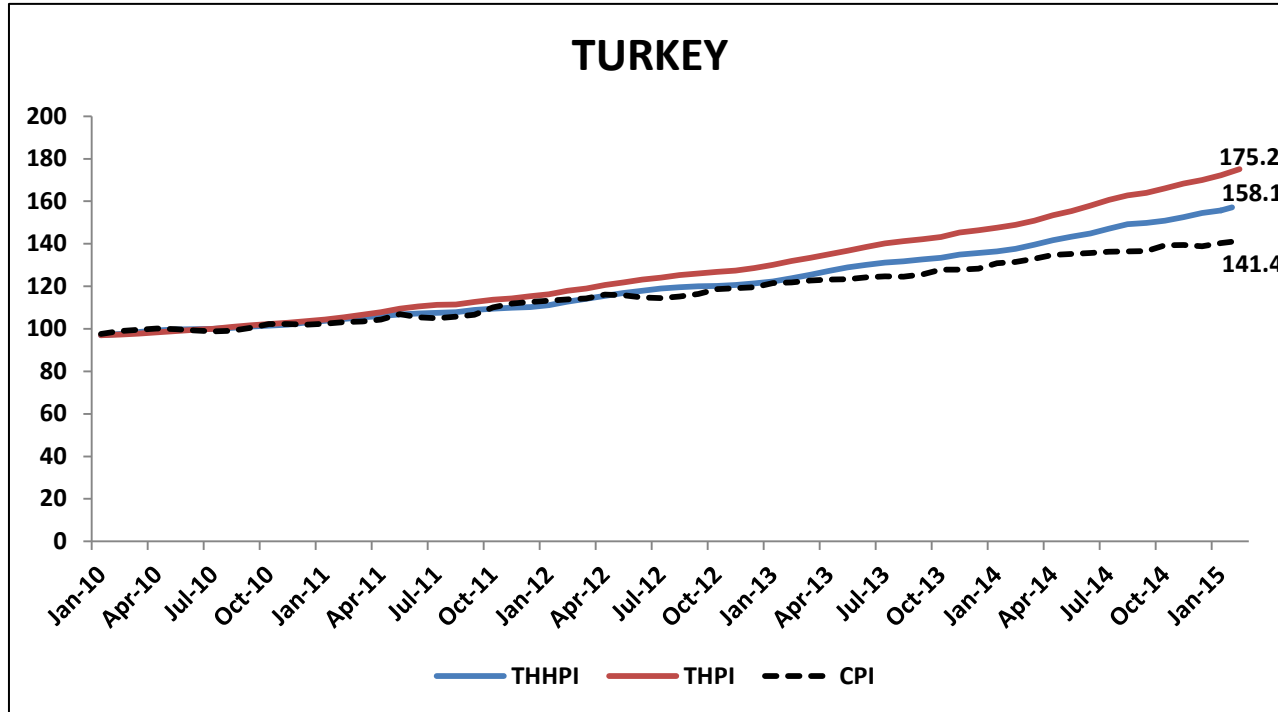
➔ **Holding characteristics constant => Quality adjusted price index**

➤ January 2012, t=0

HHPI- Regression Example (K.Çekmece, January 2012)

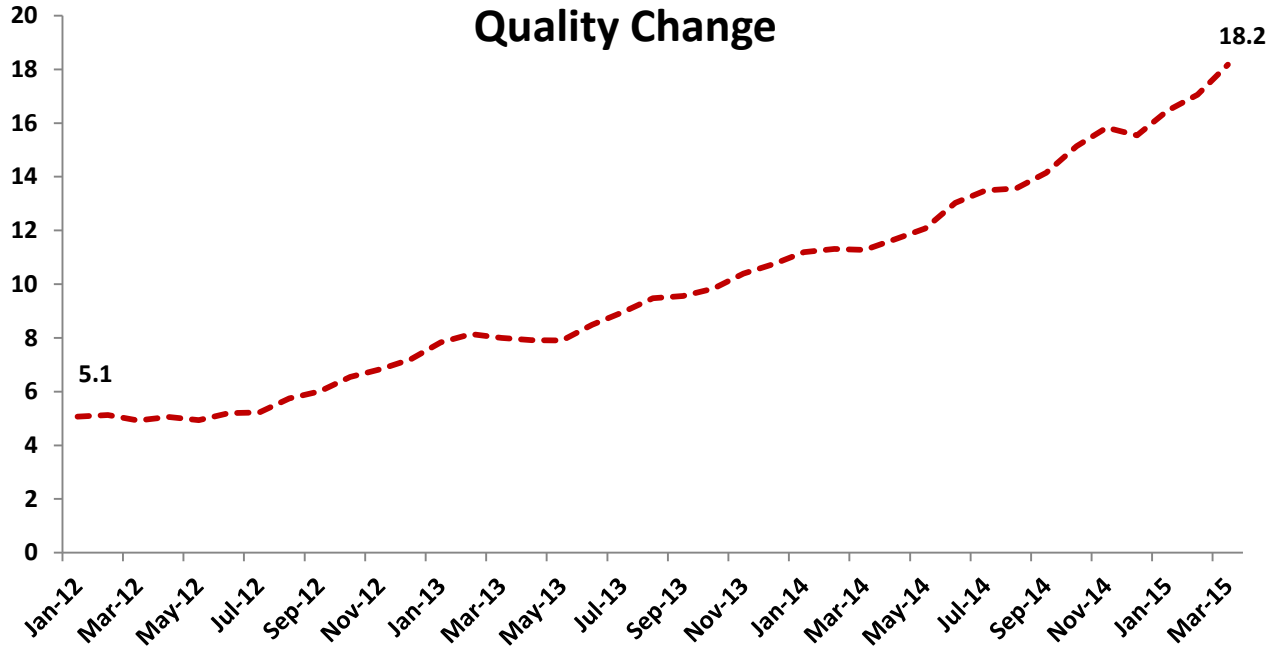
Characteristics	Coefficients
Gross Area of Use (m^2)	0.005 (0.000)**
Quality of Construction	0.109 (0.022)**
Year of Construction	0.003 (0.001)*
No. of Bedrooms	0.033 (0.017)*
No. of Bathrooms	0.084 (0.029)**
No. of Balconies	0.071 (0.017)**
Security Service	0.333 (0.032)**
Heating Type	0.118 (0.045)**
Elevator	0.133 (0.028)**
Constant	5.655 (2.040)**

THHPI

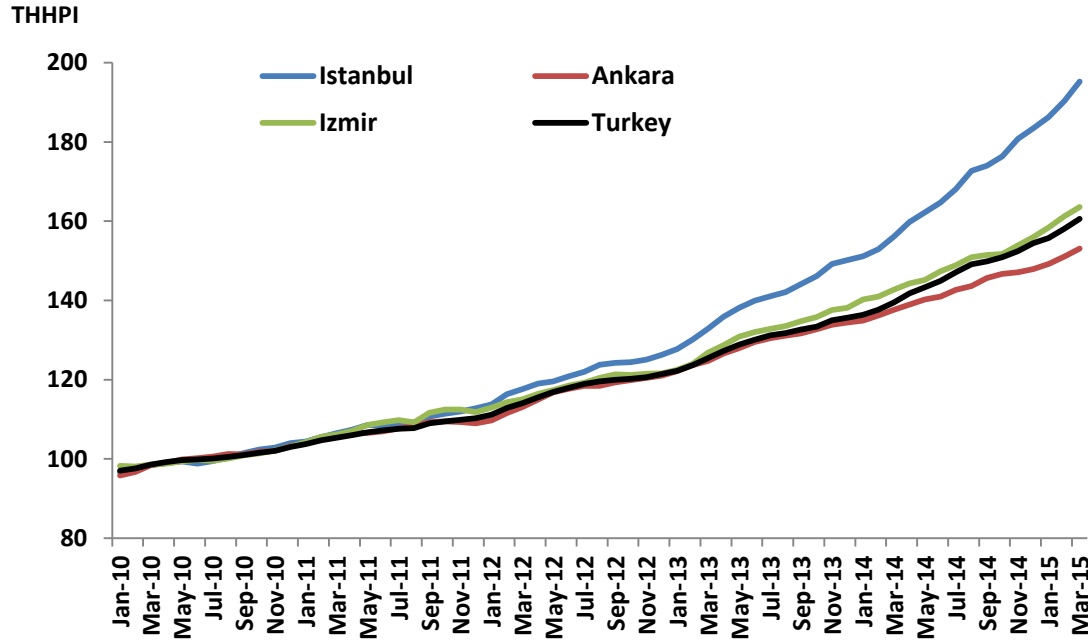


- While **THPI** was **175.2**, **HHPI** was **158.1** in March 2015. The **18.2** pp difference can be attributed to quality improvements in the housing market.

THHPI

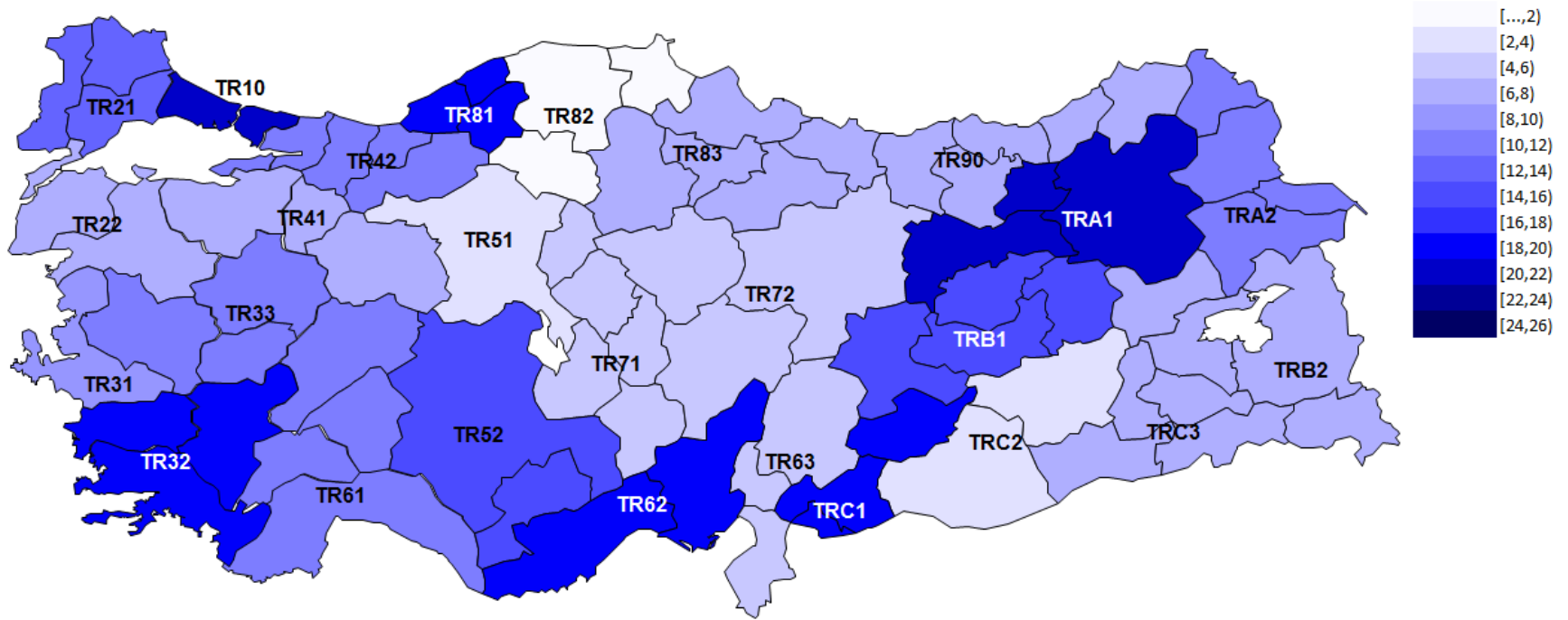


HHPI- 3 Main Cities



March 2015	THPI	THHPI	Quality Improvement	CPI
İstanbul	216.7	195.3	21.4	143.3
Ankara	157.2	153.1	4.1	143.8
İzmir	172.5	163.6	8.9	144.5

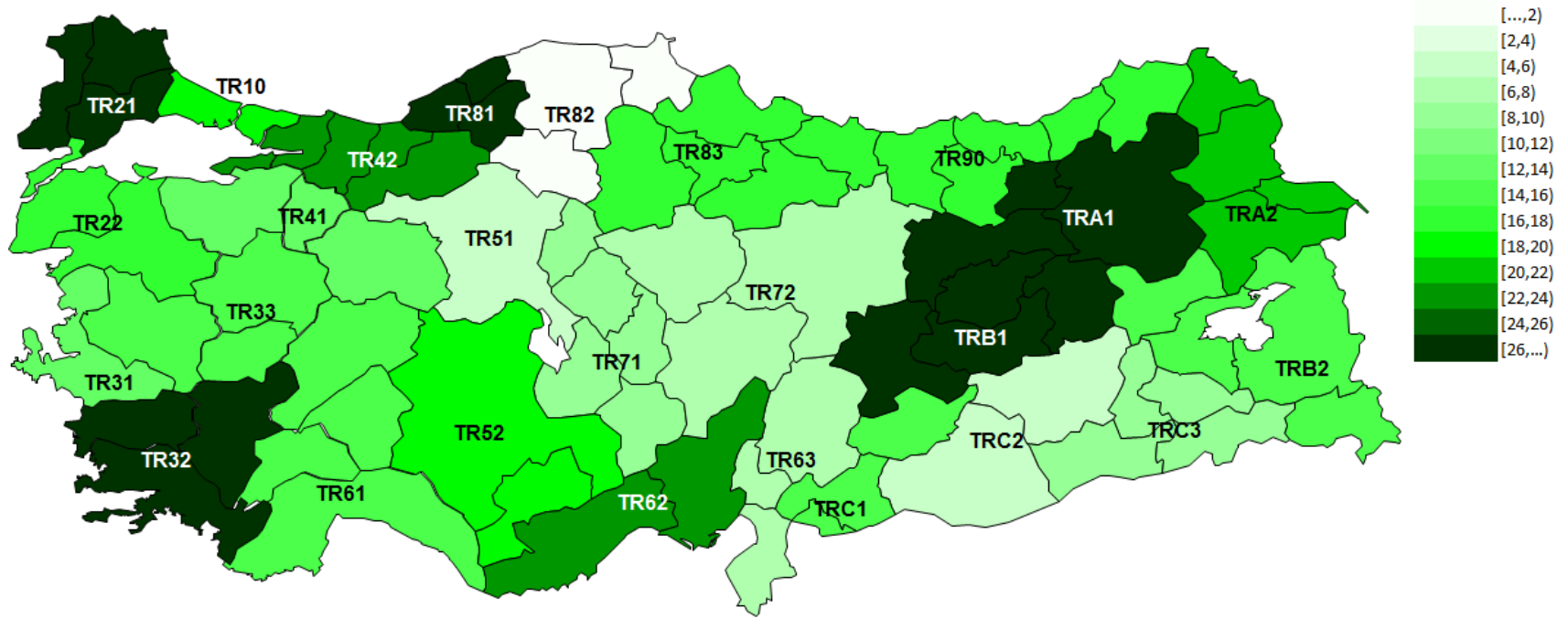
Quality Improvement Levels in Turkey (February 2015, ~57 months)



Highest	Quality Improvement
TRA1 (Erzurum, Erzincan, Bayburt)	21,2
TR10 (İstanbul)	20,6
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)	3,1
TR63 (Hatay, K.maraş, 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, Kırkkale, 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 ~%33,8
 - Quality Improvement ~%18,2
 - Pure Rise ~%15,6



**TÜRKİYE CUMHURİYET
MERKEZ BANKASI**

THANK YOU

STATISTICS DEPARTMENT

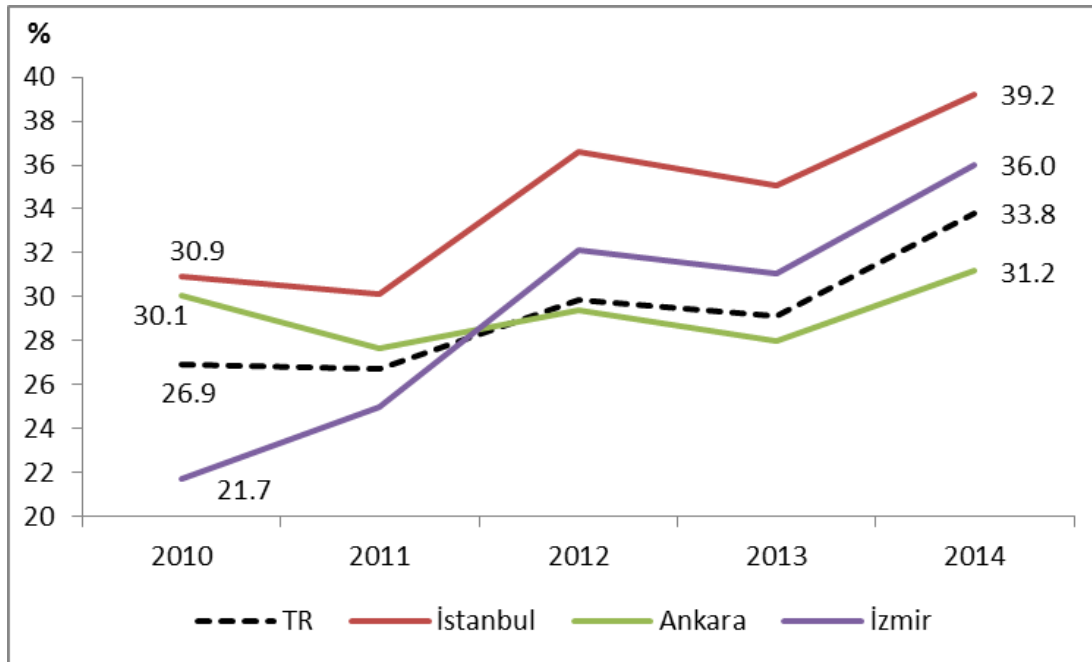
Discussion

Average Characteristics

	İSTANBUL		ANKARA	
	Jan.12	Feb.15	Jan.12	Feb.15
Price ('000 ₺)	137.3	209.0	103.8	142.9
Gross area of use (m2)	96.39	89.96	117.19	118.15
Year of construction	2001.88	2006.42	2002.47	2005.29
Quality of construction	0.58	0.54	0.44	0.49
No. of bedrooms	2.52	2.39	3.02	3.02
No. of bathrooms	1.24	1.22	1.23	1.28
No. of balconies	1.11	1.02	1.68	1.64
Security	0.15	0.16	0.04	0.05
Heating	0.91	0.87	0.91	0.86
Elevator	0.45	0.52	0.34	0.44

Discussion

Share of New Apartments



Discussion

