



Urban and real estate economics

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Week 1

Real estate value

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Contents

1. How is the value of real estates determined?
2. Hedonic regression: a statistics-based explanation of real estate prices.

1. How is the value of real estates determined?

How much are real estates worth?

- Determining the value of real estates is not unambiguous because:
 - real estates are very different,
 - their price cannot be observed as they rarely change hands.

How much are real estates worth?

- Guidelines, regulation:

Ministry of Finance Decree 25/1997. (VIII. 1.) on the methodological principles of determining the collateral security value of real estates not qualified as arable land

<http://jab.complex.hu/hjegy.php?docid=99700025.PM>

RICS Red Book, 6th Edition

http://www.joinricsineurope.eu/uploads/files/VorosK2010_1.pdf

Valuation methods

- Cost-based (RICS: amortised substitution cost-based) method

Replacement cost: how much would it cost now to build a real estate with the same attributes?

- Yield calculation-based (cash flow, RICS: earnings-based) method

What cash flow can one count on from the real estate?

- Comparative (RICS: market comparative) method

Based on prices of similar real estates, then corrections are made.

Cash flow method

- Discounted present value of the cash flow deriving from the real estate. It is worth using for real estates with a cash flow: real estates to let and operational real estates (hotel, offices, real estates of retailers, industrial real estates).
- For other cases, it would be merely the estimation of future sale price/value, and the problem would remain the same.

Comparative method

”Comparative analysis should be made on a set of real estates with similar **location** and identical **type** as of the analysed real estate. Outliers with a significant deviation from the average data of the set should be ignored.”

Comparative method

”The value corrective effect of **value correction factors** can exceed the **specific base value** of 30% only in exceptional cases and by 50 percent of the base value. In such cases the valuing person has an obligation for reasoning it.”

Comparative method: conclusions

1. The timeliness of data matters.
2. The location of the real estate matters.
3. The characteristics of the real estate also matters.

No. 1 and no. 2-3 are relatively independent.

At the beginning of this course we deal with no. 2, in the middle of the course no. 1 will be discussed.

No. 3 will not be discussed in details as it would require some engineering knowledge.

2. Hedonic regression: statistics-based explanation of real estate prices

Comparative method

- Hedonic (value-based) principle: real estate is a complex bundle of characteristics.
- Decomposition of the values of real estates into characteristics (“value correction factors”) and valuing/assessing the characteristics separately.
- Characteristics: technology and state of real estates, legal position/status, surroundings.

Calculation exercise

Calculate the value of a 200-sqm-real estate with two bathrooms. Transactions have been made around by your office, find the available data below.

Real estate	1	2	3
Price (million HUF)	30	30	27.5
Floor area (sqm)	175	200	175
Number of bathrooms	2	1	1

Solution by deductions

- Only the floor area is the different in case of real estate 1 and 2, hence the value of 1 sqm is

$$(30 - 27.5) / (200 - 175) = 0.1 \text{ m HUF/sqm}$$

- We know the difference of real estate 1 and 2 explained by floor space, the residual/leftover is the value of the bathroom:

$$(30 - 30) - (175 - 200) \times 0.1 = 2.5 \text{ m HUF/bathroom}$$

- The real estate in question has one more bathrooms than in real estate no. 2:

$$30 + 2.5 = 32.5 \text{ m HUF}$$

Solution by regression

price of real estate = $b_0 + b_1$ floor area + b_2 x
number of bathrooms + error term

$p = 7.5 + 0.1$ x floor area +

+ 2.5 x number of bathrooms + error term

where the coefficients are the so-called „shadow
prices”

$7.5 + 0.1 \times 200 + 2.5 \times 2 = 32.5$ million HUF

The change of real estate prices

- Constant b_0 often varies significantly from time to time. Essentially, it also measures the "value of the given date".
- The overall change of real estate values is defined as house price index.

Equation for price per sqm and absolute prices

Which sign (positive, negative or zero) should have the coefficient of floor area in case the dependent variable is the price, or the price per sqm?

- In case the price is the dependent variable:
positive - a larger real estate costs more.
- In case the dependent variable is the price per sqm:
negative – one more sqm is worth more in small dwellings.

Coefficients in various specifications

- *Linear*: price levels are explained by levels of characteristics (shadow prices).
How much more does a 1 sqm larger dwelling cost?
- *Log-level*: the logarithm of prices are explained by levels of characteristics.
How many percent more is a 1 sqm larger dwelling worth?
- *Log-log*: the logarithm of prices is explained by the logarithm of characteristics.
How many percent more is a dwelling with 1% larger floor space worth?

Mass appraisal

- In case data of many real estates are available, mass appraisal method can be applied, which is based on statistical grounds.
- The fitting is not exact:
 - characteristics have no fixed price and
 - the value of the dwelling cannot be described completely by the characteristics.

What does the deviation of real estate prices explain?

John F. Kain, John M. Quigley: Measuring the Value of Housing Quality

The 5 factors explain 60% of the standard deviation.

1. 40% is explained by the overall structural conditions
2. 8% is explained by the adjacent structures and parcels

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Table 1. FACTOR LOADINGS ON INDIVIDUAL QUALITY VARIABLES

Variable	Factor				
	1	2	3	4	5
<i>Dwelling unit</i>					
1 Overall structural condition	—	.93	—	—	—
2 General housekeeping	—	.66	—	—	—
3 Condition of ceilings	—	.88	—	—	—
4 Condition of walls	—	.88	—	—	—
5 Condition of floors	—	.88	—	—	—
6 Condition of lighting	—	.82	—	—	—
7 Condition of windows	—	.83	—	—	—
<i>Structure and parcel</i>					
8 Condition of structure exterior	.74	—	—	—	—
9 Overall parcel condition	.72	—	—	—	—
10 Quality of exterior	.52	—	.62	—	—
11 Parcel landscaping	.56	—	—	—	—
12 Trash on parcel	.65	—	—	—	—
13 Nuisances affecting parcel	—	—	—	—	—
14 Condition of drives and walks	.57	—	—	—	—
<i>Adjacent structures and parcels</i>					
15 Condition of structures	—	—	.91	—	—
16 Condition of parcels	.86	—	—	—	—
17 Structural quality of poorer	.71	—	—	—	—
18 Structural quality of better	.70	—	—	—	—
19 Parcel quality of poorer	.81	—	—	—	—
20 Parcel quality of better	.81	—	—	—	—
21 Nuisances affecting adjacent properties	—	—	—	—	—
22 Sample relative to adjacent properties	—	—	-.78	—	—
<i>Block face</i>					
23 Neighborhood problems	—	—	—	—	—
24 Percent residential	—	—	—	.77	—
25 Percent commercial and residential	—	—	—	-.81	—
26 Percent vacant	-.55	—	—	—	—
27 Percent in poor condition	-.77	—	—	—	—
28 Percent in fair condition	—	—	—	—	-.89
29 Percent in good condition	.65	—	—	—	.56
30 Block landscaping	.58	—	—	—	—
31 Trash on block	.70	—	—	—	—
32 Condition of sidewalk	.50	—	—	—	—
33 Condition of street	—	—	—	—	—
34 Condition of curbs	—	—	—	—	—
35 Amount of commercial traffic	—	—	.62	—	—
36 Nuisances affecting block	—	—	—	—	—
37 Condition of alleyways	—	—	-.61	—	—
38 Cleanliness of alleyways	.61	—	—	—	—
39 Overall block condition	.77	—	—	—	—

NOTE: — indicates standardized factor loading less than .5.

Conclusion

”Lots of attributes determine real estate prices but the three most important of them are location, location, location.”

Dummy variables

- The type, location and heating system of the buildings cannot be measured on a continuous scale.
- *Dummy* (two-valued) variables (or a group of them) is used.
- Binary: having either central or private heating.
 - Private heating dummy: $D=1$, if there is a private heating system in the dwelling.

Interactions

- Joint presence of characteristics can enhance or slacken each other's effect.
- The premium of a detached house is higher in Budapest than in the countryside.
- Dwellings on higher floors are relatively worthier if there is an elevator in the building.

Calculation exercise

Which territory is worthier?

- In the inner parts of Ferencváros the average price per sqm is 300,000 HUF.
- In the central parts of Ferencváros dwellings cost 350,000 HUF/sqm.

The answer is not obvious as the character of dwelling stocks might differ.

Calculation exercise

We know the rule below.

- The estimated equation below is available about the value of real estates:

$$\begin{aligned} & \textit{dwelling price per sqm} = \\ & 770 - 4.5 \cdot \textit{floor area} - 3.2 \cdot \textit{age of dwelling} \end{aligned}$$

- In the inner parts of Ferencváros dwellings are 20 years older on average.
- The average floor area of dwellings is 70 sqm in inner Ferencváros and 60 sqm in central Ferencváros.

Calculation exercise (solution)

In central Ferencváros the price per sqm is higher due to the characteristics of dwellings.

$$4.5 \cdot 10 + 3.2 \cdot 20 = 109,000 \text{ HUF/sqm}$$

That is more than the difference between the averages of the two territories, hence inner Ferencváros would be worthier with dwelling stocks being identical.

$$300,000 \text{ HUF/sqm} > (350,000 - 109,000) \text{ HUF/sqm}$$

What proxy variables may be used?

- Not all of the variables can be captured accurately, these can be substituted.
- The address is not a hedonic variable either, though it is generally used.
- Can we use the income of the family living in the dwelling as an explanatory variable?
- Can we use the average income of the settlement as an explanatory variable?

Housing survey

- HCSO prepares it every five years on a sample of cca. 6,000 dwellings.

<http://portal.ksh.hu/pls/ksh/docs/hun/xftp/idoszaki/pdf/lakviszezr.pdf>
pp. 92-93.

- The value of the real estate is estimated by the owner.
- The value of the real estate can be explained in 90 percent with cca. 20 attributes.
- Most of it stems from the residential surroundings.

Curriculum

- Denise DiPasquale–William C. Wheaton [1996]: *Urban Economics and Real Estate Markets*. Chapter 4.
- Hungarian Central Statistical Office: *Helyzetkép a lakásviszonyokról 1999–2005*. (Snapshot on Housing 1999–2005) HCSO, 2006.

Further readings

- John F. Kain, John M. Quigley: Measuring the Value of Housing Quality. *Journal of the American Statistical Association*, Volume 65, Issue 330 (Jun., 1970), pp. 532-548.
- 25/1997. (VIII. 1.) PM rendelet a termőföldnek nem minősülő ingatlanok hitelbiztosítéki értékének meghatározására vonatkozó módszertani elvekről. (Ministry of Finance Decree 25/1997. (VIII. 1.) on the methodological principles of determining the collateral security value of real estates not qualified as arable land)
- RICS Red Book, 6th Edition