Urban and real estate economics

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Urban and real estate economics

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Urban and real estate economics

Week 10

The macroeconomics of real estate markets III

Transaction volume and vacancy in the model

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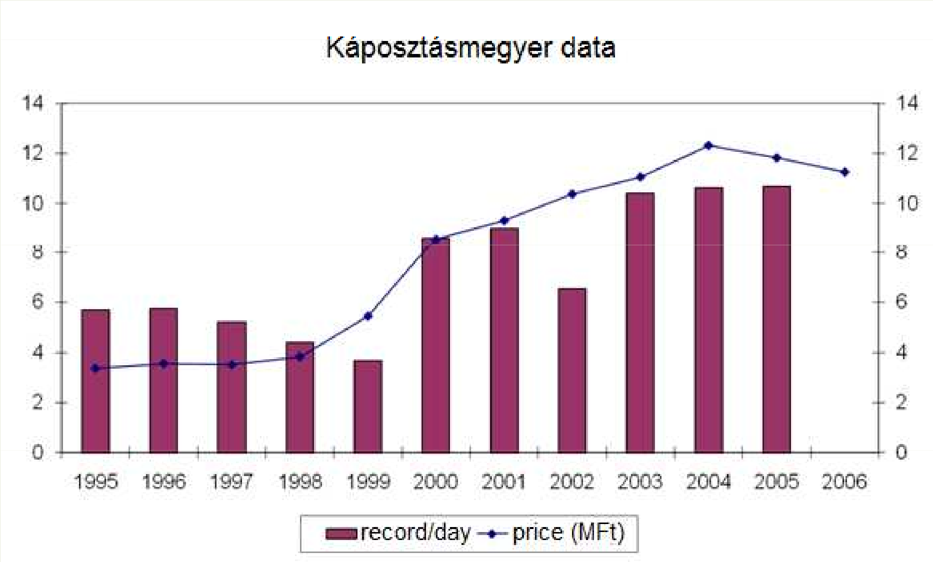
Contens

1. Modelling real estate market transaction volume
2. A dynamic model with vacancy

1. Modelling real estate market transaction volume

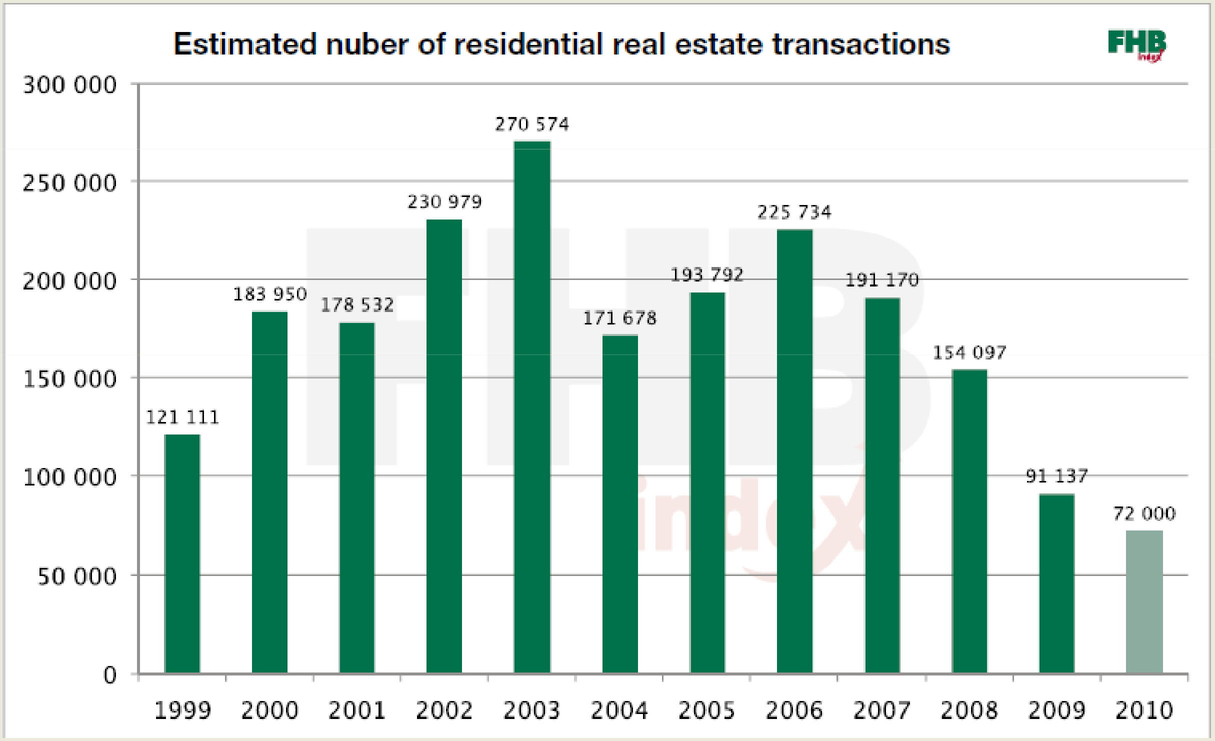
Transaction volume on the house market

transaction volume on the housing market can have sizeable fluctuatations .



Example: property prices and ads in Káposztásmegyer

Estimated number of transactions on the housing market



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Theoretical background

- In general equilibrium models everyone gets their goods after the Walrasian auction. These models do not aim to explain how sellers and buyers find each other.
- Motivated by the previous observations, it can be interesting to examine this matching on property markets.

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Structural mismatch

- The first search, matching, vacancy models were used on labour markets to describe unemployment.
- The analogy between labour and property markets:
  - It takes time until the employee (buyer) and the employer (house) find each other.
  - There are vacant positions / empty offices.
  - There are unemployed, but sellers rather choose to own two houses simultaneously.

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The model

- There are two types of households: type 1 and type 2
- Let H1 denote the number of type 1 households

$$H1_{t+1} = \beta_2 H2_t + (1 - \beta_1) H1_t$$
$$H2_{t+1} = \beta_1 H1_t + (1 - \beta_2) H2_t$$

- The β paremeters denote the probability of changing types.
- β_2: what is the probability that a type 2 household becomes type 1.

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Vacancy

- There are type 1 and type 2 houses.
- *S*: the housing stock is given.

$$V1 = S1 - H1$$

$$V2 = S2 - H2$$

- *V* (vacancy) is the number houses without residents.

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The model

- Every household has (at least) one house. To move, a houeshold buys a new house first (thus it owns two houses for a while), then they sell the old one.
- A household a) can be satisfied, b) wants to buy or c) wants to sell.

$$H1 = HM1 + HS1 + HD1$$

$$H2 = HM2 + HS2 + HD2$$

- HM: nr. of content (matched) households.
- HS: nr. of discontent (mismatched) households.
- HD: nr. of households wanting to sell (double).

Transaction volume, probabilties of moving and selling

Transaction volume appears in the model:

- Mismatched household find a new house with probability *m.*
- Thus $m1 \cdot HS1$ households will move to type 2 houses.
- And $m2 \cdot HS2$ households to type 1 houses.
- With a given supply the transaction volume will be necessarily the same.

Probabilities of moving and selling

- Selling probabilty (*q*) can be calculated simply by using the number of moves:

$$q1 = \frac{m1HS1}{V1}$$

$$q2 = \frac{m2HS2}{V2}$$

Transition equations of resident types

$$HS1_{+1} = (1-m1)HS1 - \beta 1HS1 + \beta 2HM2$$
$$HS2_{+1} = (1-m2)HS2 - \beta 2HS2 + \beta 1HM1$$

$$HD1_{+1} = (1-q2)HD1 + m1HS1 + \beta 2HD2 - \beta 1HD1$$
$$HD2_{+1} = (1-q1)HD2 + m2HS2 + \beta 1HD1 - \beta 2HD2$$

$$HM1_{+1} - HM1 = -(HS1_{+1} - HS1_t) - (HD1_{+1} - HD1_t)$$
$$HM2_{+1} - HM2 = -(HS2_{+1} - HS2_t) - (HD2_{+1} - HD2_t)$$

Solution in a symmetric case

$$HS_{+1} = (1-m)HS - \beta HS + \beta HM$$

$$HS_{+1} = (1-m-\beta)HS + \beta(H - HD - HS)$$

$$HS_{+1} = (1-m-2\beta)HS + \beta(H - HD)$$

$$HD_{+1} = (1-q)HD + mHS + \beta HD - \beta HD$$

$$HD_{+1} = (1-\frac{mHS}{V})HD + mHS$$

$$HD_{+1} = mHS(1-\frac{HD}{V}) + HD$$

$$HM = H - HS - HD$$

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Comparative statics in steady-state

$$\mathrm{HD} = V$$

$$\mathrm{HS} = \frac{\beta(H - V)}{2\beta + m}$$

- The nr. of mismatched goes up, if *m* goes down.
- The nr. of mismatched goes up, if *V* goes down.
- The nr. of mismatched goes up, if *β* goes up.
- The nr. of mismatched goes up, if *H* goes up.
- The expected time to sell goes up, if *m* goes down.
- The expected time to sell goes up, if *H* goes down.
- The expected time to sell goes up, if *β* goes down.
- The expected time to sell goes up, if *V* goes up.

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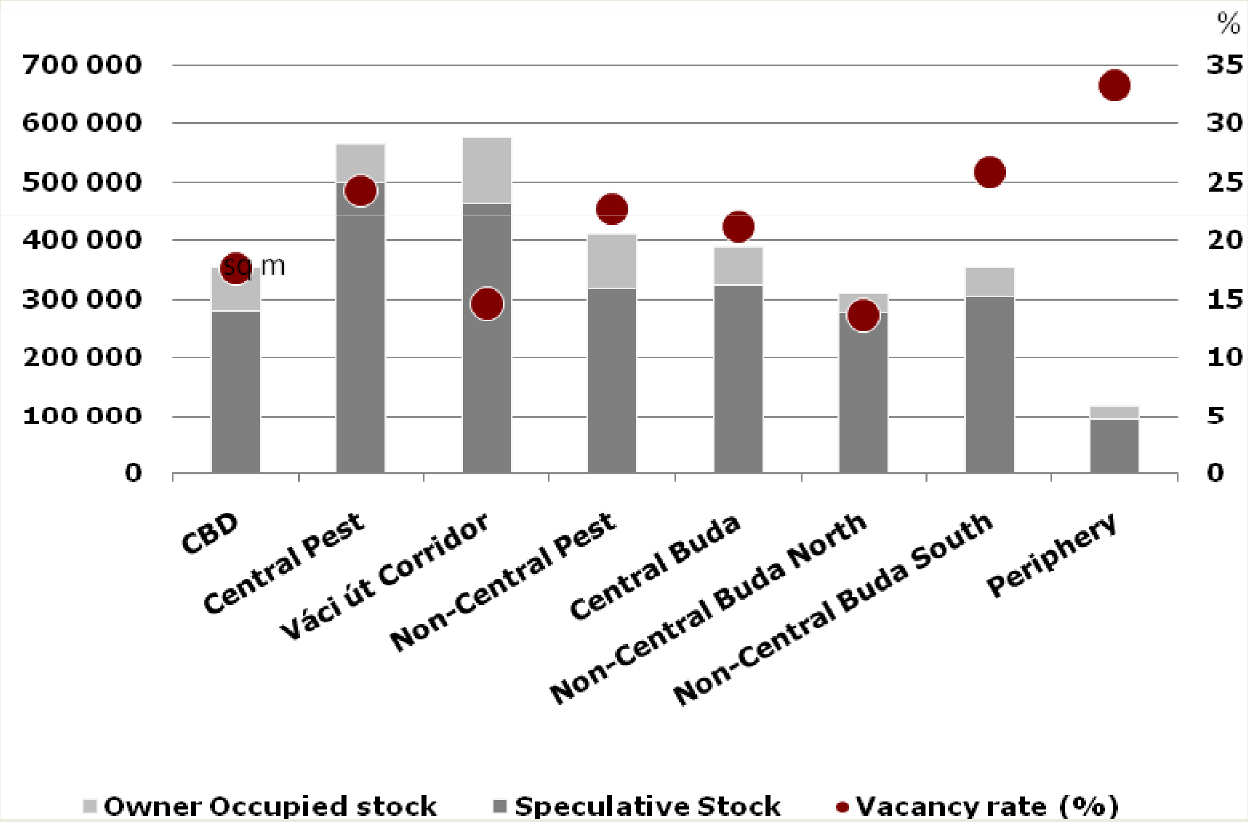
3. A dynamic model with vacancy

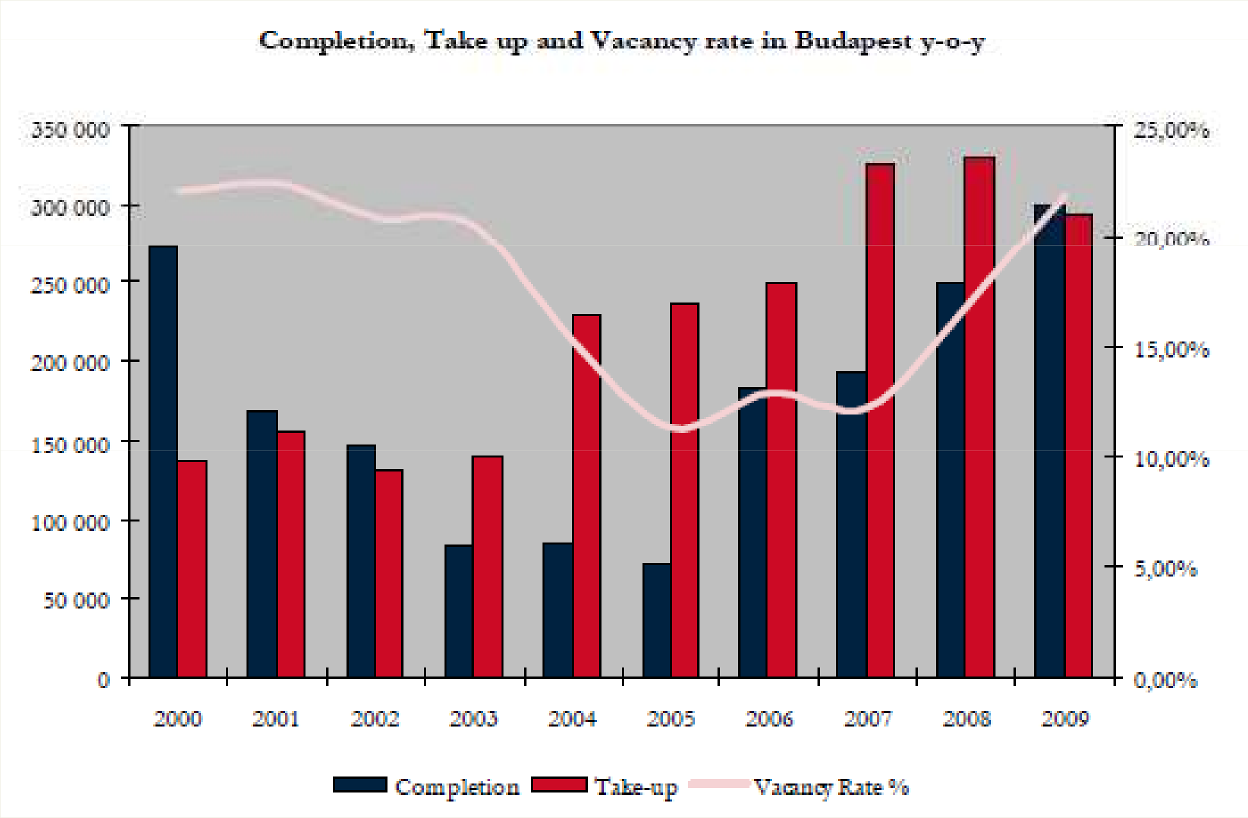
Observations

- There is structural vacancy: there are always empty houses offices, hotel rooms and warehouses to let.
- There is a link between vacancy and the change in supply and demand on the residential market.
- The vacancy ratio is related to the expected time to sell.

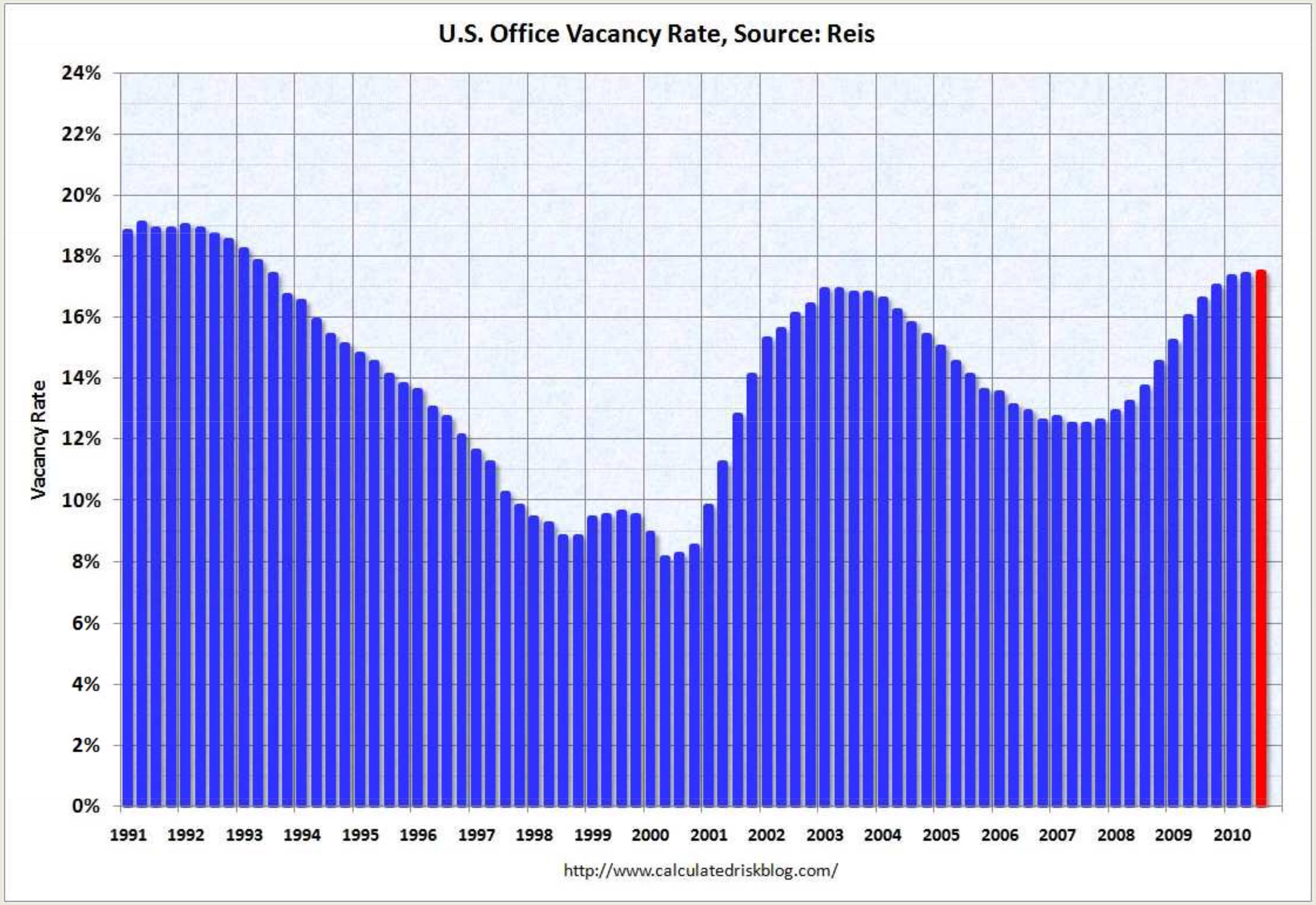
Vacancy rate on the Budapest office market in 2010. (Source: BRF)



Vacancy rate of the Budapest office stock (BRF)



Vacancy rate on the US office market 1991–2010 (source: REIS)



A dynamic model with vacancy

- A model with explicit vacancy.
- We get back our observations on volatility.
- We get back our observations on lags.

Supply side

- Construction (*C*) takes time so it can only react to previous rental prices (*R*).
- There exists a rental level (a threshold *K*), under which no construction takes place.
- The reaction of the construction process is defined by the parameter *ε*.

$$C_t = \begin{cases} \varepsilon R_{t-L}, ha\, R_{t-L} > K \\ 0\, egyébként \end{cases}$$

Supply side

- The accumulation of the housing stock:

$$S_t = S_{t-1} + C_t$$

- (For simplicity's sake we ignore the amortization)

Demand for housing space

- The demand for housing space (*D*) depends on an exogenous demand-shifting factor (*N*, e.g. number of clerks working in the office market) and (negatively) on the rental price.
- The price elasticity of the demand is determinded by the parameter *η*.

$$D_t = \alpha + \tau N_t - \eta R_t$$

- It takes a period for the demand to appear on the market (*OS*):

$$OS_t = D_{t-1}$$

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Vacancy rate

- Vacancy rate is by definition:

$$v_t = \frac{S_t - OS_t}{S_t}$$

- Using the lagged demand:

$$v_t = \frac{S_t - D_{t-1}}{S_t}$$

Change in rental prices

- Rental prices are changed according to the market pressure:

$$R_t = R_{t-1}\left(1 - \lambda \frac{v_t - V}{V}\right)$$

- Where *V* is the long-run, natural rate of vacancy.
- When the market is ”tight”, prices go up.
- When the market is ”loose”, prices go down.

Solving the system

- 6 equations, 6 unknowns:
- construction, housing stock, vacancy, rental price, demand, simultaneous demand

- System of difference equations.
- No lead term, but a good number of lags.

Solving the system

- For a steady state we have to know the value of *V*.

$N = 70.000$	$\varepsilon = 0,3$
$S = 20.000.000$	$\eta = 0,3$
$V = 10\%$	$\tau = 200$
$R = 20$	$\alpha = 10.000.000$
	$\lambda = 0,3$
	$L = 3$

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Persistent increase in demand

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- Cycles can evolve inherently in the real estate market.
- Rental prices follow vacancies.
- Constructions reaches its highest value around the peak of vacancy.

Curriculum

- David M. Geltner – Norman G. Miller – Jim Clayton – Piet Eichholtz [2007]: *Commercial Real Estate Analysis and Investments*. Chapter 6.

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Further readings

- Denise DiPasquale–William C. Wheaton [1996]: *Urban Economics and Real Estate Markets*. Chapter 11.
- William C. Wheaton [1990]: Vacancy, Search and Prices in a Housing Market Matching Model. *Journal of Political Economy*, 98(6),(dec 1990)

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