Hochschule für
Wirtschaft und Umwelt
Nürtingen-Geislingen

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Structural Vacancies in the German Office Market and Their Effects on Real Estate Finance

Presentation by

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prepared for the 15th Annual Conference of the European Real Estate Society, June 18-21, 2008 in Krakow/Poland

Hochschule für Wirtschaft und Umwelt Nürtingen-Geislingen

Nürtingen-Geislingen University: One of the Pioneers in Real Estate Education in Germany

- Located in south-western Germany, between Stuttgart and München
- 3,500 students in 20 degree courses
- Several rankings show HfWU in the top flight of Germany‘s business schools (Stern, Spiegel, ManagerMagazin, Stiftung Warentest, Wirtschaftswoche, Focus)
- Major in real estate management since 1983
- Degree course in real estate management since 1998 (Diplom/Master and B.S.)
- Today: Appr. 360 real estate students currently enrolled, 12 real estate professors and more than 27 lecturers, 4 electives
- Accredited by RICS and FIBAA

Motivation For This Study

- Motivation: Improvement of valuation models used for **real estate ratings**
- Observation: ***Vacancy rate*** persistently high in the German office markets

  HOW BIG is the problem? WHY? WHAT should be done?
- Macro-view:
  - Obviously ***structural problems*** (e.g., overbuilding) contributed to this
  - But ***structural vacancies*** are not easy to detect—no common definition, no data, no economic models—and ***nominal vacancy rate*** not a good measure

    Survey by Stanglmayr (2008a, 2008b)) among valuers shows grave structural vacancies in many markets—not only in economically weak regions, but also on the outskirts of major cities with functioning real estate markets
- Micro-view:
  - Current investors/lenders: **Properties with structural vacancies** are becoming obsolete after some time, which may lead to unexpected write-offs in the future.
  - Future investors/lenders: Standard **valuation models** do not take structural vacancies into account → under-estimation of vacancy risk

Market Situation (1)

Fig. 1:
Nominal Vacancy Rates in Classes of Cities in Germany [%]

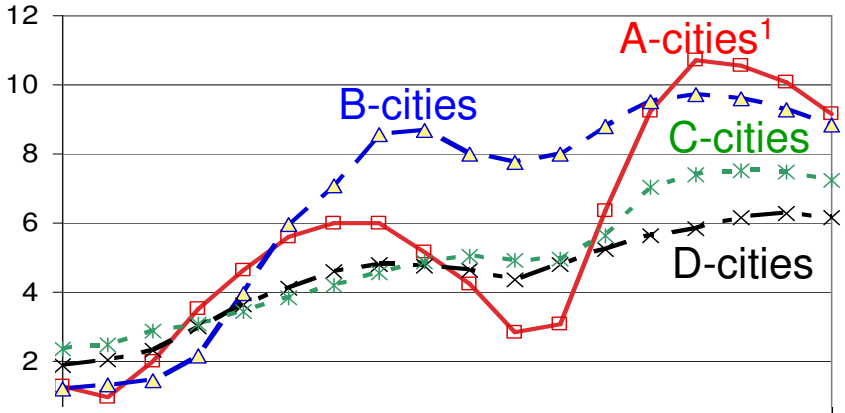
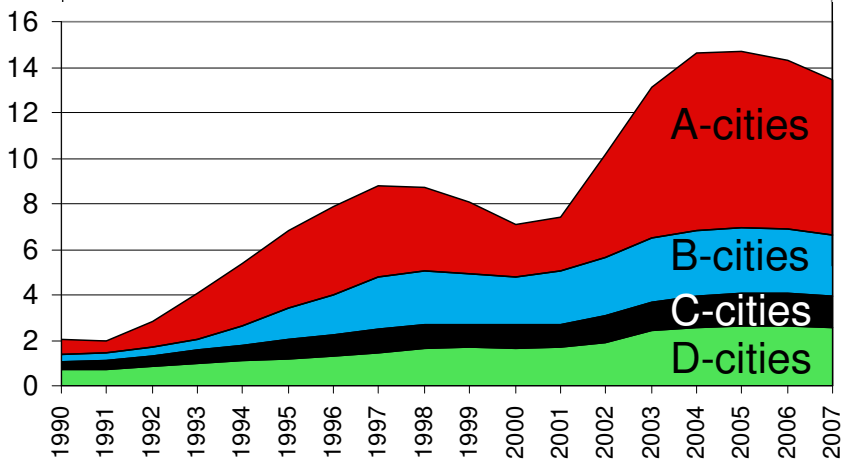


Fig. 2:
Vacant Office Stock in Classes of Cities [million sqm]



1 A-Cities = Berlin, Hamburg, Düsseldorf, Köln, Frankfurt, Stuttgart, München

Market Situation (2)

Fig. 3:
Market Indicators for München [%]

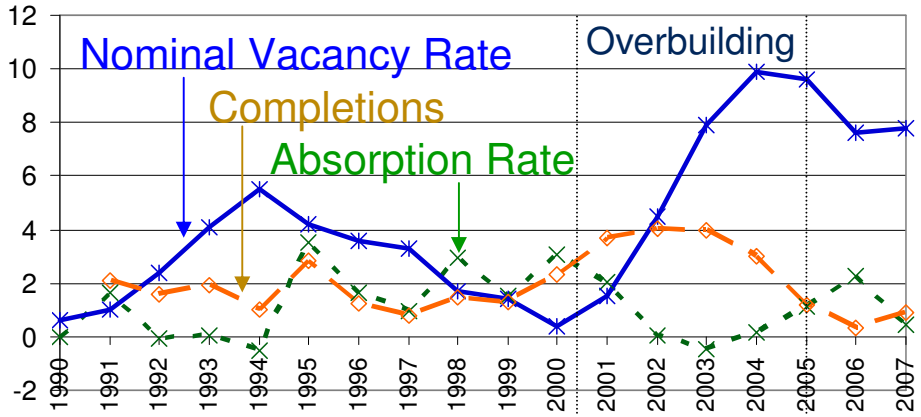
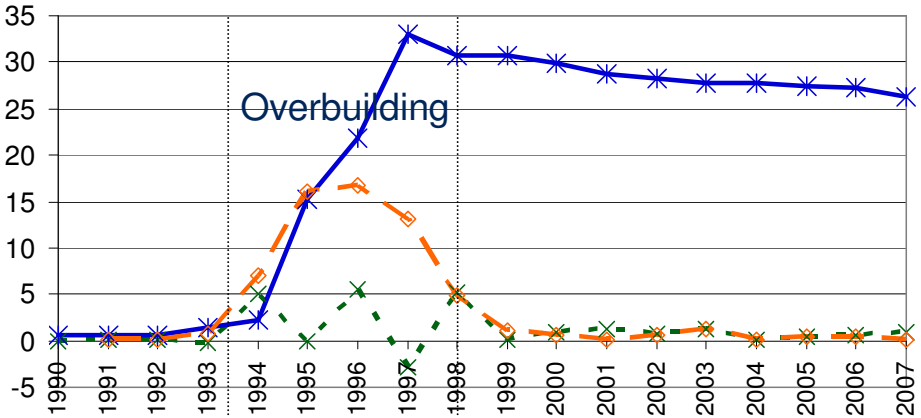
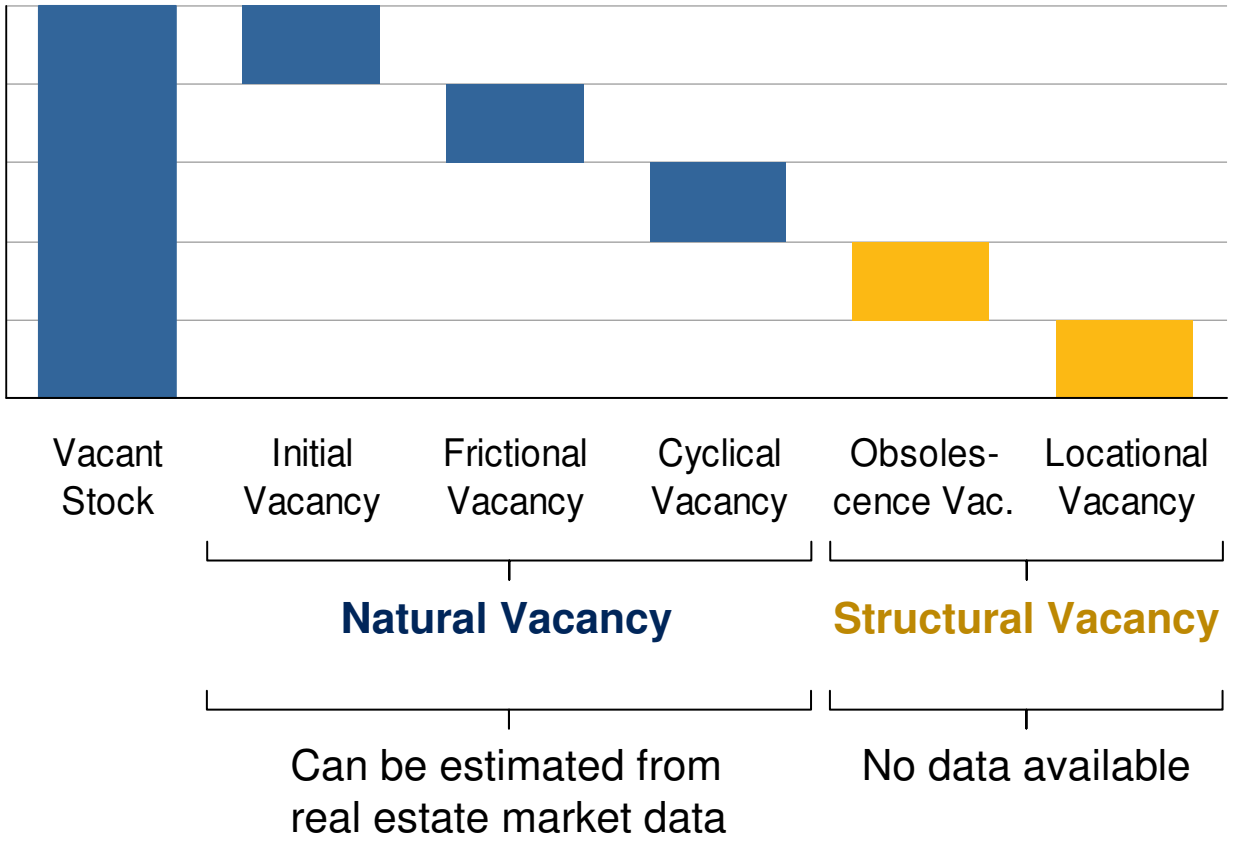


Fig. 4:
Market Indicators for Leipzig [%]

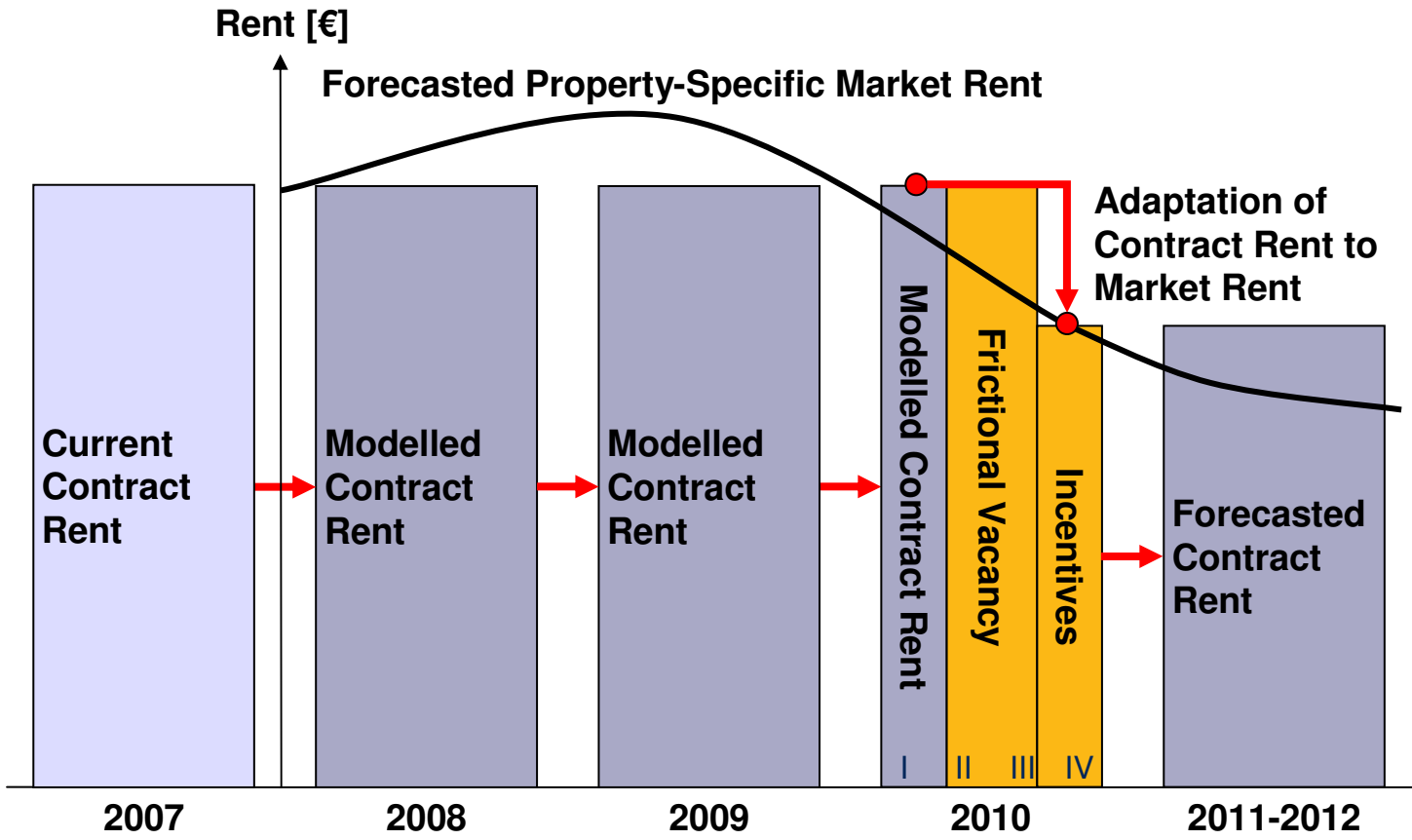


Forms of Vacancy[1]



Sources (among others): Stanglmayr (2008), Koppels/Keeris (2006)

Valuation Models: Example of a Standard DCF-Model Used by Banks for Internal Ratings



Definitions, Assumptions, Hypotheses

- Natural Vacancy rate = „the desired inventory of vacant units held by landlords given current and expected market conditions“
- Structural vacancy rate = „the gap between the actual or nominal vacancy rate and the natural vacancy rate that determines the deviation from equilibrium in the rent-adjustment process“

- Hypotheses:
  1. The natural vacancy rate can be estimated with a model to predict rental changes
     (rationale: if the vacant stock is too small, the rents will increase)
  2. The structural vacancy rate in German A- and B-cities has risen in recent years

Estimating the Natural Vacancy Rate (NVR)

- Directly as suggested, for example, by Voith/Crone (1988):
  - NVR = f (market-specific equilibrium vacancy rate, time-specific adjustment for market situation)
- Indirectly via rental adjustment estimation with the general form:
  - Real rent change = f (vacancy rate, rent-vacancy relationship), or:
    $\Delta RR_t = a\text{-}b \cdot NOM_t + \varepsilon_t$
    where a = constant, b = coefficient, NOM = nominal vacancy rate in period t
  - By setting the equation to zero we get:
    $0 = a\text{-}b \cdot NOM_t \Leftrightarrow NOM_t = a/b = NVR_t$
- 25 years of improvements, refinements and criticism
- For our purposes, we chose a model which…
  - can cope with the limitations of the data
  - allows for intertemporal variability for NVR
  - is fairly straight-forward since perfection of rent forecast was not a goal!

Selected References

- Pioneering works
  - Eubanks/Sirmans (1979)
  - Rosen/Smith (1983)
  - Wheaton/Torto (1988)
- United States
  - Sivitanides (1997) → real rent change = f (natural vacancy rate, lagged nominal vacancy rate, speed of adjustment)
  - Krainer (2001)
  - Anari, Hunt (2002)
- World/Europe
  - Hendershott (1996); Hendershott et al. (1999, 2002)
  - Sanderson et al. (2006)
- Germany
  - Francke (2007) → model and results unpublished
  - Stanglmayr (2008a) → interviews

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- **Stanglmayr (2008a):** Stanglmayr, M., Die Relevanz struktureller Entwicklungen für die Bewertung *[The relevance of structural developments for property valuation]*, Immobilien & Finanzierung No. 9, 327-329.
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Model and Procedure

1. Stationarity tests
2. Derivation or transformation of variables into growth rates
3. Model: $RPR_t^* = a + b \cdot NOM_{t-i}^* + c \cdot X_{t-i}^* + d \cdot RPR_{t-i}^* + \varepsilon$

   where $RPR_t^* =$ real prime rent (* indicates growth rate or derivation)

   $a,b,c,d =$ constant and coefficients

   $X_{t-i}^* =$ one of the variables, e.g., office employment

   $NOM_{t-i}^* =$ nominal vacancy rate

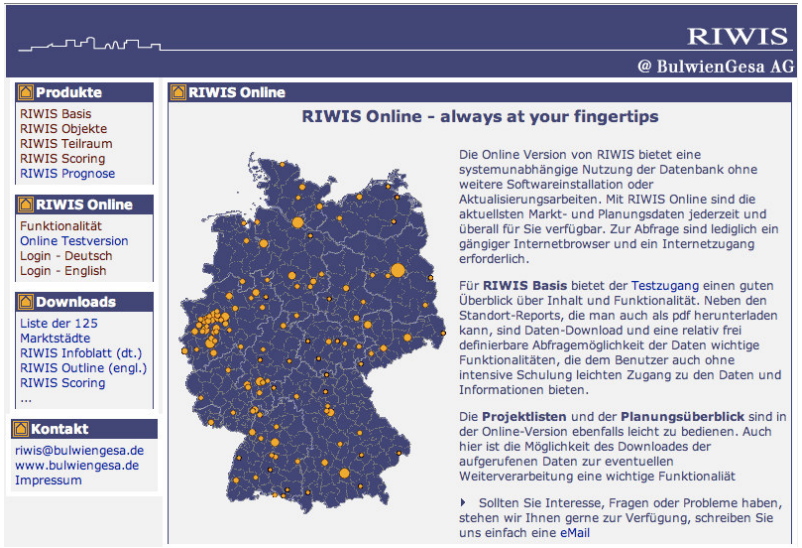
   $i =$ time lags

   $\varepsilon =$ error term
4. Calculation, model optimization, tests
5. Estimation of the natural vacancy rate (NVR) with:

$$NVR_t^* = \frac{a}{b} + \frac{c}{b} \cdot X_{t-i}^*$$

The Empirical Part of the Paper Uses Data From RIWIS by BulwienGesa AG

- All data from www.riwis.de
  - most comprehensive data source for real estate market data in Germany
  - data is collected from various sources, quality-checked, and condensed by independent research company BulwienGesa
  - 125 cities, 1990-2007



- Time series used:

- OST	total office space stock (sqm)	- OEM	office employees (#)
- OPC	office space per capita (sqm)	- ABS	absorption (sqm)
- COM	completions (sqm)	- ABR	absorption rate (%)
- TUO	turnover (sqm)[1]	- RPR	real prime rent (€)[2]
- NOM	nominal vacancy rate (%)	- RAR	real average rent (€)[2]

1 Also called transaction volume or take-up
2 Dependent variable; deflated with the national consumer price index as reported by Statistisches Bundesamt

Results Rental Adjustment Models: A-Cities

City	a	b(t)	b(t-1)	X	c(t)	c(t-1)	c(t-2)	d(t-1)	d(t-2)	Long-run coeffi-cient *b*	Long-run coeffi-cient *c*	Adj. R^2	D-W-Test
Berlin	-0.017	-0.071	-0.065	ABS		0.000	0.000	-0.960	-1.054	-0.045	0.078	0.925	2.424
	(0.085)*	(0.002)***	(0.007)***			(0.005)***	(0.003)***	(0.006)***	(0.004)***				
Düsseldorf	0.016	-0.027		TUO		0.153				-0.027	0.153	0.534	2.383
	(0.32)	(0.017)**				(0.069)*							
Frankfurt	-0.056	-0.030	-0.019	OST	2.988		1.989			-0.075	4.978	0.804	1.625
	(0.193)	(0.001)***	(0.006)***		(0.041)**		(0.1)*						
Hamburg	0.017	-0.041	0.018	OPC	-1.354			0.259		-0.032	-1.829	0.841	2.313
	(0.073)*	(0)***	(0.043)**		(0.037)**			(0.039)**					
Köln	0.029	-0.027		ABS	0.000			0.540		-0.059	0.058	0.767	1.593
	(0.017)**	(0.017)**			(0.097)*			(0.003)***					
München	0.014	-0.017		OEM	2.202					-0.017	2.202	0.712	2.424
	(0.274)	(0.046)**			(0.001)***								
Stuttgart	0.022	-0.019	-0.017	OPC	0.885	-0.919				-0.036	-0.034	0.860	1.825
	(0.015)**	(0.009)***	(0.008)***		(0.056)*	(0.021)**							

- For all cities we found significant models for estimating rent changes
- The explanatory power is quite good
- The factors used to determine “X“ differed from market to market

* = significant on the 10% level, ** = significant on the 5% level, *** = signficant on the 1% level

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Results Rental Adjustment Models: B-Cities

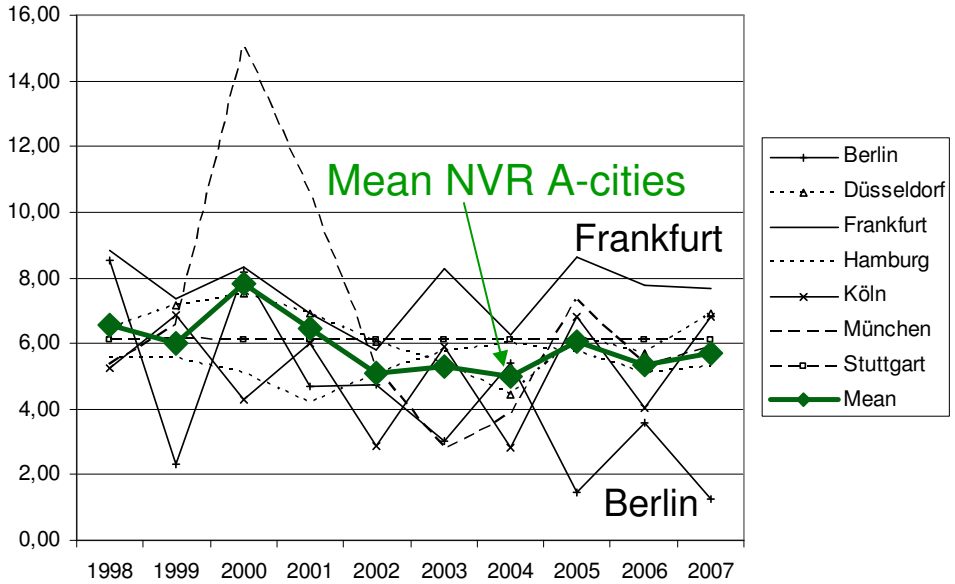
City	a	b(t)	b(t-1)	b(t-2)	b(t-3)	X	c(t)	c(t-1)	c(t-2)	d(t-3)	d(t-1)	d(t-2)	d(t-3)	Long-run coeffi-cient *b*	Long-run coeffi-cient *c*	Adj. R^2	D-W-Test
Bonn	-0.028		-0.028	0.047		OPC	0.845	-0.658			0.745	-0.035		0.067	0.642	0.762	1.791
	(0.095)*		(0.044)**	(0.01)**			(0.017)**	(0.051)*			(0.006)***	(0.065)*					
Dortmund	0.013				-0.027	OEM		1.303						-0.027	1.303	0.417	2.415
	(0.3)				(0.057)*			(0.074)*									
Duisburg	0.021			-0.030		COM		-0.012			0.421			-0.053	-0.021	0.333	1.426
	(0.076)*			(0.032)**				(0.137)			(0.088)*						
Erfurt	-0.009			-0.014		OST			-1.041				-0.692	-0.008	-0.616	0.612	2.474
	(0.49)			(0.011)**					(0.02)**				(0.008)***				
Essen	0.062					OEM	-2.670				0.631	-0.285		-0.059	-4.079	0.762	2.365
	(0.002)***						(0.007)***				(0)***	(0.022)**					
Magdeburg	-0.025		-0.018	-0.014		OPC	0.944							-0.032	0.944	0.588	1.905
	(0.16)		(0.01)***	(0.076)*			(0.081)*										
Mainz	0.025	-0.028	-0.038	-0.016		COM			-0.042		0.509			-0.166	-0.086	0.874	1.783
	(0.007)***	(0.002)***	(0.003)***	(0.061)*					(0.003)***		(0.027)**						
Wiesbaden	0.024		-0.024	-0.018		COM	-0.053	-0.029	-0.045	0.025	-0.688	0.475		-0.035	-0.084	0.693	1.730
	(0.027)**		(0.021)**	(0.061)*			(0.016)**	(0.046)**	(0.009)***	(0.071)*	(0.03)**	(0.059)*					

- For most cities we found significant models
- No meaningful results for Bremen, Dresden, Hannover, Nürnberg, doubtful results for Leipzig
- Statistical models less sound and lower explanatory power than for A-cities

* = significant on the 10% level, ** = significant on the 5% level, *** = signficant on the 1% level

Results Natural Vacancy Models: A-Cities

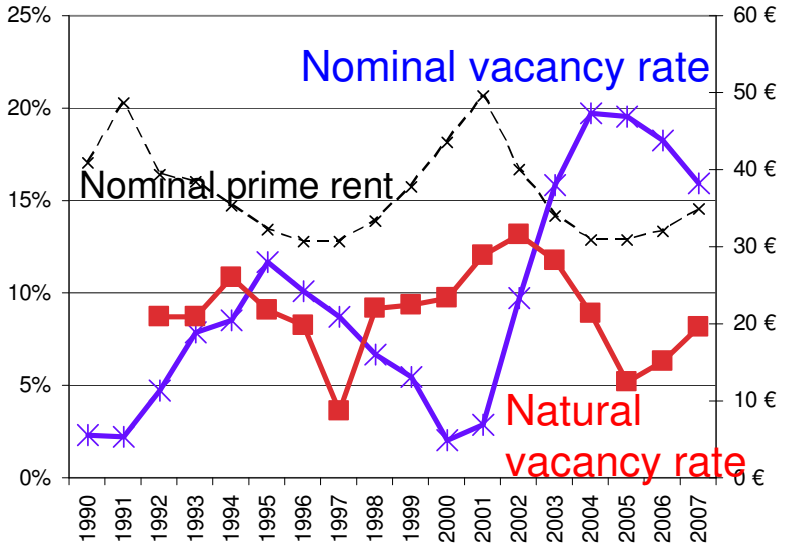
Fig. 5:
Natural Vacancy Rates in A-cities [%]



- High volatility (due to high sensitivity to changes in input factors), low correlation
- On average "stable" NVR around 6% of total office stock
- NVR seems to depend on factors like market size, turnover and market health, which is basically in line with our assumptions: i.e., cities with a low turnover relative to the office stock (like Berlin) need lower natural vacancy rates than cities with high relative turnover (like Frankfurt)

Results Natural Vacancy Models: Example

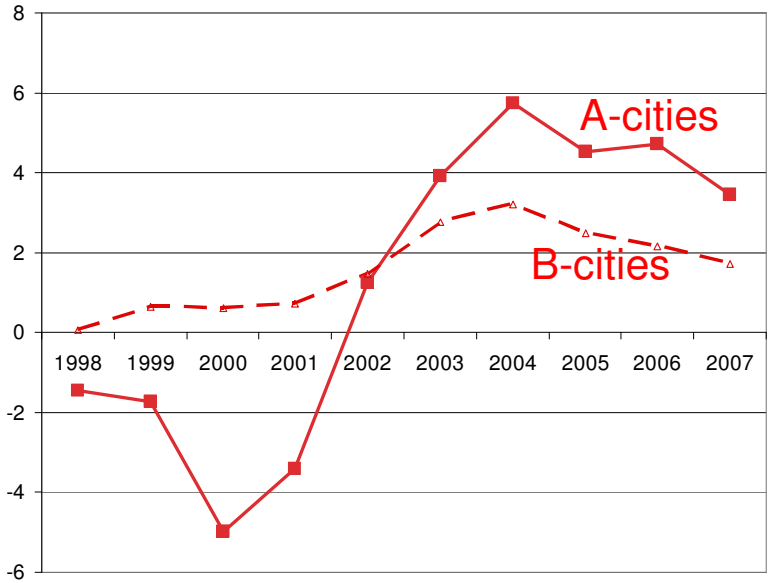
Fig. 5:
NVR, NOM, and nominal prime rent in Frankfurt



- The connection between nominal and natural vacancy rates can easily be seen between 1998 and 2001: excess demand led to a price increase of 10-16% p.a.
- In 2001/2002, the market turned over and the (nominal and real) rents collapsed as supply and demand got out of balance, caused by the crash of the “new economy” and overbuilding
- Since then the market market has not fully recovered

Results Structural Vacancy Model: A-Cities

Fig. 6:
Mean structural vacancy rates in A- and B-cities



- Both trend and level are a little different from what we expected
- However, there are indeed high structural vacancies in the German office market, adding up to appr. 3.5 million square metres in the A- and B-cities
- And: other results are in line with our expectations, e.g., negative structural vacancy rate around Y2K, course since then, higher volatility in A-cities

Summary

- Real rent changes in the German office market can be estimated by a model using natural vacancy rates
- We could not verify our hypothesis of a rising structural vacancy rate
- However, in many markets the structural vacancies have been on a very high level for several years
- This poses a severe threat for investors and banks who cannot capture the vacancy risk in their valuation models
- Further research necessary, for instance:
  - Optimizing the model
  - Searching for the drivers of the natural vacancy rate (see, for instance Sanderson et al. (2006))
  - Collecting data for direct measurement of natural and structural vacancies
  - Improving valuation models
  - Finding answers for the question „How to deal with structural vacancies in my building/portfolio/loan portfolio/city/region…“

Many Thanks to…

- BulwienGesa AG
- Ralf Fröba — BulwienGesa AG, München
- Stefanie Jablonka — Nürtingen-Geislingen University, Geislingen
- Mathilde Stanglmayr — MSP Stanglmayr Projektmanagement, Berlin
- Artur Tarassow — Düsseldorf

Questions or Comments?

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