

Real Estate Cycles in Germany - Causes, Empirical Analysis and Recommendations for the Management Decision Process

Paper presented at the
8th Conference of the Pacific Rim Real Estate Society
21-23 January 2002
Christchurch, New Zealand

Authors:

Nico Rottke

Martin Wernecke

Chair of Real Estate Economics
EUROPEAN BUSINESS SCHOOL
D-65375 Oestrich-Winkel

Phone: +49-67 23-99 50 45

Fax: +49-67 23-99 50 35

e-mail: nico.rottke@gmx.de; wernecke@nespri.de

This article represents a first draft version only. For citation, please contact the authors for the latest version.

Abstract: Unlike in the US or the UK, research of real estate cycles in Germany exists only to a limited extent. Therefore, this article follows three objectives:

- To briefly introduce the reader to the theory of real estate cycles. Much has been written about theoretical approaches to analyze cycles. Real estate cycles and their phases are thus only described. For more detail, the attached bibliography gives an overview of articles that provide a good understanding of real estate cycles and their management.
- To analyze the German office market empirically based on its observable and quantifiable variables. There is hardly any cycle research in Germany. Therefore, this paper is one of the first attempts to show the cyclical behavior of the German real estate market. Due to data unavailability and scarce data resources the large office markets have been chosen.
- To present recommendations for the management decision process based on theoretical causes and empirical analysis. What can a decision maker do to assure that the cyclical behavior of a given real estate market is accounted for? As an example, real estate finance and project development are chosen since they reveal the clearest disproportion between current utilization of cyclical real estate management and its full potential.

Introduction

Real estate cycles have been subject of much research over the last 10 years throughout the world. Although some academics deem real estate cycles as irrelevant or non-existent, many others did a lot of research in this area, e.g. well-known academics as Pyhrr, Born, Webb, Wheaton, Grissom or Roulac. Interestingly enough, there is nothing like a cycle theory. Many researchers look from different viewpoints at real estate cycles and try to figure out the best ways how to describe cycles, how to forecast them and how to integrate them into an overall context. These views can be classified as the macroeconomic, microeconomic or the finance view.

From the perspective of the macroeconomic view, real estate cycles are regarded as part of the business cycle and focus on overall construction activity and sector unemployment rates in order to find relationships between cyclical behavior of real estate and other aggregate markets.

The microeconomic view differentiates four markets as part of the real estate market: the space market, the investment market, the market for new construction and the land market. A focus is put on elements like rent levels, vacancy and absorption rates and the role of different forms of expectations formation.

The finance view on cycles is based on Modern Portfolio Theory (MPT) and draws its conclusions out of valuation frameworks such as the Capital Asset Pricing Model (CAPM), the Arbitrage Pricing Theory (APT) or Real Options Models. Central variables are e.g. interest rates, volatilities and higher moments, serial correlations and risk premiums.

A fourth view has hardly been researched: the management view. This view examines whether and how cycles can be integrated into management aspects. Management aspects are part of the so-called “house of real estate economics”, a framework for real estate economics as a scientific discipline that is used in Germany at European Business School and that focuses on the interdisciplinary aspects of real estate.¹

Within the category of management a distinction can be made between phase-oriented, function-specific and strategy-related aspects. Whereas phase-oriented aspects stand for the temporal determinant in the life cycle of real estate, the functional approach has regard to the real estate-related particularities of business administrative functions. Strategy-related aspects, on the other hand, are concerned with the portfolio management of investors and corporate and public real estate management (see Figure 1).²

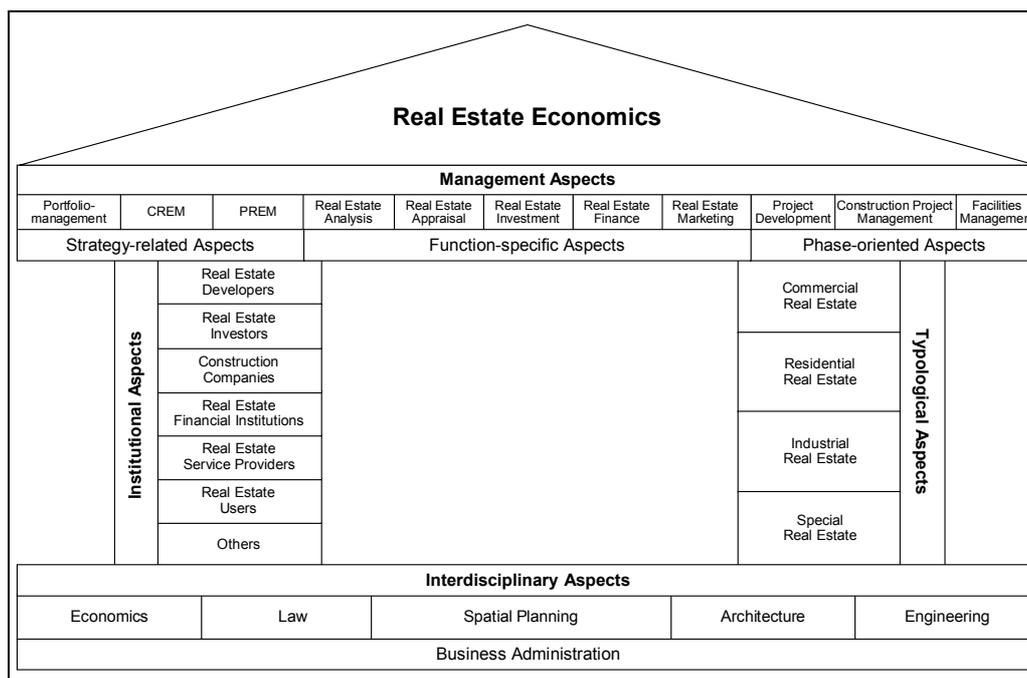


Figure 1: House of Real Estate Economics; Source: Schulte/Schäfers (2000)

Unlike in the US or the UK, research of real estate cycles in Germany exists only to a limited extent. Therefore, this article follows three objectives:

- To briefly introduce the reader to the theory of real estate cycles. Much has been written about theoretical approaches to analyze cycles. Real estate cycles and their phases are thus only described. For more detail, the attached bibliography gives an overview of articles that provide a good understanding of real estate cycles and their management.
- To analyze the German office market empirically based on its observable and quantifiable variables. There is hardly any cycle research in Germany. Therefore, this paper is one of the first attempts to show the cyclical behavior of the German real estate market. Due to data unavailability and scarce data resources the large office markets have been chosen.
- To present recommendations for the management decision process based on theoretical causes and empirical analysis. What can a decision maker do to assure that the cyclical behavior of a given real estate market is accounted for? As an example, real estate finance and project development are chosen since they reveal the clearest disproportion between current utilization of cyclical real estate management and its full potential.

Literature review

Research on real estate cycles in the US began as early as the 1930s with the pioneering work of Kuznets (1930). The number of publications rose rapidly at the beginning of the 1980s, but the coverage remained widespread and inconsistent. In 1990, Pyhrr and Born made an effort to systematize the findings. This effort was continued up to today. Mueller, Pyhrr and Born (1999) noticed that a common terminology, methodology and agenda in cycle research is not in place yet. In the same year, Pyhrr/Born and Grissom/DeLisle published two studies in which they try to restructure the topic of real estate cycles.

Up to now in the US and the UK, cycle research papers have increased enormously both in terms of quantity and quality. There are more than 350 papers dealing with this issue. In other countries, cycle research is very limited - a fact which is often explained by data unavailability and lack of real estate research in general.

One scope of this paper is to apply real estate cycles to management. With an interdisciplinary approach, real estate cycles can be integrated into the "house of real estate economics", the framework for real estate economics as a scientific discipline. Schulte and Schäfers (2000) describe the reasons for neglecting real estate as a science and offer an approach to differentiate real estate as a scientific discipline. Schulte (2000) describes the application of this framework and, among other aspects, the position of management in it.

Focusing on German real estate, Rottke and Wernecke (2001/2002) applied real estate cycles to the management aspects of the above mentioned framework. They analyzed the cyclical behavior of German real estate markets with regard to the management of participating individuals and companies. The management aspects and their sensitivity to market cycles are described and solutions are offered on how the dependency on cycles can be reduced by - or at least integrated into - management.

Next to this publication, few sources concerning real estate cycle research in Germany can be named: Becker (1998) analyzed economic patterns of housing and commercial construction expenditures from a microeconomic point of view. Using a 4-quadrant model, he describes the functioning of German housing and office markets and the causes of cyclical movements. Dobberstein (2000) examines the pro-cyclical behavior of participants in the German office market. Project developers, financiers, investors, consultants and cities are examined with regard to their pro-cyclical behavior and possibilities how to deal with it.

Causes of real estate cycles

Endogenous mechanisms

Real estate cycles may partially be caused by endogenous market imperfections. Perhaps the most important of these imperfections is the existence of time lags, which characterize other cyclical markets as well.

In order to understand the acceleration process of under- and over-exaggeration, it is necessary to take a closer look at the time lag issue. Mainly three types of time lags are distinguishable: the price-mechanism lag, the decision lag and the construction lag.³ An unexpected increase in demand faces a supply volume, which is fixed in the short run. The market reactions towards a temporary equilibrium take place in form of price- or quantity adjustments, the latter only possible by reductions in the vacancy rate. Therefore rents (and sales prices) go up while vacancy goes down. As soon as the vacancy is absorbed below the so-called "natural" level, the short run market reaction can only occur in form of price movements. The time that passes until prices (fully) react is called the price-mechanism lag. Because of the internal decision processes of large companies (which are able to invest large sums), investors also react with a lag to rising prices (decision lag). When they finally decide to invest, new construction has to be planned and construction companies have to be contracted. The time that passes until a project has been built is called construction lag. It is the time period of these three time lags together that is characterized mainly by price reactions and that makes up the "short run" in the microeconomic sense.⁴ If at least some investors form their expectations based on exaggerated prices, substantial overbuilding may occur, causing price reactions - this time to the opposite direction. The repetition of this process leads to a (probably softened) endogenous cycle, which varies in time, space and from sector to sector.

Exogenous influences

The initial cause for endogenous movements are influences, that are exogenous to real estate markets. They occur in form of demand shocks of different size, which - depending on the situation - either accelerate or soften the process. These exogenous factors can be categorized into middle- and long-term influences.

Middle-term influences from outside are based on the economic development in a country and its local markets. They consist of movements in main economic variables such as infla-

tion, interest rates, GDP or the interest level. Long-term influences do not visualize in a sudden shock, but have a long-term impact in form of structural change. Examples for structural change are political upheaval (e.g. the foundation of the European Union), economic structural change (e.g. globalization), a change in the space-time dimension (e.g. new information and communication technologies) or growing ecologic consciousness (new technologies or new forms of urban planning).⁵

Cycle description: reference cycle or stylized facts

In order to describe real estate cycles, two methods can be chosen. One way is to stick to a clear-cut definition, like that of the Royal Institution of Chartered Surveyors (RICS), which describes real estate cycles as follows:

„The property cycle is taken as ‘recurrent but irregular fluctuations in the rate of all-property total return, which are also apparent in many other indicators of property activity, but with varying leads and lags against the all-property cycle.’”⁶

The advantage of such a definition is that it has a direct interpretation from the management point of view. Unfortunately, in Germany there is missing data to construct a performance history.⁷ Moreover the reference cycle in terms of the RICS-definition as all-property yield represents a conglomerate of independent movements which are expressed in one figure only. This potentially leaves important but contrary movements of income and price unobserved. Another disadvantage of this definition is the attribute “recurrent but irregular”, as it may be difficult to find a time series which does not show this pattern in one way or the other.

The second way to describe real estate cycles is through identification of its stylized facts, which may consist of single and multivariate movements, their first and higher moments and other patterns of all those variables that seem appropriate. The advantage is that variables can be chosen in terms of data availability (e.g. demand for space, absorption, construction figures, rents or vacancy rates). But some caution is necessary in order not to define cycles in a manner of self-reference, which could arise from the misconception that “market movements are known to have been cyclical, therefore past patterns of the variables define the real estate cycle”. Figure 2 shows in a simple tabular schedule, how styl-

ized facts may be used to describe phases of the real estate cycle using first order movements only.⁸

phases of a real estate cycle					
	demand for space	absorption	increase in supply of new space	rents	vacancy
↑↑ = strongly increasing ↑ = increasing ↓ = decreasing ↓↓ = strongly decreasing ↓→ = decreasing / constant ↗ = slowly increasing					
	↓	↓	↑↑	↓	↑
	↓↓	↓≡	↑	↓↓	↑↑
	TM	↑	↓	TM	↓
	↑↑	↑↑	↓↓	↑	↓↓

Figure 2: Stylized facts - phases of a real estate cycle; Source: Rottke/Wernecke (2000/2001)

Psychological factors of influence

Real estate markets are cyclical. A scope of this paper is to describe how this phenomenon can be incorporated in the management decision process. Therefore, it is necessary to show how participants react to real estate cycles.

As has already been shown, there are basically three time lags that are an important cause of real estate cycles. If decision makers only react to time lags, but do not anticipate them, they are in danger of acting pro-cyclically.

There are some patterns in the human nature that partly explain, why market participants may act pro-cyclically. Dobberstein (2000) described these behavioral patterns in a rather metaphorical way.⁹

The *gold digger mentality* expresses the idea of developers or investors who try to copy the success of project developments which are ideally timed from a cyclical point of view. Taking into account what was mentioned above, this turns out to be impossible, since future movements of the market cannot be anticipated precisely.

The *gamblers fallacy* is the strong belief, that an investor or developer can even surpass the result of formerly successful market participants.

The *Midas syndrome*, as the name suggests not a German phenomenon only, expresses an constant egomaniacal opinion. An investor or developer might believe that the own project will be far more successful then others, although there are indications that the market already loses momentum and other projects begin to have problems finding users or buyers. The *greater fool-belief* depicts the tendency that market participants think that there will always be someone who will buy a project or object.

And at last, there is the high urge of self-realization at least in some developers who forget the basic rule of “never fall in love with real estate”. They try to develop - although it is obvious that the project will have to struggle.

Empirical analysis

Outline and limitations

After having briefly delineated the basic theoretical background of real estate cycles, an examination follows of how real estate cycles look like in Germany. This analysis, however, will be restricted to show some main trends and behavioral patterns of chosen markets. The analysis is restricted to the five largest German office markets because of the following reasons:

- In Germany, data availability for office and residential real estate is the best.
- The German residential real estate market is strongly regulated, reacting more to pro-cyclical political decisions. The office markets are more “typical” in the sense that they are more exposed to the free forces of demand and supply.

As the analysis will show, these markets are highly correlated. One conclusion of this fact may be, that inter-city diversification within the office sector only makes sense (if it makes sense at all), when splitting up sources between large cities (e.g. Frankfurt or Munich) and middle-sized cities (e.g. Münster or Kiel). The analysis also leads to the suggestion, that in a single-asset portfolio, diversification with other property types, e.g. industrial or retail trade real estate makes much more sense.

Investment market

The office investment market in Germany seems not to be very attractive for foreign investors - at least in terms of expected return. Figure 3 shows that between 1985 and 2000 the maximum yield for office buildings in the five largest markets varied approximately between five and six percent. This may well be the reason why international investors - despite equally low volatilities - do not to include German office real estate in their portfolios on a large scale.

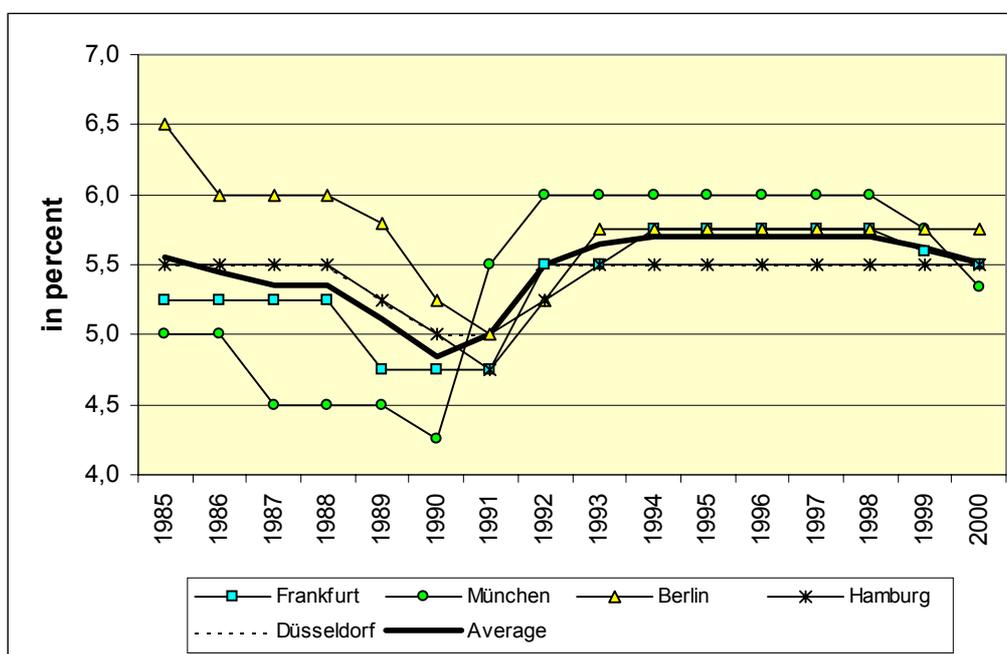


Figure 3: Comparison of maximum yields in the German office market;
Source: Jones Lang LaSalle

Construction market

Figure 4 reflects the over- and under-exaggerating phases caused by time lags. It can be seen in the four largest office markets in Germany (Frankfurt, Hamburg, Munich and Düsseldorf¹⁰) that - depending on the market - every three to eight years, a significant higher portion of new construction is added to the office market of the particular city. It is eye-catching, that in 1993 most of the researched office markets peaked in completion of new construction. This perfectly fits into the scheme of German Reunification in 1990 plus a three-year time lag.

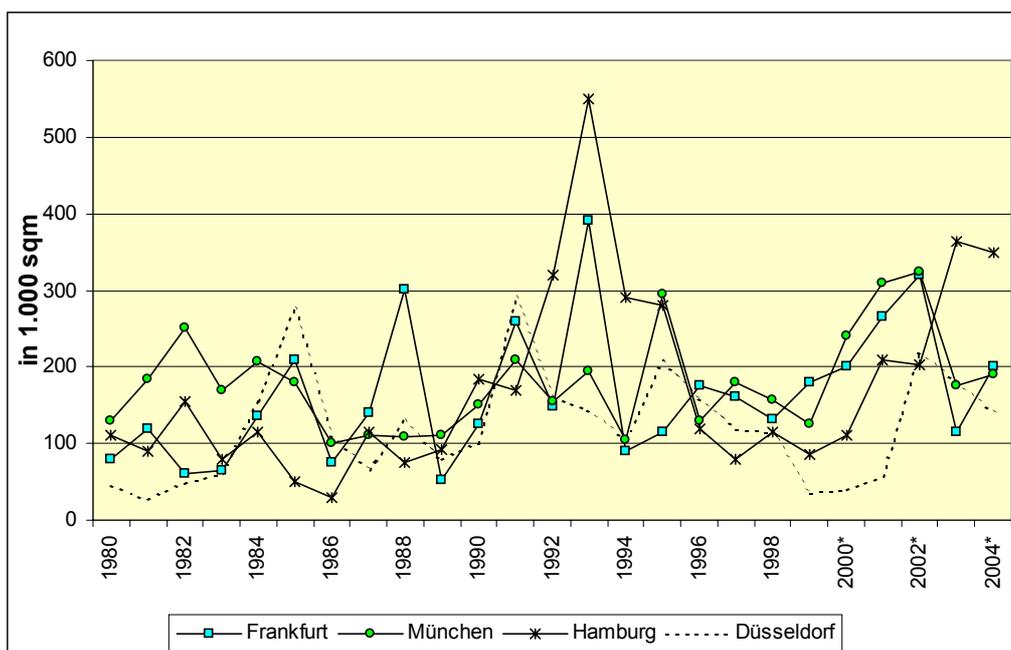


Figure 4: Completion of office space in Germany's biggest markets (except Berlin);
Source: Federal Statistical Office Germany

Furthermore, the “lag-topic” can be demonstrated by taking a look at the planning permissions and completions and their relationship to the top rents of the above mentioned markets. In order to do this, the top rent figures of the five markets are averaged and compared to the planning permissions and completions in Germany. Figure 5 shows that both the decision- and construction lag can be observed. After the start of the price-mechanism lag and the absorption of a certain part of vacancy, rents begin to rise. Approximately one year later (decision lag) planning permissions peak and another one to two years later, completions follow.

As Figure 6 shows, the top rents from 1985-2000 of the large German office markets are highly correlated.¹¹ Particularly conspicuous are the high correlations between Frankfurt and Munich as well as Berlin and Düsseldorf. Although these markets have different rent levels on an absolute scale, they move in line through good and bad times.

With regard to the highest volatility of the rents over the last 16 years, Berlin (41,8%) and Frankfurt (23,6%) have to be named. The reason may be seen in the structural change of these cities: Frankfurt became the new financial center in Continental Europe (domicile of the European Central Bank [ECB]) and Berlin new capital of the reunited Germany.

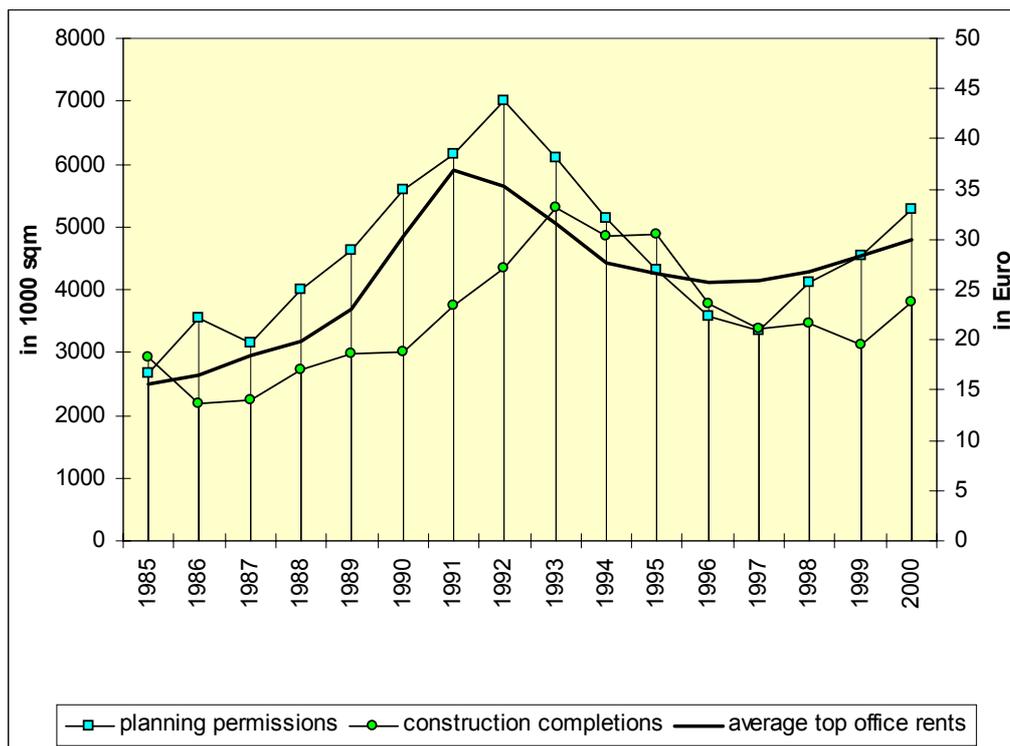


Figure 5: Planning permissions, completions and average top rents in the German office market; Source: Federal Statistical Office Germany and Jones Lang LaSalle

	Düsseldorf	Frankfurt	München	Hamburg	Berlin	St.Dev.
Düsseldorf	1					18,5%
Frankfurt	0,83	1				23,6%
München	0,81	0,96	1			17,1%
Hamburg	0,86	0,76	0,62	1		20,4%
Berlin	0,95	0,87	0,83	0,87	1	41,8%

Space market

Figure 6: Correlation coefficients and standard deviations for the largest cities in the German office market; Source: Own calculation; data: Jones Lang LaSalle

Comparing top rents and unemployment rate in Frankfurt, one can find out, that they run opposite to each other (see Figure 7).¹² This supports the common belief widely seen as the most important stylized fact of the office market, that the economic situation is its main driving force: during boom phases, companies employ more staff and do not minimize their space per worker as they tend to do during bust phases.

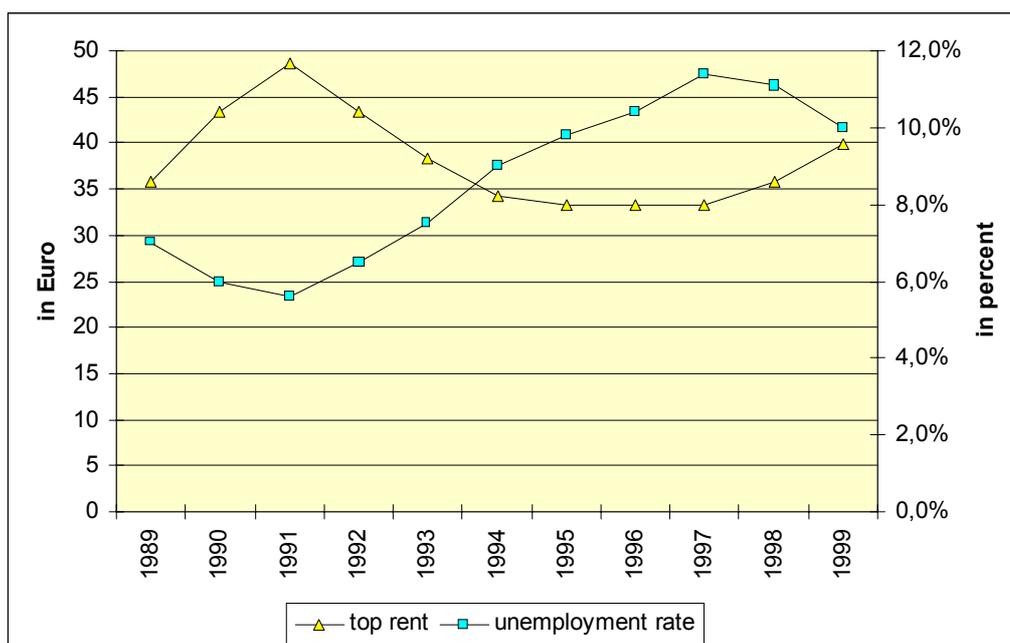


Figure 7: top rents and unemployment rate in Frankfurt; Source: Bulwien, RIWIS

Recommendations for the management decision process

The management decision process

As mentioned above, this paper uses the framework of the “house of real estate economics” taught in Germany at European Business School (see Figure 1). The strategy-related, function-specific and phase-oriented aspects are now analyzed with regard to the potential for active management considering real estate cycles and the implementation of cyclical real estate management in practice.¹³ As Figure 8 shows, there seem to be a lot of disparities between the possibility of an integration of real estate cycles into active management and a real implementation into practice.

The authors estimate that cycle management has been partially incorporated into portfolio management, marketing, in real estate analysis and appraisal. Cycle management only plays a minor role in public real estate management, facilities management and construction project management.¹⁴

The aspects with the largest disparity seem to be real estate finance and project development. These two aspects are analyzed in more detail.

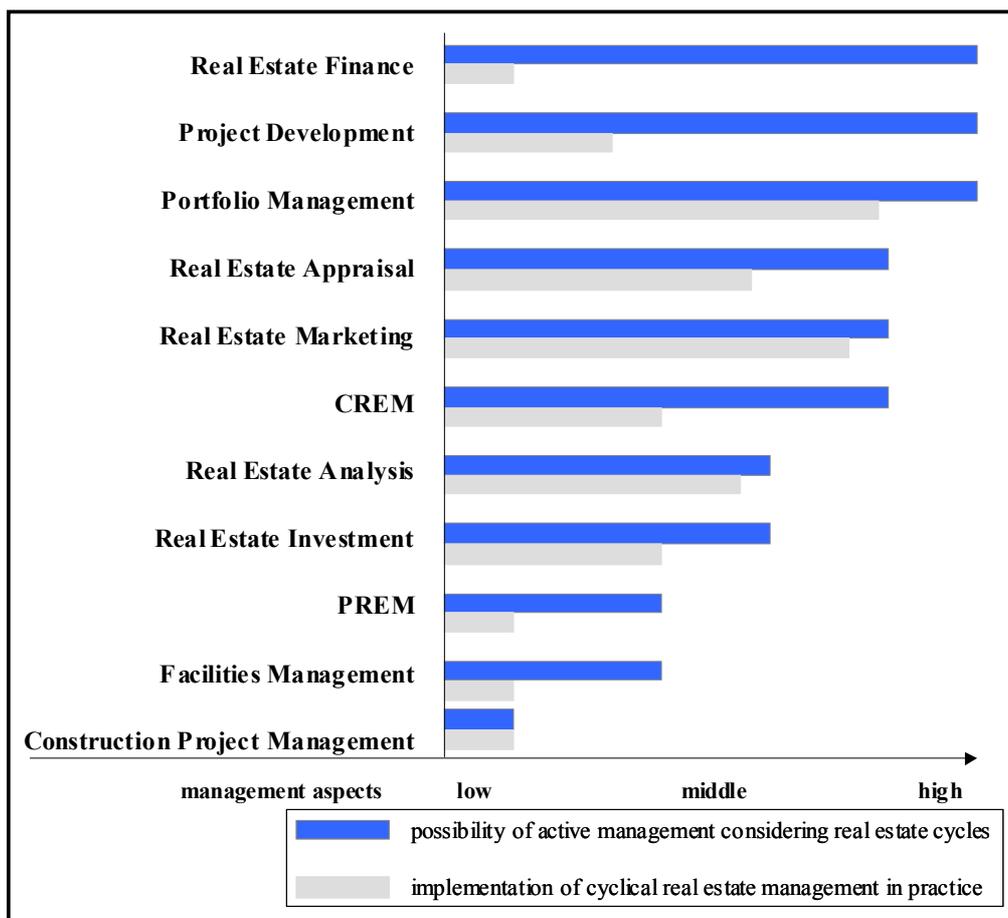


Figure 8: Real estate "cycle management"; Source: Rottke/Werneck (2001/2002)

Real estate finance

Because of the following reasons, German banks tend to fund real estate investment pro-cyclically:

- They have too much liquidity during boom phases.
- They do not focus on the quality of the project, but on the creditworthiness of the developer.
- According to principal-agent theory, it is hard for a real estate loan to pass due diligence during a bust phase and relatively easy during a boom phase.

A way to get a loan even in a bust phase can be achieved by using innovative forms of financing and therefore let the banks participate in the success of a developer or investor. In a recent study, Lucius/Iblher (2001) found that this alternative is hardly used in Ger-

many.¹⁵ They asked mortgage banks, savings banks, state-owned banks as well as commercial banks about the percentage they would allocate to innovative financing in the form of

- mezzanine capital,
- participating mortgages,
- convertible mortgages,
- project-financing, and
- joint-venture financing.

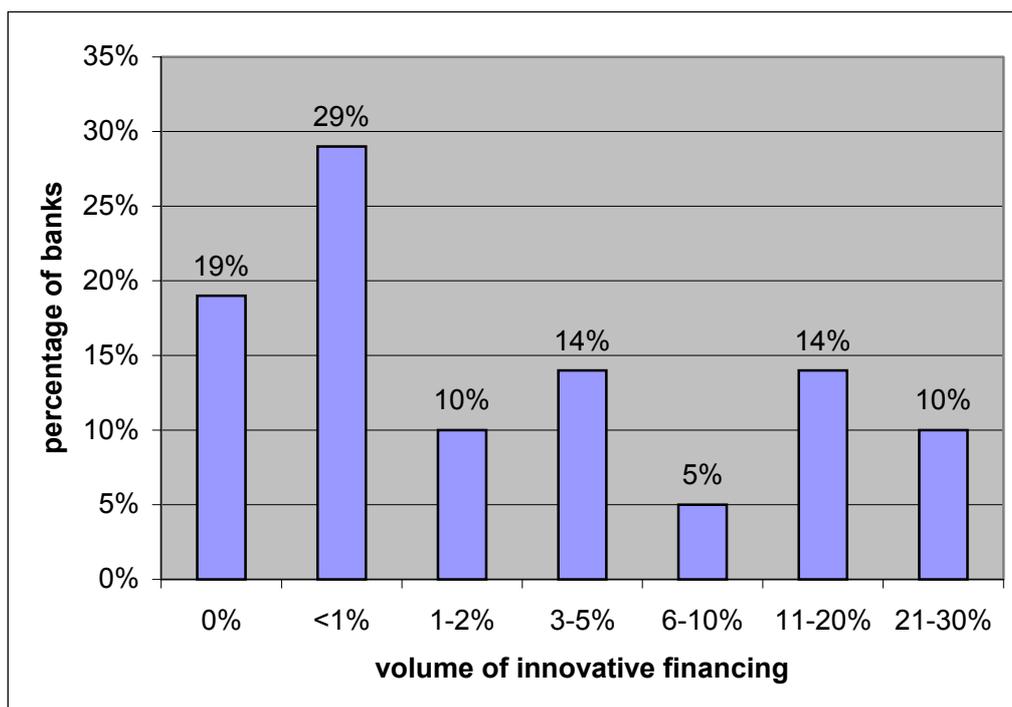


Figure 9: Volume of innovative financing in Germany as percentage of the total credit volume; Source: Iblher/Lucius (2001)

As Figure 9 shows, an accumulated figure of approximately 70% of the participating 22 institutes attributed 3-5% or less of their business to innovative financing. Only about 23% of the institutions make use of it to an extent of 11 to 30 percent. German developers or investors, and among them especially the small- and medium-sized ones, can ensure their loan-financing only during good times and therefore have little possibility to act anti-cyclically, although they may know that this could be a superior strategy.

Two other innovative ways to receive financing are private equity and venture capital, which draw additional attraction out of the even stricter regulations of the European mortgage market (due to the new Basel Capital Accord ["Basel II"-act]). In 2001, the first pure

real estate venture capital company has been founded in Germany.¹⁶ Since this form is still unique, it cannot be judged yet, which impetus it will have on Germany's financing scene.

Project development

As described above, developers hardly have a chance to invest anti-cyclically because of the pro-cyclical behavior of the banks.

Figure 10 shows the three types of developers and their sensitivity to cycles.

Developer types	Trader-Developer	Investor-Developer	Service-Developer
phase in the development process	from initiation to completion	from initiation to completion	pure service up to release of construction with following project management
sensitivity towards cycles	high	small to medium	depending on the order situation
time horizon	app. 2-4 years	app. 10-30 years	app. 1-2 years
customer/ client	mostly speculative, after completion sale to end-investor	investor-developer himself	owner of property with capacity limit
taking over of risk	for own risk and account	for own risk and account	own risk and for account of another
marketing	mostly use of an intermediary	own property	possible takeover of marketing, renting and exploitation

Figure 10: Developer types and real estate cycles; Source: Rottke/Werneck (2001/2002)

In Germany, the species "service developer" is a practically non-existent phenomenon. Only the two forms of the investor- and the trader-developer participate in the market.¹⁷

The investor-developer only has a small to medium sensitivity towards cycles, since he retains enough capital resources. Also, he can make use of a buy-and-hold strategy: Buy at some point and sell some 20 years later, when the market conditions are favorable.

The trader-developer has a time horizon of two to four years only. He is very sensitive to real estate cycles as his investment goals have a mainly speculative background. Only small companies ("speedboats") among the trader developers, which act proactively and which are able to shorten the decision, can deal successfully with the cycle. At the end of boom phases, companies like these focus on consulting or property administration. At the end of bust phases, they restart initiating their projects.¹⁸

Market trends and their effects on cycles

In order to be able to react properly to future real estate cycles, it is a key factor to anticipate future trends. In Figure 11, some trends are shown, which the authors deem to be important for the real estate markets. Each of these trends is examined for possible softening or enforcing impacts on future cycle amplitudes.

Trend	Expected impact on cycle amplitude	
	softening	enforcing
Globalization	“think global“ prevents undocking of regional market developments	internationalization of cycles increases; local speculative bubbles receive international liquidity
Securitisation	higher potential of anti-cyclical development	extension of timelags
Venture Capital/ Private Equity	Venture Capitalists provide anti-cyclical VC	Venture Capitalists act as cyclical as banks
Transparency	<ul style="list-style-type: none"> • better market understanding • “more rational“ participants 	---
Conclusion	<ul style="list-style-type: none"> • these trends only include parts of the causes of real estate cycles • the effects are often contrary 	

Figure 11: market trends and their effects on cycles; Source: Rottke/Werneck (2001/2002)

The result of these reflections is that there is no consistent expectation towards the development of real estate cycles. Most of the aspects show softening as well as enforcing impacts.

One thing at least can be taken for granted: market transparency has improved and will continue to improve worldwide - along with a better understanding of the markets through education of the participants which leads to a more “rational” behavior.

Conclusion

This paper has given a brief overview over

- real estate cycles in general,
- office cycles in Germany,
- and the integration of real estate cycles into management, using the examples of the management aspects of project development and real estate finance.

The paper is also an attempt to put forward cycle research in Germany. With respect to the main research interest of the authors, which is the integration of real estate cycles into management, a lot of research remains still ahead. Topics to be covered in future include:

- an empirical analysis of the role of real estate cycles in different management aspects,
- answers to the question of how to actively implement cycles into the management aspects,
- market trends and their effects on cycles,

and more generally:

- other typological real estate cycles in Germany, i.e. residential, industrial, or retail and their dependencies on cyclical behavior of real estate markets.

Literature

Becker, Kurt: Analyse des konjunkturellen Musters von wohnungswirtschaftlichen und gewerblich-industriellen Bauinvestitionen, in: Teichmann, U. / Wulff, J. (Hrsg.): Wissenschaftliche Schriften zur Wohnungs-, Immobilien- und Bauwirtschaft, Diss., Dortmund 1998 [Analysis of economic patterns of housing and commercial/industrial construction expenditures, in: Teichmann, U / Wulff, J. (ed.): Academic series for housing-, real estate- and construction industry, Diss., Dortmund 1998].

Beyerle, Thomas: Zukunftstrends – Wirkungsfaktoren des deutschen Immobilienmarktes, in: Immobilienmanager, Mai 1999, S. 23-25 [Future trends – factors of the German Real Estate Market, in: Real Estate Manager, May 1999, p. 23-25].

Dobberstein, Monika: Das prozyklische Verhalten der Büromarktakeure – Interessen, Zwänge und mögliche Alternativen, in: Arbeitspapiere zur Gewerbeplanung, Universität Dortmund, Fakultät Raumplanung, Arbeitspapier No. 2, 2000, S. 1-34 [The pro-cyclical behavior of participants in the office market – interests, constraints and possible alternatives, in: Working papers for trade planning, Uni-

versity of Dortmund, Faculty of Urban Planning, Working Paper. No. 2, 2000, p. 1-34].

Downs, Anthony: Principles of Real Estate Management, 13th Ed., Illinois 1991.

Grissom, Terry / DeLisle, James R.: A Multiple Index Analysis of Real Estate Cycles and Structural Change, in: Journal of Real Estate Research, Vol. 18, No. 1, 1999, S. 97-129.

Kummerow, Max: A System Dynamics Model of Cyclical Office Oversupply, in: Journal of Real Estate Research, Vol. 18, No. 1, 1999, S. 233-255.

Kuznets, S.: Secular movements in production and prices, New York: Houghton Mifflin, 1930

Lucius, Dominik / Iblher, Felix: Innovative Financing in Germany – A Financial Desert?, Paper presented at the 1st conference of the International Real Estate Society (IRES), July 25-28, 2001, Girdwood, Alaska.

Mueller, Glen R.: Real Estate Rental Growth Rates at Different Points in the Physical Market Cycle, in: Journal of Real Estate Research, Vol. 18, No. 1, 1999, S. 131-150.

Mueller, Glen R.: Understanding Real Estate's Physical and Financial Market Cycles, in: Real Estate Finance, Vol. 12, No. 3, Fall 1995, S. 41-52.

Mueller, Glen R. / Pyhrr, Stephen A. / Born, Waldo L.: Introduction, in: Journal of Real Estate Research, Vol. 18, No. 1, 1999, S. 3-6.

Pyhrr, Stephen A. / Born, Waldo L.: Real Estate Cycles: The Body of Knowledge, presented at the Annual Meetings of the American Real Estate Society (ARES), April 7 -10, 1999, Tampa, 8.4.1999, S. 1-28.

Pyhrr, Stephen A. / Roulac, Stephen E. / Born, Waldo L.: Real Estate Cycles and their Strategic Implications for Investors and Portfolio Managers in the Global Economy, in: *Journal of Real Estate Research*, Vol. 18, No. 1, 1999, S. 7-68.

Pyhrr, Stephen A. et al.: Real Property Valuation in a Changing Economic and Market Cycle, in: *The Appraisal Journal*, January 1996, Vol. LXIV, No. 1, S. 14-26.

Pyhrr, Stephen A. / Born, Waldo L. / Webb, James R.: Development of a Dynamic Investment Strategy under Alternative Inflation Cycle Scenarios, in: *Journal of Real Estate Research*, Vol. 5, No. 2, Summer 1990, S. 177-193.

Roulac, Stephen E.: Real Estate Market Cycles, Transformation Forces and Structural Change, in: *Journal of Real Estate Portfolio Management*, Vol. 2, No. 1, S.1-17.

Rottke, Nico: Immobilienzyklen in Deutschland – Ursachen und empirische Analyse, Diplomarbeit an der European Business School, Oestrich-Winkel, Januar 2001 [Real Estate Cycles in Germany, Causes and Empirical Analysis, Diploma Thesis at European Business School, Oestrich-Winkel, Germany, January 2001].

Rottke, Nico / Wernecke, Martin: Management im Immobilienzyklus, 16 Folgen, in: *Immobilien Zeitung*, Juni 2001 – Januar 2002 [Management in the real estate cycle, 16 issues, in: *Immobilien Zeitung*, June 2001 – January 2002].

Royal Institution of Chartered Surveyors (RICS): Understanding the Property Cycle, Main Report: Economic Cycles and Property Cycles, London 1994.

Schulte, Karl-Werner: Immobilienökonomie – ein innovatives Lehr- und Forschungskonzept!, in: Schulte, Karl-Werner (Hrsg.): 10 Jahre ebs Immobilienakademie, Festschrift, Frankfurt 2000, S. 36-47 [Real Estate Economics – an innovative concept for theory and research!, in: Schulte, Karl-Werner (ed.): 10 years of ebs Real Estate Academy, commemorative volume, Frankfurt 2000, S. 36-47].

Schulte, Karl-Werner: Real Estate Education in Germany, in: Real Estate Education throughout the world: Past, Present and Future, Schulte, Karl-Werner (ed.), Boston 2001, p. 125-147.

Schulte, Karl-Werner / Schäfers, Wolfgang: Immobilienökonomie als wissenschaftliche Disziplin, in: Schulte, Karl-Werner (Hrsg.): Immobilienökonomie, Band I, 2. Aufl., Betriebswirtschaftliche Grundlagen, München 2000, S. 99-115 [Real Estate Economics as an academic discipline, in: Schulte, Karl-Werner (ed.) Real Estate Economics, Volume I, 2. Ed., economic principles, München 2000, S. 99-115].

Shilton, Leon: Patterns of Office Employment Cycles, in: Journal of Real Estate Research, Vol. 15, No. 3, 1998, S. 339-354.

Wheaton, William C.: Real Estate "Cycles": Some Fundamentals, in: Real Estate Economics, Vol. 27, No. 2, 1999, S. 209-230.

Wheaton, William C. / Torto, Raymond G. / Evans, Peter: The Cyclic Behaviour of the Greater London Office Market, in: Journal of Real Estate Finance and Economics, Vol. 15, No. 1, 1997, S. 7-92.

Notes

- ¹ Schulte, Karl-Werner / Schäfers, Wolfgang (2000): Immobilienökonomie als wissenschaftliche Disziplin, p. 109.
- ² Schulte, Karl-Werner (2001): Real Estate Education throughout the world, p. 141.
- ³ Rottke (2001), Immobilienzyklen in Deutschland, p. 20.
- ⁴ Becker (1998): Bauinvestitionen, p. 40.
- ⁵ Beyerle (1999), Zukunftstrends, p. 24.
- ⁶ RICS, Property, S. 9.
- ⁷ The German Real Estate Index "DIX" provides only data for the last five years. Moreover, its portfolio reaches only now a volume that is representative for the whole market.
- ⁸ Rottke/Wernecke (2001/2002), Immobilienzyklen, issue 5.
- ⁹ Dobberstein (2000): Das prozyklische Verhalten der Büromarktakeure, p. 3-4.
- ¹⁰ Because of German Reunification, there is partially no consistent statistical data available for West and East Berlin together, although this is the biggest German office market.
- ¹¹ Top rents had to be taken instead of average rents for each markets since average rents were not available for all cities. For demonstrating cycles, the use of top rents is sufficient, since they show stronger over- and under-reactions as average rents.
- ¹² An examination of the figures for Munich leads to the same results .
- ¹³ This analysis is based on an estimation of the authors for Germany. It is not yet proved by empirical evidence.
- ¹⁴ Rottke/Wernecke (2001/2002): Immobilienzyklen, issue 16.
- ¹⁵ Lucius/Iblher (2001): Innovative Real Estate Financing in Germany, p. 12-13.
- ¹⁶ See: <http://www.revc.de>
- ¹⁷ Rottke/Wernecke (2001/2002): Immobilienzyklen, issue 14.
- ¹⁸ Rottke/Wernecke (2001/2002): Immobilienzyklen, issue 14.