Real Estate Performance
Five Essays

Kicki Björklund

Stockholm 1999
Real Estate Performance
Five Essays

Kicki Björklund

Stockholm 1999
Life is a possibility
Abstract

This dissertation consists of five papers addressing various real estate performance issues (see full titles in italics below). The dissertation is empirical in nature and the data used in most of the empirical sections consist of figures for income-producing property returns. Paper 1 was presented at seminar and accepted as a Licentiate Degree in Engineering thesis. Papers 2 to 5 were all written jointly with others (the names of the co-authors appear later in the dissertation). Paper 3 has been published in the *Journal of Real Estate Research*, and Papers 2, 4, and 5, are also intended for publication in academic journals.

The objective of Paper 1, entitled *Capital Recovery and Long-run Profitability*, was to find empirical and scientific support for adopting measurements of profitability featuring stability, simplicity and reliability, that could easily be implemented into existing administrative routines, and which could also support effective decision-making. The model was empirically tested through analysing the profitability of individual properties and property portfolios. The portfolios studied were put together featuring variation in property location, usage and initial performance expectations.

Paper 2, entitled *An Investigation of Property Price Studies*, constitutes an untraditional literature review covering articles where price equations in the real estate market have been estimated using regression techniques. This paper examines the degree to which these studies follow good scientific practice when reporting on the econometric issues. It also presents a descriptive overview of the prevalence of these articles in the literature, and the significance of the various topics addressed by these studies. This paper was prepared in 1996 and examines 145 articles published between 1990 and 1995 from 12 highly regarded (see later) research journals on real estate, housing and urban economics.
Paper 3, entitled *Property Cycles, Speculative Bubbles and the Gross Income Multiplier*, addresses the issue of whether or not the occurrence of significant price increases during the upturn in a property cycle can be attributed to a speculative bubble. The findings of this study indicate that a speculative bubble may have driven the Swedish income-producing real estate market during the 1980s. This conclusion is based on an analysis of panel data where the state of the property cycle has been mirrored by the value of the Gross Income Multiplier (GIM).

In Paper 4, entitled *Analysing Performance in a Constant Sample of Mixed-use Properties*, property performance was analysed using annual total rate of return (TRR) data for a sample of 138 mixed-use income-producing properties from 1979 to 1997. The empirical analysis using panel data models involve three-step analyses. In step 1, various different TRR definitions were compared and found to provide almost identical results at the portfolio level. In step 2, regression analyses were used to explain the variation in the TRR. The percentage of commercial space in particular was found to have an important and cycle-dependent impact. Regression has also been used for explaining the individual deviation from the mean TRR. In step 3, maintenance costs and investments were found to have a significant effect.

In Paper 5, entitled *Rent Determinant and Rent Drift in a Housing Market under Rent Control*, residential rent 1990—1997, was studied from an investor’s point of view. Estimations were conducted using rent equations to analyse whether or not rent levels varied between locations while other rent-affecting variables were held constant, and found evidence suggesting that they did. Annual increases in the effective rent charged for privately owned residential properties were compared with the official increases set via official negotiation for municipality owned residential housing to see whether excessive rent increases (indicating rent drift) could be found. Evidence was found to support the existence of rent drift, and also that this rent drift is partly explainable in terms of investment and maintenance.

Descriptors: Depreciation, gross income multiplier, net operating income, property performance, real estate profitability, profitability, residential rent, total rate of return,
Lönsamhet i avkastningsfastigheter
Fem Studier

Kicki Björklund

Institutionen för fastigheter och byggande
Kungliga Tekniska Högskolan

Akademisk avhandling (sammanläggning)
framlagd till offentlig granskning med tillstånd av delfakultet ALV
för vinnande av Teknologi Doktorsexamen
i sal D3 vid Kungliga Tekniska Högskolan
Fredagen den 10 december 1999, kl. 13:00

Referat.


Syftet med uppsats 1, Kapitalåtervinning och långsiktig räntabilitet - metodutveckling och analys av 277 fastigheter, var att finna en enkel och samtidigt stabil analysmodell för analys av förräntning i fastighetsinvesteringar som var teoretiskt förankrad. Modellen utformades för att minimera de tolkningsproblem som är förknippade med traditionell analys av förräntning i avkastningsfastigheter. Modellen testades empiriskt genom analys av förräntning i enskilda fastigheter och för grupper av fastigheter (portföljer). Avkastningen jämfördes mellan portföljer konstruerade efter olika läge, olika användning respektive olika förhållande vid investeringstillfället.


Sökord: Avkastning, avskrivning, bruttokapitaliseringsfaktor, bostadshyra, direktavkastning, driftnetto, kapitalåtervinning, lönsamhet, totalavkastning, återbetalningstid
Acknowledgements

The processes underlying decision-making in the real estate industry have been an enduring interest of mine throughout my career. Of particular interest have been issues relating to the understanding and explanation of variations in real estate investment performance. From 1981 to 1989, I worked in the real estate department in a large insurance company. During this period I learnt a lot about the use of performance measures in practice, which has been distinctly advantageous in subsequent academic work. I wish to take this opportunity to express my gratitude and appreciation for all the valuable discussions with my colleagues during this period. I would also like to acknowledge the great foresight of Gudrun Larsson, the late Helge Stensæus and the late Lars-Erik Hermansson, in saving long-run return data for future research purposes.

I would like to thank my supervisor Professor Roland Andersson for his encouragement and support in getting my dissertation off the ground at the department of Building and Real Estate Economics. He has shown unwavering confidence in my ability even when I doubted it myself. I also greatly appreciate the improvements he has made to doctoral education within the department; illustrated for example by inviting Professors Nancy Wallace and John Quigley to present an advanced course in Housing Economics and Financial Analysis. This course has been very important for my dissertation work, and I therefore wish to thank them too for a valuable and most useful course. While undertaking my Licentiate Degree in Engineering thesis, I received great support from Professor Paulsson Frenckner and Associated Professor Hans Lind. I also wish to thank Professor Christian Janssen for his support and encouraging me to begin working with regression analysis. I also want to thank all my colleagues at the department of Building and Real Estate Economics for a wealth of interesting and stimulating discussions. I would also like to thank Samuel Azasu, Peter Collopy and Sigrid Katzler for their valuable help.

In order to work consistently hard it is necessary to maintain one’s good health and well being. I would therefore like to thank Jenny Åkerman for teaching me how to eat more healthily. I would also like to thank Kerstin Klingborg-Stark for her guidance in achieving a “lifestyle that you can love”.

Most of all, I wish to acknowledge my deep gratitude to my wonderfully supportive family - my husband Dag and my two sons, Anders and Martin. Anders was only three when I started my work and Martin was born after it began. While concentrating hard on my work, I have not always been able to find as much time to devote to them as a mother and wife as I would have otherwise liked. Their support and pride in my work has been steadfast. I also wish to express my heartfelt thanks to my parents Elsa and Ingvar, my sister Elisabeth and her children Sanna and Patrik for their support over the years.

My dissertation (as is often be the case) has taken many years to complete, and the list of colleagues and friends, who have inspired, helped and encouraged me is very long. I have only managed to mention a few of you by name in the small space here, but you are by no means overlooked, and I give you all my kindest regards.

Kicki Björklund
Bromma, November 1, 1999
Real Estate Performance—Five Essays
Kicki Björklund

Table of contents

Introduction 12
Contribution to Research 13
Individual contributions to Papers 2-5 15
Summary of papers 1-5 17

– Paper 1 Capital Recovery and Long-run Profitability 17
– Paper 2 An Investigation of Property Price Studies 20
– Paper 3 Property Cycles, Speculative Bubbles and the Gross Income Multiplier 22
– Paper 4 Analysing Performance in a Constant Sample of Mixed-use Properties 23
– Paper 5 Rent Determinants and Rent Drift in a Housing Market under Rent Control 25

References 26

Table of content for papers in full-length 27
Introduction

This dissertation focuses on real estate performance. Major fluctuations in performance, especially the recent real estate crisis seen in almost all the developed countries, has emphasised the need for achieving a better understanding of inherent differences and changes in real estate investment performance. There is a need for understanding how returns are established and what causes the cyclical patterns clearly evident in the real estate markets. Some of the most important issues to be addressed in the real estate decision-making process are how to achieve the following:

- rank properties in a portfolio,
- diversify within a property portfolio,
- choose which property to sell or to buy,
- know whether a quality improvement strategy is a success, and
- identify the effects on performance for given different management strategies.

The five papers included in this dissertation focus on a profit-maximising perspective within decision making. Performance can be equated to profitability based on different methods of calculation and for different periods of time. Each method for calculating profitability faces its own set of problems. The level of net operating income (NOI) and the change in price together make up the total rate of return (TRR). NOI is determined in the rental market, while prices are determined in the real estate market. To estimate returns, reliable knowledge must be obtained from both these markets. There are a lot of variables that can be used to explain differences in property profitability, such as location, type, size, age and quality.

According to theory location is an important property-profitability variable when determining differences in both rents and property prices. However location is a complex variable, composed of both the geographical location and the local “neighbourhood”. This is relatively easy to understand theoretically, but because every location is so unique, estimating differences in performance due to location is not always that simple. In the empirical work carried out here, various locations dummy variable have been used to attempt to capture differences relating to location. Applying this method has not been as straightforward as had been expected in all the cases.

Property type, size, age and quality are also important variables that can be used to explain variation in the return on real estate investments. The situation in Sweden, as in many other countries, is that the rental market for income-producing properties shows duality. The market for residential rental apartments within multifamily housing structures (apartment buildings) is subject to rent control, where the rent for these units is established through official negotiations held between municipally owned multifamily housing companies and tenant organisations. This rent level sets the ceiling for rent levels in privately owned multifamily housing. The rent charged for commercial units on the other hand is set by individual negotiation in the marketplace. This is one of the reasons for investigating differences in property returns by property use. When analysing differences in profitability it is important to control as many variables as possible. The relative importance of each of these factors may vary individually between different categories of properties and therefore also be reflected in the profitability.

Another problem encountered when attempting to analyse property returns is the relative infrequency with which particular properties are traded, which leads to poor price
information. This leaves the researcher with two different approaches to estimating TRR. On one hand, an analysis of those properties that have been traded can be undertaken based on actual observations of property price levels. However a drawback with this is that there is a lack of information on the NOI for these properties. There is in fact not enough price information available for estimating price movements, i.e. properties have only been sold once a year. On the other hand information relating to the NOI and investment performance over time for a constant group of properties can be used instead. Unlike the first approach, there is no real price information available, so prices have to be estimated. There are advantages and disadvantages with both approaches. In the first approach we have price information from the real estate market and in the second from the rental market. The analyses carried out in this investigation have been conducted in line with the second approach.

An interesting issue arising when measuring property return is how reinvestments are being interpreted. Due to the intrinsic nature of real estate, investments are long term, commonly featuring large reinvestments during the life of the investment. This has to be taken into consideration when measuring short-term profitability, which is often looked at on a yearly basis. Theoretically, the term investment is well defined. In one way or another, investments will effect return. The most common effect is rent increasing, where the value of the return increases as a consequence of investment. In practice though, it is not so easy to make a clear distinction between maintenance and investment. In real estate management, an improvement to a property could be interpreted as both maintenance and investment, and therefore can’t be split indisputably. This issue is of major importance when analysing NOI and return on property investments.

Contribution to research

All the papers included in this dissertation deal with subjects directly or indirectly associated with real estate investment performance. There are five separate papers covering various different aspects of the topic, however all are in some way empirical. Data used in the analysis are obtained from income-producing properties. The work commenced in 1990, but most of the papers are written during the period 1996—1999.

Paper 1 (Capital Recovery and Long-run Profitability), written in Swedish, aims to develop a simple yet accurate model, capable of measuring long-run profitability, and featuring minimal problems in the interpretation and understanding of the results. The model has been empirically tested through analysing profitability in individual properties and property portfolios by differences in location, usage and initial investment expectations. This study was published as a department of Building and Real Estate Economics research memorandum in 1992, and presented by the author at seminar, for a Licentiate Degree in Engineering. This degree is less common elsewhere nowadays, but is retained by Swedish post-graduate programmes, with the licentiate thesis commonly being reused as a component in a subsequent doctoral dissertation. Using the model presented here as a complement to ordinary analysis in control and decision making processes could provide investors in real estate industry with an essential new tool.

Paper 2 (An Investigation of Property Price Studies), is of more indirect importance to the area of real estate performance. In addition, the experienced gained during the synthesis of this paper has among other things provided the author with valuable insight into the academic
process, including the presentation of results from empirical analyses, using regression analysis. Paper 2 has been co-written with Bo Söderberg and Mats Wilhelmsson, referred subsequently in the dissertation as Söderberg and Wilhelmsson respectively. It was originally published as a Swedish report and working paper (No. 29) in English at the Department of Real Estate Research. The revised version, included in this dissertation, is intended for publication in an academic journal. The objective of this study was to broadly classify and review the presentation of empirical studies in research articles, where price equations for the real estate market were estimated using regression techniques. The paper was prepared in 1996, and it examined 145 articles published between 1990 and 1995 in 12 journals highly-regarded by researchers, covering the topics real estate, housing and urban economics. The results of the study contribute to research by providing a solid overview of the most recent academic work involving price studies. It also provides the industry with a method for presenting the results of empirical work using regression analysis.

Paper 3 (*Property Cycles, Speculative Bubbles and Gross Income Multiplier*) is published in the Journal of Real Estate Research, Björklund and Söderberg (1999). The unexpected confusion and similarities encountered in the preliminary results of analyses between two different databases being used by the author of this dissertation (Björklund) and Söderberg inspired this work. Söderberg was studying property prices and Björklund was studying property returns, yet both sets of graphs showed the same cyclical pattern. This led to the idea of studying property cycles with the aid of the return measurement, the gross income multiplier (GIM). One important finding from this work with respect to the real estate investors’ decision-making process is that the study of price cycles and speculative bubbles ought not to be limited to the study of property prices. It was found to be equally important to continuously investigate the relationship between the rent and the price cycles in order to improve investment decision-making. GIM was found to be a helpful tool for identifying the various phases of the property cycles.

Paper 4 (*Analysing Performance in a Constant Sample of Mixed-use Properties*) is a further development of analysing the returns on income-producing properties. An essential component of all investment decisions is the monitoring of investment performance for various investment opportunities. In the case of property this means the various different types of properties. Most properties can to some extent be defined as mixed-use, however most indexes are only interpreted according to the different types of property use. The main purpose of this paper was to estimate various time series for TRR based on different types of property by using data for returns on mixed-use properties. The research contribution made to the real estate investors’ decision-making processes resulting from this paper is in showing that it is possible to use the entire portfolio and extract returns for different types of properties. This could be helpful when attempting to benchmark mixed-use properties or whole portfolios against specific property indexes. Furthermore, some of the most common decisions made by real estate investors concern altering the property portfolio for maximising profit. In this study, panel-data were used to analyse whether any of the property items were under or out-performing average return, while holding maintenance cost and investment variables constant. For real estate investors, this type of analysis could be a starting-off point for finding properties that in one way or another exhibit exceptional performance.

Paper 5 (*Rent drift in a Housing Market under Rent Control*), studies the determinants of residential rent in multifamily housing. The decision was made to conduct the study from an investor’s point of view, which can be seen as aiming to maximise the TRR in a market with soft rent control. One possible way to achieve a rent increase above the level determined
through official negotiations is to improve the quality of a property. The study shows that there is a rent drift, i.e., a divergence from the official determined level, which is partly explained by maintenance costs and investments. Support was also found for explaining differences in the rent levels by location. Understanding performance in a rent-controlled system is essential, especially for real estate investors’ wishing to maximise profit. The study has contributed the research area with the knowledge that it is possible to achieve a positive return via quality improvement in a market under soft rent control.

Paper 1 is entirely the author’s own work, while Papers 2, 3, 4 and 5 are jointly written. The individual contributions to each of these studies are elucidated in the next section of the dissertation. Each paper is then summarised in the subsequent section. Because Paper 1 is a Swedish report (not translated into English), it is presented more thoroughly here than the other papers. The summary section is then followed by full drafts of all five papers.

**Individual contributions to Papers 2-5**

At the Royal Institute of Technology, Stockholm, a PhD thesis may be jointly written, but the individual contributions of each of the co-writers must be clearly demonstrated. It can often however be quite difficult to identify the exact contributions made by each individual researcher in jointly-performed research work and the resulting co-written papers some time after they have been written (note that to avoid confusion the author of the dissertation is referred to as Björklund).

The guidelines for the academic defence of doctoral dissertations emphasises that after the dissertation, the PhD candidate ought to be prepared to carry out independent research in his or her research field. As most research work today is carried out in research teams, the ability to make an individual contribution within a framework of co-operation ought to be seen as being equally valuable as making a contribution in an individual project. Particularly valuable skills and experience in maintaining personal scientific integrity and respect for the contributions of others within a joint research project have been gained during the progress of the research work undertaken here. Good indication of whether a researcher has made an important contribution to a particular research team is provided by his or her continued inclusion as a co-author and member of the research team.

Papers 2-5 in this dissertation have been carried out within joint research projects. In all these jointly written papers, all the researchers have actively taken part in all stages of the research process. The following is a list of the various research stages: initiating the research project, collecting data, creating a useful research database, identifying relevant research topics, formulating hypotheses, reviewing the literature, specifying the models, defining the variables, carrying out the analyses, interpreting and evaluating the results, writing the report, presenting results at seminars and conferences, handling the editorial review process and revising the work. For practical reasons, the main responsibility for the various different stages have been distributed differently in different papers.

Professor Roland Andersson has directed the research work. All of the jointly written papers have been carried out with the co-operation of Bo Söderberg. The research team in Paper 2 also included Mats Wilhelmsson. Söderberg, Wilhelmsson and Björklund are all PhD students in the Department of Real Estate Economics, at the Royal Institute of Technology,
Stockholm. There are no significant differences between the academic qualifications of all three, also indicating that their relative research contributions are approximately equal.

The authors have together identified and acknowledged the following contributions from each individual researcher.

Paper 2, was initiated by Söderberg, and inspired by a paper written by McCloskey and Ziliak (1996). Individual contributions to this paper (both direct and indirect) have in turn become contributions in the other papers. The research work itself commenced in 1996, receiving financial support from the Lundberg Research Foundation in Sweden. The study was designed jointly by the authors. Sample collection, analyses and interpretations were also carried out jointly. Wilhelmsson made a major contribution to all aspects of the work requiring a solid knowledge of econometrics, and carried out at least a third of the heavy work involving reviewing the articles for the study. Readers of the working paper kindly pointed out some major shortcomings. Söderberg has rewritten the paper in light of the critique. Final decisions regarding content were also made in common.

Paper 3 was inspired by discussions between Söderberg and Björklund. Björklund contributed significantly by refining the data. Work involving exploring the data, carrying out the model specifications, the analyses and the interpretations was performed jointly. Söderberg and Björklund each wrote sections of the first version of Paper 3. Söderberg made a major contribution through reviewing the literature. Professor Christian Janssen reviewed the paper and made valuable suggestions. The many revisions required to finalise the paper for publication in the Journal of Real Estate Research (JRER) were carried out jointly. The paper was written in 1997, and at the time both Söderberg and Björklund were satisfied with the quality and uniqueness of the data used. However, during the preparation of the paper, it was realised that longer time series and additional variables for each observation would be needed for undertaking studies of even more interest to the industry. A great deal of effort was therefore put into achieving this objective. Important progress was made in this regard with the settling of an agreement concerning long-range research collaboration with two private companies in the real estate branch. The most important outcome of this was an increase in the access to and the availability of good data. The work undertaken to compile this information and to improve the databases has been an important part of the underlying research in Papers 4 and 5.

Söderberg initiated Paper 4, and Björklund contributed significantly by creating the database. The work done on model specifications, the analyses and the interpretations was carried out jointly. The literature review and the design of the paper were undertaken together. Söderberg contributed significantly by writing the first draft of the paper. Björklund presented the first version of the paper at the AREUEA/AsRES Conference in Hawaii, in May 1999. Since then the paper has been subject to major revision following the kind suggestions made by fellow conference participants. These revisions have been carried out jointly by the authors.

Björklund initiated Paper 5, and contributed significantly to the paper by creating the database. Work on model specifications, the analyses and the interpretations has been carried out jointly. The literature review and design of the paper was also undertaken together. Söderberg contributed significantly by writing the first draft of the paper. Both Söderberg and Björklund presented the first version of the paper at the ENHR Conference in Cardiff, September 1998. Readers kindly pointed out some major shortcomings in the early version. Revision following these suggestions was carried out jointly.
Summary of Papers 1 to 5


This paper was inspired by Björklund’s professional interest and practical experience from working with issues relating to measuring profitability in the controlling and decision-making processes within the real estate industry. Insight gained through carrying out the study shows that methods used by the industry for measuring property performance, and in particular profitability, are often based on accounting methods, which can lead to certain problems being encountered with communicating and interpreting differences in profitability. This in turn creates considerable problems for the decision-making process. Björklund’s primary objective was to find empirical and scientific support for stable, reliable, yet simple measurements of profitability that could be easily implemented into administrative routines and that supported the decision-making process more efficiently.

The search for a model providing theoretical support focused on simplicity. The model had to be unequivocal about (a) analysing property performance aimed at maximising cash flow in the long run, (b) being simple to use, and (c) being easy communicated to real estate management. The incentive for this work was the need to find a model that was easy to understand yet would restrict subjective manipulation, while at the same time is correct from a theoretical point of view. The model was empirically tested by analysing the profitability of individual properties and property portfolios, where properties were grouped by differences in location, usage and initial investment expectations.

The work began with the difficulties encountered when measuring and interpreting profitability for income-producing properties using an accounting-based control system, similar to that used in most real estate companies. Björklund chose to study profitability from cash-flow figures over a long period of time. The reason for this was firstly that accounting-based return figures could easily be manipulated subjectively when cash flow figures are being entered into the books. Especially it is important to divide cash outflows into operating and maintenance costs and investments. In practice, the line separating these groups is not always so obvious, though the decisions made are of great importance for the level of profitability. The model ought to be constructed to handle these sorts of measurement problems when measuring return on a yearly-basis. Secondly, return figures fluctuate over time, therefore profitability for just one year would at best provide no information, and in the worst case scenario, provide false information about the long-run performance of an individual property. This would be counterproductive to the objectives of building a model for analysing and presenting profitability in the long run.

TRR is arrived at using the dividends and the value changes. In long-term ownership, changes in value are merely estimations of increases and decreases in value, not really of cash flow until the property is sold. However dividend is a running cash flow that could be reinvested and used in the business.

The model that is presented here is a graphical interpretation of the discounted payback method. The fundamental idea is that long-run profitability is a function of the initial investment, the level of cash flow over time, and the market value at the end of each period. Long-run profitability can be calculated as an internal rate of return (IRR) for a given period of time. The IRR is the mean value of yearly return for an analysed period, based on a mix of
NOI and market value. It is not easy to intuitively decompose the IRR into its different return components. In the method presented in this paper, long-run return could be seen as providing scope for regaining invested capital, given the actual cash flow and the required rate of return. The value of the unreturned investment could then be compared with the market value for each period of time. The basic idea being that in each period of time the unreturned investment could be covered by future NOI or by the sale prices (the market value at sale).

The main advantages of the analysis model are that:

− regardless of whether the cash outflow is being interpreted as maintenance or investment, this has no influence on the performance being measured;

− it is possible to see the share of the NOI that could be used for regaining capital when the required rate of return on investment is satisfied; and

− total profitability could easily be graphically interpreted in the long term, by comparing the unreturned capital with actual market value.

The model is simple and its strength lies in the fact that it makes communicating differences in profitability so easy that almost every person in an organisation can understand it. The model is in use today within some real estate companies as a complement to ordinary accountant-based control systems. Combined with a well-specified goal for profitability, the model sheds light on long-run performance for both individual properties and groups of properties. The starting point for the model is the initial investment. Every year the remaining capital (unreturned) has to be calculated. This is done using the following formula:

\[ K_n = G_0 \times \left( (1+p_1) \times \ldots \times (1+p_n) \right) \times \sum_{i=1}^{n-1} \left[ D_i + I_i \times \left( (1+p_{i+1}) \times \ldots \times (1+p_n) \right) \right] - (D_n + I_n) \]

where:

\[ K_n \] = capital not regained in year \( n \)
\[ G_0 \] = initial investment at the beginning of year one
\[ p_n \] = required rate of return for year \( n \)
\[ D_n \] = NOI year \( n \)
\[ I_n \] = reinvestment year \( n \)

The NOI is defined as rent minus operating and maintenance costs. This is the total amount from which the owner will receive both (a) the required rate of return on invested capital, and (b) the opportunity for regaining invested capital, at a level that is justifiable as compensation to the owner for the decrease in the value of the building caused by ageing (the real extent of depreciation).

Unreturned capital can be graphically presented as both an index and a real money value. The scope for regaining capital is inversely related to the required rate of return on invested capital. With a higher required rate of return, there is proportionately less room for regaining invested capital. Figure 1 presents regained capital for a property, given two required rates of return (in real terms). All calculations are made in nominal terms but the result is interpreted in 1992 currency values.
Figure 1  
Unreturned capital giving a real required rate of return for one individual property of four and six percent.

The graph above would remain unchanged were any of the maintenance costs to be interpreted as investments. What could change the graph when analysing the return *ex post*, is however the level of the required rate of return. A large reinvestment provides a cash outflow for the actual year and this is shown in this model as an increase in unreturned capital.

To analyse total long-run profitability, the figure above has to be compared with the market value. The simple interpretation is that when market value is higher or equal to the unreturned capital, a sale at that point in time will give an IRR for the holding period that is equal or higher than the required rate of return.

The empirical test of the model involves a simple analysis, comparing different portfolios that have been constructed focusing on one independent variable at a time. The variables that were analysed, were property use, location and special circumstances current at the time of the initial investment. The reasons for choosing this particular set of independent variables were that the levels and variations in return figures are associated with risks, which can vary for different property uses and locations. The reason for analysing the sample with a focus on the initial investment was that this could in some way interpret initial expectations. Given that the portfolios are constructed in one perspective only, it is not possible to draw far-reaching conclusions about the effects of each of the analysed variables, though it does provide some insight into the effects of diversification.

The data used for the empirical test were yearly rent figures, operating and maintenance costs, investments for each holding period, and estimated values of 277 mixed-use income-producing properties in different locations throughout Sweden for the period 1974—1992. These properties were bought during the period 1941—1990. The market value of the total portfolio was 9 billion SEK in 1992. Most of the properties (74 percent) are located in the three biggest cities in Sweden (Stockholm, Gothenburg and Malmoe). More than half the properties in the sample group are used mainly for commercial purposes. The distribution of the sample by location and property use is shown in Table 1.

<table>
<thead>
<tr>
<th>Location</th>
<th>Percentage</th>
<th>Property Use</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stockholm</td>
<td>39</td>
<td>Mainly residential</td>
<td>18</td>
</tr>
<tr>
<td>Gothenburg</td>
<td>27</td>
<td>Mixed-use, mainly residential</td>
<td>14</td>
</tr>
<tr>
<td>Malmoe</td>
<td>8</td>
<td>Mixed-use, mainly commercial</td>
<td>10</td>
</tr>
<tr>
<td>Other big cities</td>
<td>24</td>
<td>Mainly Commercial</td>
<td>58</td>
</tr>
<tr>
<td>Small cities</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100</strong></td>
<td></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

Table 1  
Distribution of property use and location for the 277 properties analysed presented as percentages.
Two examples from the empirical results are presented in Figure 2. Profitability is shown graphically for two property portfolios, one with mainly residential properties (A) and one with mainly commercial properties (B) for the period 1974-1992.

![Figure 2](image)

Looking at (A) in Figure 2, we can see that when the market value was at its peak, the long-run return was only above a real rate of return of four percent for a short time. It can also be seen that unreturned capital is increasing for the whole period at a real rate of return of six percent. Turning to (B) in Figure 2, it can be clearly seen that a large number of properties were purchased in 1989. Two years before that, market values increased significantly and rose above all the graphs illustrating unreturned capital, but declined sharply after this peak. Since then, the market value curve has been far below the curve for unreturned capital at a real rate of return of two percent.

Some interesting findings can be concluded from the empirical part of the work, which can be formulated as follows:

- the level of dividend when making the decision to invest is of great importance for long-run profitability;
- the scope for regaining capital during the first year has a crucial effect on long-run profitability; and,
- a property portfolio exhibiting high performance also varies greatly over time, with property use appearing to be an important factor in performance.

Paper 2: An Investigation of Property Price Studies

When composing a scientific paper there are a lot of issues to be solved relating to the presentation of the results. The background of this paper is the joint interest the authors share in price studies in the real estate market. All three were working with empirical econometric research when it was realised that a good way of advancing work in the area even further would be to study a large number of articles where price studies were presented in academic journals. This work was carried out in 1996, and constitutes a literature review of articles where price equations in the real estate market have been estimated using regression techniques. The review is not empirical, nor is it traditional. It is inspired by (and in some respects the analysis even resembles) an article by McCloskey and Ziliak (1996).
The purpose of the study was twofold. Firstly, the authors aimed at providing an overview of the prevalence of property price studies, and classifying the articles of the sample roughly into a number of subgroups. This was expected to provide an answer to some of the questions the authors had about what is actually published and where. Secondly, the authors investigated the level of adherence exhibited by the papers to good scientific practice when reporting the econometric issues in property price studies. A number of papers considered classics by researchers in the area were studied, as well as some earlier reviews of property price studies. The empirical literature in this area has a long history, and a large number of studies have been carried out. In fact, it is not possible to get a clear overview of the entire field. This indicates the need for increasing the number of literature reviews that summarise the state of the literature and help put individual contributions in perspective. The authors found that there is little connection between the reviews that have been carried out, and that several years have passed since the latest conventional review was written.

The authors had to initially identify the relevant and important journals in the field. Journals were included that dealt primarily with real estate, housing and urban economics. Two studies that ranked the real estate journals assisted with this task. With a few minor exceptions, the total sample population consisted of full-length articles published in 12 academic journals in the field; four being British, the rest from the USA. The period analysed was 1990-1995. The total numbers of articles was 1,882 of which 145 articles some eight percent, dealt with the estimation of price or rent equations using regression techniques.

A number of subsets were identified within the sample of 145 articles. Firstly the articles were grouped by their main objective, which in most of the articles was done by estimating coefficients for individual attributes (100). For the rest of the articles, a search was undertaken for a single model. In these two groups the articles were grouped after dependent variables. Most of the articles studied prices on the real estate markets, but some of the articles studied returns. When grouping articles after the type of property being studied, it could be seen that most of the studies concentrated on owner-occupied properties. Only a small group studied income-producing properties. This provides a good reason for undertaking studies on income-producing properties, which has been done in all papers included in this dissertation.

Reviewing how well the econometric issues were reported in the various articles was based on 18 questions, which focused on various key aspects. The key aspects relate to the following:
- how the work is connected to previous research;
- how considerations underlying the modelling procedures are presented;
- how the data are presented; and
- how the results are presented and interpreted.

The main results from this section were derived using simple descriptive statistics on the frequency of “Yes” responses to the 18 questions. The outcome of the questionnaire varies considerably, with “Yes” responses ranging from 19-93 percent. This is arguably quite plausible. However, there are some questions, where these results are seen as being rather poor. For example, results from residual analysis are only presented in 25 percentage of all the articles, and only 27 percent of articles provide reasons for making choices regarding functional form.

The results from this investigation ought not to be interpreted as indicating that the articles studied represent anything less than high quality research. There are a great number of reasonable explanations for not finding a “Yes” response to a specific question in a specific
article. The paper makes a valuable contribution to the research area via the questionnaire, which can serve as a checklist for authors of other empirical price studies and also as a starting point for further academic debate.

Paper 3: Property Cycles, Speculative Bubbles and Gross Income Multiplier

Real estate investors make their decisions and act on them in a real estate market afflicted by major fluctuations. This raises some important questions, such as whether these fluctuations are phases of a cyclical pattern, or whether they are somewhat more irregulars, akin to stochastic shocks. Is it possible to predict fluctuations, and in so doing are there arbitrage opportunities hidden in the real estate market that can be revealed by looking for the underlying trends? Knowing the answers to these and other related questions is essential for making correct decisions in the real estate industry.

In this paper the question of whether significant price increases in Sweden can be explained by a speculative bubble was investigated. The evolution of property prices and property market fundamentals “from boom to bust” has been investigated. The hypothesis is that during the boom phase the property market (in terms of rent levels and rent growth) wasn’t driven exclusively by market fundamentals.

There are three major steps in this empirical analysis of the Swedish real estate market. The first step is an experiment that aims to elucidate the real inconclusive nature of “good” results from regression analysis, by using macroeconomic variables to explain the evolution of real estate prices. An estimated price index is initially entered as the dependent variable in a number of regression equations with different independent macroeconomic variables. Secondly, it is assumed that the price index includes a speculative bubble during the boom phase and so excluding the hypothetical bubble. An investigation then proceeds into whether variations in the assumed growth rate of the bubble affect the explanatory power in the regression model when macroeconomic variables are regressed on the de-bubbled price index. The results show that adjusted $R^2$ increases from 5 to about 50 percent of the annual growth of the bubble. The insight gained from this experiment is that macro-models explaining price evolution cannot be used alone as evidence for excluding the existence of speculative bubbles.

The second step involves estimating and analysing the GIM over time and testing for statistically significant changes from year to year. The theory here is that if both income and price are affected equally and proportionally as the cycle progresses through its stage, then the quotient (GIM) ought to remain essentially unchanged. However, the GIM was found to vary in almost complete harmony with prices over the period of the cycle. There are three possible ways of explaining the cyclical changes in the GIM, apart from the possibility that the price was partly driven by a speculative bubble. These three ways relate to the operating expenses ratio, the required rate of return and the expected growth of the net operating income (NOI). The results from theoretical computations of the GIM, indicate that it is difficult to explain the variations in the observed GIM by variations in fundamentals alone.

The third step involves regressing a set of macroeconomic variables; firstly the price, secondly the expected rent and thirdly the GIM. If the same macro variables were able to explain both income and prices, they would be incapable of explaining the ratio (GIM).
The overall conclusion is that there is a fair amount of evidence pointing to the possible existence of a speculative price bubble. To improve investment decision-making it is important to investigate the relationship between the rental and the price cycles. In this study GIM has been used in identifying the various phases of the property cycle. An important conclusion is that it is worthwhile for investors to produce and study time series for these kinds of variables. Short-run fluctuations in the GIM may of course occur for a number of reasons. However, when a drift in the GIM appears for a prolonged period of time, it is a serious indication that the property market has entered transition to a new stage. In this situation, it is important for an investor to fully understand the mechanisms behind that drift, thereby facilitating knowing when to enter or leave the particular property market when it is most profitable to do so.

All regressions were carried out in a pairwise manner, and the important observation in each step was to be made in terms of the differences between the two (or more) cases. Furthermore, there was also another purpose for carrying out these regressions, which was to illustrate the limited usefulness of such analyses. This is highly relevant when considering that several other papers have made such regressions the major tool of their analysis.

There is one important conclusion that doesn’t concern the various empirical analyses. This was interestingly enough that via taking part in the review process of the *Journal of Real Estate Research*, it was found that the reviewers and the editors also appreciated the main source of inspiration for writing this paper initially. Additionally, the usefulness of the GIM as a means of describing the phases of the property cycle was in itself found to be an important finding.

**Paper 4: Analyzing Performance in a Constant Sample of Mixed-use Properties**

Most properties in the real estate market can be described as being mixed-use. We know that usage is one variable that effects return, because different uses are accompanied by different risks in the rental market, and risk is a fundamental factor affecting return on property. An issue for decision-making is how to use these mixed-use properties when analysing performance.

Total rate of return (TRR) on individual property is an average of the particular mix for the individual property. This can be a problem when using information on individual properties for constructing indexes for specific property uses. Another practical problem is how to estimate TRR on a yearly base.

In large databases, the variability in property uses was found to be a problem. It was found that only properties with a single use or at least a principal use could be handled when establishing figures on returns for an actual group. In this work attempts have instead focused on trying to decompose TRR for various different property uses in a mixed-use portfolio.

All indexes for returns provide information on average return in properties of one particular use. This information is used for benchmarking in different situations to support the decision-making process. It is used for diversification purposes, for comparing real estate investments with other investment opportunities, and for comparing different types of properties in different locations. Property indexes, which provide average returns, could be used to
compare the performance of a particular portfolio, and for comparing the performance of an individual property.

The main objective of Paper 4 was to estimate a time series for the TRR in different types of property using figures for the returns on mixed-use properties. In this respect, the scope of the work is similar to that of Dokko, Edelstein, Pomer and Urdrang (1991). A secondary objective was to analyse the possible determinants of individual deviations from annual average estimates within a property portfolio. Furthermore, it was investigated whether or not different definitions (established in the literature) for estimating the TRR differed significantly when applied to the same property portfolio.

The main hypothesis was that the TRR time series for purely commercial property, showed a different pattern to the TRR series for purely residential property. Differences were found in both the level of return and the variation over time. It was assumed that the estimates of annual average TRR differed depending on the definitions used, at least for certain years during the period being studied. In particular, it was expected that the general property boom of the late 1980s was largely a reflection of a boom in commercial property.

It was also expected that an individual property’s deviation from the average TRR would be explainable in terms of maintenance costs and investments, and that for some properties constant individual effects would be found.

Data for this empirical work were obtained from a large institutional investor. These expanded the database used in Paper 3, and include annual data for 138 mixed-use properties located centrally in Stockholm and Gothenburg for the period 1979-1997. Regression analyses were done using panel data models, which brings the total numbers of observations to 2,468. Data on rents, operating costs, maintenance costs and investments are available together with estimated market value for the whole period.

The regression analyses used in an attempt to explain annual TRR were carried out in four steps. In the first regression, the risk-free interest rate was the only independent variable that was highly significant. In the next step, this variable was replaced by a set of time “dummies”, which increased the explanatory power dramatically. From this, it could be interpreted that the cyclical pattern in the risk-free interest rate could not fully explain the cyclical pattern in the TRR on a real estate portfolio. The contribution made to the decision-making process for the real estate investors’ is that it is possible to use the entire portfolio and extract figures for returns on different types of properties. This could be helpful when attempting to benchmark mixed-use properties or portfolios against specific property indexes. Furthermore, some of the decisions most commonly made by a real estate investor relate to altering the property portfolio for the purpose of maximising profit. In the work done here, panel-data was used to analyse whether any of the properties were under or out-performing the average return, while controlling for maintenance costs and investment. For the real estate investors’, this type of analysis could be a good starting point for finding properties that are performing exceptionally in one way or another.
Paper 5: Rent Determinant and Rent Drift in a Housing Market under Rent Control

The rental market is of great importance to a real estate investor. With respect to the decision-making process, it is interesting to know whether, and if so how it would be possible to increase the level of rent by more than that stipulated through official negotiation in a controlled-rental market. One of the contributions this paper makes is that it shows that rent drift can to some extent be determined. This means that it is therefore possible to increase rent somewhat more than stipulated by official negotiation, for example through introducing different kinds of improvements.

The three main hypotheses in this work can be formulated in following way.
- Rent levels are expected to vary according to location when other rent-affecting variables are held constant.
- Effective rent increases in privately owned residential properties are expected to exceed the officially controlled increases, and this is called rent drift.
- Rent drift is expected to be partly driven by quality improvements.

The multifamily residential rental market in Sweden operates under what can be characterised as soft rent control, which could possibly explain why there are so few studies that analyse this rental market empirically. The studies that do so have been carried out mainly from a housing policy or sociological point of view. In the work done here, the determinants of residential rent were studied from the perspective of a privately owned investment with the purpose of maximising profit.

The study commenced with the expectation that rent drifts would be found in privately owned residential apartments. Among the assumptions, it was assumed that tenants in rental apartments that have an attractive location were probably able to accept minor rent increases, without bringing the matter before the rent tribunal. Rent increases could be associated with minor improvements in their apartments.

The study is empirical. Data were obtained from a large institutional investor. Observations were used from a total of 90 properties all featuring a large proportion of residential use. The level of commercial space in each property was less than 17 percent. Data on rent are separated into commercial and residential categories commencing in 1988, and the information on negotiations commences in 1990. Consequently the study is limited to the period 1990-1997. The properties are centrally located in the two largest cities in Sweden, Stockholm and Gothenburg.

The regression aimed at explaining rent levels was carried out separately for each of the two cities. Significant location effects were found when holding age and improvements constant. In the final model, the age of a building was found to be significant in both cities, being negative (as expected) in Stockholm, but positive in Gothenburg. The coefficients were found to be very small.

Controlling for quality improvement using a one-year, as well as a two-year lag for investment. Problems are encountered when trying to draw clear distinctions between investment and maintenance costs, which provides good reason for controlling the possible effects of maintenance costs as well as the one-year lag for that variable. Where maintenance costs affect the rent increase in a positive direction, the investor (a) raises rents as though
maintenance were a quality improvement and (b) gains from short-term tax advantages. The results for these variables are slightly different in the two cities. In Stockholm, the coefficient from the one-year investment lag was 0.04. The interpretation of this result is that the real rate of return on the reinvestment is four percent. Surprisingly the same return is captured on the maintenance cost in Stockholm. In Gothenburg, the one-year investment lag was found to be some two percent.

When comparing rent increases in the data material used here with the results from official negotiation, it was found that average rent drift was significantly different from zero. It was found that a small group of 11 properties had experienced a very high rent drift of more than 45 percent. The reason for this is probably that these properties have been rebuilt. The rent drift in the remaining properties in the study was less than 25 percent, but it is interesting to note that the rent drift even in this group of properties is significantly different from zero for almost every year under study.

In the second group of regressions, the observed rent drift was entered as the dependent variable, in an attempt to explain the rent drift as quality improvement. The one-year lag of the investment is still found to be highly significant, however other variables could not be found that could explain rent drift. The reason for that could be an effect caused by studying average rent drift on the level of entire properties. It would have perhaps been preferable to make the rent observations on individual rental units. It is however now known that there are significant rent drifts at an aggregated level. The next step would be to increase the number of observations. This could be achieved by simply analysing rent in each rental apartment in the same data set already used in attempting to explain rent drift.

References


Table of content for papers in full-length

Paper 1*


Paper 2


Paper 3**


Paper 4


Paper 5


** Reprinted with the kind permission of the owners of the copyright, The American Real Estate Society.