Essays on lease and property valuation

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Abstract

The first two papers in this dissertation discuss a fairly recently developed research field, Space Syntax, and how the findings in this field may be used to understand spatial economic patterns such as geographic distribution of market rents. Both papers use standard econometric methods to investigate the relationship between rents and the so called integration value developed within Space Syntax. The integration value may be understood as a measure of the accessibility of a certain location in a street network. The measure is constructed using tools from graph theory and uses the shape of the street network as its only input. The papers estimate hedonic models of office and retail leases from central Stockholm to test whether the integration value can help explain rents. A statistically significant effect of integration value on both office and retail rent is found. It appears as if Space Syntax adds important information to the understanding of intraurban rent patterns.

Illiquidity is a main feature of most property markets and market participants are therefore directed to property appraisals to obtain information about market values. The reliability of property appraisals is therefore an important research topic. The third paper studies the “rationality” of valuations by testing if capitalisation (cap) rates from individual discounted cash-flow (DCF) valuations are consistent with economic theory. Standard econometrics is used to study the variation in cap rates. For the most part the results support the hypothesis that appraisers are “rational” in the above mentioned sense.

Illiquidity of direct property also poses a problem when constructing property price indices. Lack of price observations and heterogeneity among the few observations available is likely to introduce noise in price indices based on transactions. Valuations are therefore often used instead to construct indices. These indices however suffer from a bias due to so called “appraisal smoothing”. In the fourth paper it is shown that, given certain assumptions, one may filter out noise in a transaction-based price index by regressing it on a valuation-based index (contemporaneous and lagged one period). The procedure may in some circumstances improve pure valuation- or transaction-based indices.
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Dissertation summary

Introduction

This dissertation consists of four papers in real estate economics. At a broad level they all concern valuation and thus contribute to the part of economics that analyses prices. The first two papers are about lease valuation and the last two about different aspects of property valuation.

Paper one and two are part of the literature on hedonic modelling of property prices and rents. In this literature, researchers seek to estimate how different attributes influence prices on properties and rented space. One may for instance want to estimate the difference in rent between apartments with or without a nice view. The difference in rent would be interpreted as the implicit price for the attribute “nice view”. Econometric methods, and in particular regression analysis, is used in hedonic modelling. Many goods can be seen as composite goods. Hedonic modelling is thus not specific to property research. The methodology was originally developed for cars (Court 1939 and Griliches 1961). An important reference on the theoretical foundation of hedonic modelling is Rosen (1974).

Paper one and two focus on the spatial aspects of hedonic rent modelling. The effect of location on rent is the main topic. Nappi-Choulet and Maury (2009) and Colwell and Munneke (2008) are two recent references relevant for hedonic modeling of rents and prices with focus on spatial aspects. Common ways of modelling the effect of location on rent and property values include location dummies and the distance to focal points such as the city centre. The prime contribution of papers one and two is to analyse a fairly recently developed measure of location. This measure, integration value, was developed within the research field Space Syntax and is intended to measure how integrated, or accessible, a street segment is in a metropolitan area.

Integration value differs from traditional measures of location in important ways. First, it is not based on the metric distance but topological distance. In that sense it incorporates a more complex notion of distance than traditional distance measures. Secondly, the input used when calculating integration values is a map of the space under study. No information about existing economically important factors, such as the location of economic activities (anchor stores, malls) or transport hubs, is used.
The third paper investigates individual valuations and so takes a micro-level perspective of property valuation. Illiquidity is a main feature of most property markets and market participants are therefore directed to property appraisals to obtain information about market values. Property valuations are thus used in a number of situations and play an important role in real estate markets. The quality of appraisals and the appraisal process is therefore an important field of research.

There are a number of studies that compare valuations with subsequent sale prices. References to this literature can for example be found in Crosby (2000) and McAllister et al. (2003). Studies of this type generally find that valuations are fairly accurate estimates of sale prices. The reliability of this type of study is however dependent on the relationship between valuations and prices which is problematic since prices and valuations may affect each other in various ways (Baum et al. 2001). One may for example imagine that valuers are informed by sale negotiations long before the actual transaction takes place.

The type of study performed in paper three offers another type of insight into the valuation process by looking at the calculations made by valuers. The aim is, loosely speaking, to see if the variation in the assumptions made in calculations follows a reasonable pattern, i.e. the pattern predicted by theory. The empirical research in this area is scarce largely because detailed appraisal data normally is proprietary (Gunnelin et al. 2004).

The starting point of paper three is Gunnelin et al. (2004) who estimate models for a number of valuer assumptions used as inputs in individual discounted cash-flow (DCF)-calculations using data from the Swedish property databank IPD/SFI. The overall conclusion of Gunnelin et al. (2004) is that the study generates confidence in the appraisal process. Paper three takes a new look at this issue, using a richer data set.

The study focuses on capitalisation (cap) rates. The cap rate is the ratio of annual rent minus operating costs to value. It thus measures how much you must pay for a given yearly net operating income. Understanding cap rates is fundamental if one wants to understand property markets. This is the motivation for the focus on cap rates in the paper. Most earlier research on cap rates is on aggregate level, that is, average or overall cap rates for a market. For an overview of this literature see for example Dunse et al. (2007) and Hendershott and MacGregor (2005). This literature has among other things studied how cap rates vary over property type and market. Time series aspects such as property cap rates’ relation to other financial markets and rents have also been studied.
Property price index construction may be seen as valuation of a population of properties. In other words, it may be seen as macro-level valuation. Paper four studies index construction and thus takes a macro perspective on property valuation. Price, or market value, indices for property markets are important for several reasons. They are used as benchmarks by property owners and by investors as a means to compare average returns on property and alternative assets such as stocks and bonds. High quality price indices are also important in portfolio allocation decisions and can furthermore be used in research on property markets (property cycles, covariance between property and other financial markets etc).

Illiquidity of direct property poses a problem when constructing property price indices. Lack of price observations and heterogeneity among the few observations available is likely to introduce noise and/or bias in property price indices. A number of methods for index construction have been presented in the literature. A description of challenges in index construction and proposed methods is given in Hoesli and Macgregor (2000, ch 4). A recent and important contribution in the field is Fisher et al. (2007). In their paper they present a transaction-based index that takes variable liquidity into account and also adjusts for sample selection bias.

Since an index constructed from price observations is likely to contain much noise and perhaps also bias, valuations are often used instead of price observations. Appraisal-based indices are however by many researchers believed to lag and smooth out actual movements in property values (Geltner et al. 2003). There are thus problems associated with both pure transaction-based and pure valuation-based indices. The fourth paper presents a method for combining information from both transactions and valuations when constructing an index. The point of the method is to (at least partly) provide a remedy for the problems associated with pure valuation- or pure transaction-based indices.
Overview of papers

Paper one and two

Paper one “Can Space Syntax help us in understanding the intraurban office rent pattern? accessibility and rents in downtown Stockholm” and two “The effect of accessibility on retail rents: testing integration value as a measure of geographic location” investigate whether the research field Space Syntax may help explain the geographic distribution of office and retail rents within a metropolitan area.

Space Syntax is a fairly recently developed research field that studies the built environment from a spatial perspective using quantitative tools. Research within this field has examined how form and function are related in the built environment. The general approach of analysis within Space Syntax is to divide space into components using a set of rules and then measure certain spatial and topological characteristics of the components. Two fundamental references to the Space Syntax field of research are Hillier (1996) and Hillier and Hanson (1984).

The concept integration value was developed within the research field Space Syntax and is intended to describe how well integrated – or accessible – a location is in a metropolitan area. The measure is constructed using tools from graph theory and uses the shape of the street network as its only input. It has been found to be correlated to traffic (Penn (2003) list references) and has been used to analyse successfully a number of other human activities such as e.g. crime (Turner et al. 2005).

The primary purpose of paper one and two is to test whether there is a statistical relationship between integration values and office and retail rents respectively by estimating hedonic rent equations. A number of other relevant factors are controlled for in the equations. Standard econometrics is used.

Paper one studies office rents. A hedonic model for office rent is tested against data from the Stockholm office market. The sample consists of 184 office rental contracts from 62 properties located in the central parts of Stockholm. The contracts are gathered from three large property companies. It is found that the integration value is associated with office rents in the studied data. The more integrated is the location of an office, the higher the rent. The paper also develops a model of the demand side of the office market. Paper one and an adjoining erratum have been published in the Journal of Real Estate Finance and Economics
Paper two studies retail rents. The data consists of 114 observations from the central parts of Stockholm. The data is gathered using a questionnaire sent to the members of a Swedish retail organisation (Svensk Handel). A statistically significant positive effect of integration value on rent is found also in this paper. One important difference between paper one and two is that paper two includes more specifications of “competing” accessibility measures.

Assuming that rents are affected by integration value and that locations with high rents ceteris paribus can be interpreted as attractive locations, integration value can be used to predict which locations are attractive for offices and shops. An attractive feature of using integration value for this purpose is that very little data is needed to calculate integration values. A map showing public and non-public space of the metropolitan area under study is enough. Since maps usually can be provided for planned developments, integration values can be a useful tool in the initial stages of planning new developments. This is an important aspect of the integration value. No information about existing circumstances, such as existing traffic flows, is needed.

One may ask if the empirical results can be generalized to other cities. In a strict sense this is not possible since the data is collected solely from Stockholm and we cannot exclude the possibility that Stockholm is special in some sense. However, results from other studies within the Space Syntax field indicate that integration values are related to many types of human activity across many cities and may therefore arguably be thought of as a fairly general concept and not something specific to a certain urban area (Turner et al. 2005). This suggests that the results in the study may be general to other urban areas though further research is needed to confirm this.

The relation between integration value as a measure of accessibility and other accessibility measures is important but complex. First, there is the need to control for the risk that integration value is “stealing” explanatory power from other accessibility measures. It is however also important to avoid “over-controlling”. It may for instance be a mistake to control for distance to “attractive locations” as defined by market observers since the purpose of integration values is precisely to identify these “attractive locations”. The distance to “attractive locations” as defined by market observers is a description built on knowledge about current economic activity. There is no fundamental explanatory “story” built into the
measure. Integration value on the other hand offers at least part of an underlying explanation why some locations are perceived as attractive; the layout of the street network. There may of course be other competing fundamental accessibility measures. In fact, there have been fairly recent advances within the Space Syntax field (Turner 2007). It would be interesting to use these advances in future research. In general, it would be interesting to test integration value against more competing measures.

The quantitative analysis performed in the two papers consists of standard econometric techniques. It should be noted that, as is common in economic research, the data used in the studies is not perfect. Ideally, one would have run some sort of randomized experiment in order to test the effect of integration values. In such an experiment one would expose randomly chosen shops/offices to a “treatment” in the form of a change in integration value. It is difficult to come up with a method of achieving this that is not extremely costly and that holds constant other location factors. When a randomized experiment is infeasible one may try other methods that to various degrees imitate the important aspects of a randomized experiment. A natural experiment is an example of such a technique where “nature”, instead of the researcher, exposes a sample to a randomized experiment. A natural experiment technique presupposes that the researcher actually comes across data that have the characteristics of a randomized experiment. For paper one and two this has not been the case. There are other techniques as well that to various degrees share characteristics with a randomized experiment but they all presuppose the availability of data that allow for these techniques. Since we have been unable to obtain such data we have opted for traditional regression technique. For a reference on fundamentals regarding causality, correlation and randomized experiments see Holland (1986). For a reference on natural experiments see Meyer (1995).

**Paper three: A study of micro-level variation in appraisal-based capitalization rates**

The main purpose of paper three is to test the “rationality” of Swedish office property valuations. By rationality is meant the extent to which appraisals, and in particular appraisal cap rates, are consistent with economic theory. The study investigates how implied going-in and assumed going out (exit) capitalization (cap) rates relate to characteristics of the property, other valuer assumptions regarding the property (e.g. the property’s market rent) and variables
that capture broad time series variation in cap rates. The paper can be seen as a development and continuation of the research undertaken in Gunnelin et al. (2004).

The studied database consists of 3022 discounted cash flow market valuations of office properties in Stockholm, Gothenburg and Malmö during 1998-2004. The data is gathered from the Swedish property databank SFI/IPD (SFI, Svenskt Fastighetsindex/Investment Property Data Bank). This databank is used for construction of an appraisal-based performance index.

In this summary I will only briefly describe some of the regression results. Both going-in and exit cap rates are lower for properties with high assumed market rent. Exit cap rates are lower the lower is the long-run vacancy rate and the going-in cap rate exhibits a similar but less clear tendency. High market rent and low long-run vacancy assumption are interpreted as proxies for property quality which in turn should be associated with lower risk. The results are thus consistent with “rationality” in the above described sense. Properties that are held as lease-holds and peripheral properties have higher cap rates, again a pattern that may be seen as economically reasonable. Going-in cap rates, defined as year one net operating income divided by estimated property value, are strongly related to how actual rent in the beginning of the calculation period deviates from the property’s assumed market rent and how the vacancy rate in the beginning of the calculation period deviates from the assumed long-run vacancy rate for the property. These results are also consistent with economically reasonable valuer calculations.

Overall, cap rate variation is fairly consistent with economic theory. The studied cap rates do not exhibit major evidence of irrationality in the above mentioned sense though some of the findings point to the need for further research. The results for the time series variables, for instance, are partly inconsistent with economic theory but these findings may be due to the fact that the time series studied is short.

In the long run one would think that a valuation methodology which is consistent with economic theory should produce the most reliable estimates of market value. If valuers’ primary goal is to produce estimates of market value with high precision, which seems reasonable, they should thus adopt such a methodology. This is why I in paper three think of consistency with economic theory as rationality. It should be mentioned, however, that there is a literature which paints a more complex picture of what may constitute rational behavior for a valuer. This literature has for instance discussed the possibility that clients may influence valuers, see e.g. Levy and Schuck (2005). In this context one may argue that it could be
It is rational for valuers to let themselves be influenced by important clients in order to please them.

Paper three has been published in the *Journal of Property Research* (Netzell 2009).

**Paper four: A method for combining transaction- and valuation-based data in a property price index**

Properties are heterogeneous and transact seldom. This has the effect that for many market segments there exists relatively few observable property prices during a given time period and that those prices are not directly comparable. This is likely to introduce noise and quite possibly also bias in an index constructed from transactions.

One way of circumventing some of the problems associated with transaction-based indices is to make use of valuations instead of transaction prices. It is however believed by many researchers that valuations are subject to a certain type of bias, ”appraisal smoothing”, by which is meant that valuations lag behind and underestimate the volatility of actual value movements. This valuation bias carries through to an index based on valuations. For a review of the smoothing literature see Geltner et al. (2003).

Paper four presents a method for combining transaction- and valuation-based data in a price index. The point of the method is to, at least partly, provide a remedy for inherent problems in the two types of data: noise in transaction data and smoothing in valuation data. The methodology is devised for a world where there are at least some observable transaction prices that can be used to construct a price index that constitutes a noisy signal of the ”true” price index, an index free of bias and noise. Furthermore, it is assumed that valuations from the population can be used to construct a noiseless but smoothed and lagged version of the ”true” index. The assumed behaviour of the valuation-based index relative to the ”true” index is the same as in Geltner (1993).

By regressing, using ordinary least squares, the price index on the valuation index (contemporaneous and lagged one period) it is possible to filter out the noise in the observable price index and hence estimate the ”true” price index. The method may be seen as a way of ”de-smoothing” a valuation-based index. The advantage that this method gives compared to earlier de-smoothing techniques is that it does not require us to know the smoothing parameter beforehand. On the contrary, the methodology may be seen as a way of estimating the smoothing parameter. Some of the assumptions made are discussed. An important
conclusion that can be drawn from relaxing assumptions is that a requirement for the method to work is that the valuation-based index used is of high quality. Furthermore, variation in the extent of “appraisal smoothing” over time is problematic but may in part be remedied by statistical techniques, i.e. rolling regression.
References


