



Improving strategic decisions for real estate investors
Perspectives on allocation and management

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I would like to dedicate this thesis to the bravest man I have ever known, my father Joseph Katzler.

Abstract

Real estate is an attractive asset class in the mixed-asset portfolio due to favorable risk return characteristics and low correlations with other asset classes like stock and bonds. Unlike financial assets, real estate is a physical asset where large lot sizes/indivisibility, heterogeneity, low liquidity and high transaction costs make applying financial models like modern portfolio theory (MPT) challenging. Optimal allocations to real estate found in literature are generally lower than actual allocations by investors and portfolio managers indicating there are aspects of the application of MPT to real estate that are not fully understood. Since management of real estate is costly and requires expert skills, the question on whether to outsource property management functions is of paramount interest for the real estate industry.

The aim of the thesis is to contribute to the literature on strategic decisions for real estate investors on allocation and management, Apart from reviewing literature relevant for strategic decisions at different levels and using a top-down approach to illustrate how selected allocation and management decisions are connected, four separate empirical studies are made to investigate the nature of selected strategic decisions for real estate investors.

The main results from the four separate studies in this thesis are:

- When studying the correlation and volatility dynamics for public real estate in the mixed-asset portfolio during different market states, it appears that public real estate has become more integrated with private real estate and equities over time, providing less potential for diversification whereas the integration with bonds has decreased over time. A hedging effect of public real estate versus private real estate can only be found in the most recent time period studied. For all other time periods an increased volatility in private real estate return results in increased correlation between the two assets.
- When comparing different strategies for riskreduction in the real estate portfolio it appears that diversifying over sector is a better strategy for the Swedish real estate portfolio than diversifying over regions.
- When an allocation algorithm is created to find the most efficient way of grouping local real estate markets, the resulting portfolios are most efficient in their respective risk segments. The gains compared to geographical groupings, and groupings using economic base are moderate however, and must be balanced against difficulties in making reliable predictions about future risk and return for the optimal regions.
- Using yearly return from the Swedish MSCI index for office buildings, multiple regression analysis has been used to test the effects outsourcing of different managerial functions has on total income, total cost, and net income. The results are not conclusive, but it appears that outsourcing for large institutional investors and real estate companies where ownership of commercial real estate is core business have limited power to increase net income and reduce costs at property level.

Keywords: Public real estate, private real estate, MPT, time-varying correlation, liquidity, mixed-asset portfolio, real estate portfolio, diversification, outsourcing

Fastighetsinvesterares strategiska beslutsfattande - perspektiv på portföljallokering och förvaltning

Sammanfattning

På grund av hög riskjusterad avkastning och låg samvariation med andra tillgångsslag som aktier och obligationer är fastigheter ett attraktivt tillgångsslag i en blandad tillgångsportfölj. Till skillnad från finansiella tillgångar som är virtuella, är fastigheter en reell tillgång där höga marknadsvärden, odelbarhet, heterogenitet, låg likviditet samt höga transaktionskostnader gör det svårt att tillämpa finansiella modeller som modern portföljteori (MPT). Den optimala andelen fastigheter i en tillgångsportfölj som utifrån fastighetsekonomisk forskning beskrivs som optimal är betydligt lägre än den faktiska andelen hos investerare och portföljförvaltare, vilket tyder på att det behövs mer forskning om allokeringens beslut för fastighetstillgångar. Det faktum att fastighetsförvaltning är kostsam och kräver expertkunskaper gör att frågan om outsourcing av fastighetsförvaltning är av stort intresse för fastighetsbranschen.

Syftet med avhandlingen är att bidra till forskningen om strategiska beslut för fastighetsinvesterarare. Förutom att sammanfatta aktuell forskning introduceras en top-down-modell som åskådliggör hur allokeringens och förvaltningsbeslut på olika nivåer hänger ihop. Fyra separata empiriska studier görs om ett antal strategiska beslut viktiga för fastighetsinvesterarare.

De huvudsakliga resultaten från de fyra individuella studier som presenteras i avhandlingen är:

- När tidsvarierande korrelationer och standardavvikelse för indirekta fastighetstillgångar i den blandade tillgångsportföljen studeras under olika tidsperioder är det uppenbart att indirekta fastighetstillgångar blivit mer integrerade med direkta fastighetstillgångar och aktier över tid. Samvariationen med obligationer däremot verkar ha minskat vilket ökar möjligheterna till riskspridning inom tillgångsportföljen. Potentialen för riskspridning mellan indirekta och direkta fastighetstillgångar är begränsad och finns bara under den allra senaste tidsperioden i studien. Övriga tidsperioder ger ökad volatilitet i avkastningen för direktägda fastigheter en ökad korrelation mellan de två tillgångarna.
- När olika strategier för riskspridning inom fastighetsportföljen jämförs framgår det att diversifiering över fastighetstyp är en bättre strategi för den svenska fastighetsportföljen än att diversifiera över regioner.
- Med hjälp av en allokeringensalgorithm grupperas lokala fastighetsmarknader ihop till optimala regioner på ett sätt som gör att de resulterande portföljerna är de mest effektiva i sina respektive risksegment. Vinsterna jämfört med att risksprida utifrån geografiska grupperingar och grupperingar som utgår från ekonomisk bas är dock måttliga och måste balanseras mot svårigheterna att göra tillförlitliga förutsägelser om framtida risker och avkastningar för de optimala regionerna.
- Med hjälp av multipel regressionsanalys har effekterna av att lägga ut förvaltningstjänster på entreprenad testats för institutionella investerare och fastighetsbolag på den svenska kontorsmarknaden. Resultaten är inte entydiga, men det verkar som om outsourcing av fastighetsförvaltningstjänster har begränsad möjlighet att öka driftnettot för institutionella investerare och fastighetsbolag.

Nyckelord: Direkta fastighetstillgångar, indirekta fastighetstillgångar, MPT, tidsvarierande korrelation, likviditet, blandad tillgångsportfölj, riskspridning, fastighetsportfölj, outsourcing

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List of papers:

Paper one: Public real estate - correlation and volatility dynamics in the U.K. mixed-asset portfolio Sigrid Katzler and Han-Suck Song. Submitted to Journal of Property Research

Paper two: Katzler, Sigrid. "Methods for comparing diversification strategies on the Swedish real estate market." *International Journal of Strategic Property Management* 20.1 (2016): 17-30.

Paper three: The role of optimal regions in forming efficient real estate portfolios
Sigrid Katzler. Submitted to Journal of Real Estate Portfolio Management

Paper four: Will outsourcing of commercial real estate management add to performance? A quantitative analysis of the Swedish market. Sigrid Katzler, Björn Berggren and Christina Gustafsson. Submitted to Journal of European Real Estate Research

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1 Introduction

Real estate is an attractive asset class in the mixed-asset portfolio due to favorable risk return characteristics and low correlations with other asset classes like stock and bonds. Optimal allocations to real estate found in literature are generally lower than actual allocations by investors and portfolio managers however, indicating there are aspects of the application of modern portfolio theory (MPT) to real estate investments that are not fully understood. Intertwined with allocation decisions is the decision on whether to outsource property management functions, making it important to understand how allocation and management decisions on different levels are connected.

The investment and management decisions of large real estate investors are based on a combination of quantitative and qualitative analysis (Reddy et al 2014) and the focus in this dissertation is on the quantitative aspects of decision support underpinning strategic choices for real estate investors. Strategic choices analyzed are both choices regarding asset allocation; where allocation policy in the mixed asset portfolio, property asset class weighting, and sub-sector allocation strategies are studied, and the strategic choice on whether to outsource property management functions.

The securitized (public) real estate market has developed to overcome problems with liquidity and transparency in the private real estate market (Moss and Farelly 2015), and public real estate is known to offer diversification opportunities both to a mixed-asset portfolio and to a real estate portfolio due to its low correlation to private real estate and to financial assets (Bond et al 2007a) The low correlations tend to increase when there are shocks to the market however, reducing diversification opportunities when they are most needed (Knight et al 2005) Further studies are needed on the connection between conditional volatility and time-varying correlations for public real estate in the mixed-asset portfolio during different states of the real estate market. Also, to the knowledge of the authors no previous studies link liquidity in the private real estate market to time-varying correlations between public and private real estate.

When applying MPT to direct investments in real estate most studies find diversifying over sector a superior strategy compared to diversifying over region although different markets and different methods for evaluation can lead to different results (Viezer 2010). The Swedish system for rent regulation in the housing market stands out in an international perspective and rental contracts for offices are short compared to other European countries, with an average contract length of three years. In theory, both of the above have the potential to lead to different allocations to an efficient portfolio than in other countries. While diversifying over regions, most studies find economic regions to be superior to geographic regions as a manner of grouping local property markets (Hamelink et al 2000), and economic regions (clusters) can be created by applying clustering algorithms to real estate return variables. As pointed out by Viezer (2000), an inherent problem with the data driven methods is that they can create regions with low inter correlation that are not efficient, i.e. strategies with higher average correlation between subgroups can end up higher on the efficient frontier. If optimal regions could be identified directly using an allocation optimizer, how large would the gains from a risk/return perspective be compared to other manners of grouping local property markets, and what are the economic consequences from a portfolio manager perspective?

The decision on whether or not to outsource a service is explained in theory by transaction cost analysis (Sharpe 1997) and the potential benefits from outsourcing property management functions may be different at company level than on property level. In the property management literature, the focus of attention has been on corporate property, not on strategic decisions for

commercial property owners. Most literature regarding outsourcing in the corporate sector focus on cost reduction, but there is a lack of empirical studies linking different levels of outsourcing to return on property level.

1.1 Aim

Private real estate has certain characteristics that make application of financial models like modern portfolio theory (MPT) to portfolio allocation decisions at different levels in the investment process difficult. There is no central market place, meaning that illiquidity and transaction costs are high. Large lot size/ indivisibility and the heterogeneity of the objects make it difficult to construct well diversified portfolios for small investors. Also, real estate is management intensive requiring expert skills to manage. At sub-sector (property portfolio) level, decisions on allocation and outsourcing are intertwined making strategic decisions complex.

The aim of the thesis is to contribute to the literature on strategic decisions for real estate investors on allocation and management. More specifically, the following research questions are addressed;

- How does time-varying correlation between public real estate and other assets in a mixed-asset portfolio change over time, and can conditional correlations during different phases of the property cycle be explained by conditional volatility?
- Does liquidity in the private real estate market add in explaining time-varying correlation between public and private real estate?
- Which are the better strategies for risk reduction within the real estate portfolio?
- Will outsourcing of commercial real estate management functions add to performance at property level?

1.1.1 Limitations

The thesis is limited to the decisions concerning allocation of domestic real estate in the mixed-asset portfolio, and in the property portfolio, and to the strategic decision on whether to outsource property management functions for directly owned real estate. The purpose is to illustrate some of the decisions made by real estate investors and how they are connected. Therefore, it is not a comprehensive analysis of strategic real estate investment decisions.

1.1.2 Structure of the thesis

This thesis consists of a compilation part and four papers. The compilation part aims to discuss the results of the four papers in relation to the current state of research and to describe how they contribute to the research frontier, combined and individually. The outline of the compilation part is as follows, in section two; literature on topics relevant for strategic real estate investment decisions will be discussed. In section three, the validity of the assumptions in MPT is discussed together with a description of the data used for the analyses. The quality of the data and potential sources of bias will be discussed in the end of that section. In section four, the papers in the thesis are summarized and in section five, the overall contributions to research are discussed, together with practical contributions to stakeholders in the real estate industry. Suggestions for future research are presented at the end of the section.

1.2 Real estate as an asset class

In contrast to financial assets like stocks and bonds, real estate is a heterogeneous asset with varying physical, legal, and locational characteristics. Lacking a central trading place, private real estate is sold individually through negotiations and special arrangements (Seiler et al 1999). There is uncertainty not only regarding transaction price, but also about the time it will take to sell the property. In an industry that profits from legal insider information, public information on individual properties is not publicly available (Viezer 2010). Public real estate involves securitized real estate where the most common investment vehicle is Real Estate investment trusts (REITs). REITs are closed-end investment companies giving investors opportunities to invest in commercial real estate and mortgages indirectly (Niskanen and Falkenbach 2010).

The dominant investors in the real estate market are organizations like insurance companies, pension funds, investment trusts and property companies, the first three labeled institutional investors. The insurance companies can be divided in general insurance funds and life insurance funds. All institutional investors have different liabilities, and therefore different requirements of investments. While all institutional investors invest in the main asset classes, stocks bonds and properties, the percentages allocations to different asset classes vary between different countries. For smaller investors, the large lot size of property and the inability to construct well diversified portfolios makes it an unattractive investment (Hoesli and MacGregor 2000). It seems that large institutional investors tend to favor private real estate equities, while individuals and small institutional investors tend to favor public real estate (Pagliari *et al* 2005, Anglin and Yanmin 2011).

Two possible ways of looking at real estate from an investor perspective, is to either focus on the decision process where fund managers combine quantitative analysis (mainly mean variance analysis) with a qualitative overlay (mainly judgement, and experience) (Reddy *et al* 2014) or to regard real estate from a management perspective. The management of real estate can be described at three different levels; at portfolio level, where decisions on allocation are made; at asset level, where sales and purchases are handled together with investment decisions; and finally at property level where property management includes the technical management of the properties together with managerial services of rental contracts, and the financial management (Ling and Archer 2012). The property management obligations vary depending on type of property, and require expert skills. Asset management, including refurbishment, redevelopment and disposals can create additional value to the investor (Corgel *et al* 1995, Ling and Archer 2012).

2 Strategic real estate investment decisions

In real estate investment there are normative models for the pricing and allocation of assets, and while the decision maker may rely on required exposure levels dictated by an asset allocation model, the final decision may/will be influenced by factors outside of the mathematical model (French 2001). Although plenty of research investigate fund managers allocation to different assets in the portfolio, the practical aspects on the property asset allocation decision making process is underdeveloped (Reddy *et al* 2014). Reddy *et al* studies Australian fund managers' property asset allocation strategies and decision-making frameworks at strategic level, and find that the typical Australian fund manager's property asset allocation framework consists of six steps, where the steps and accompanying actions are:

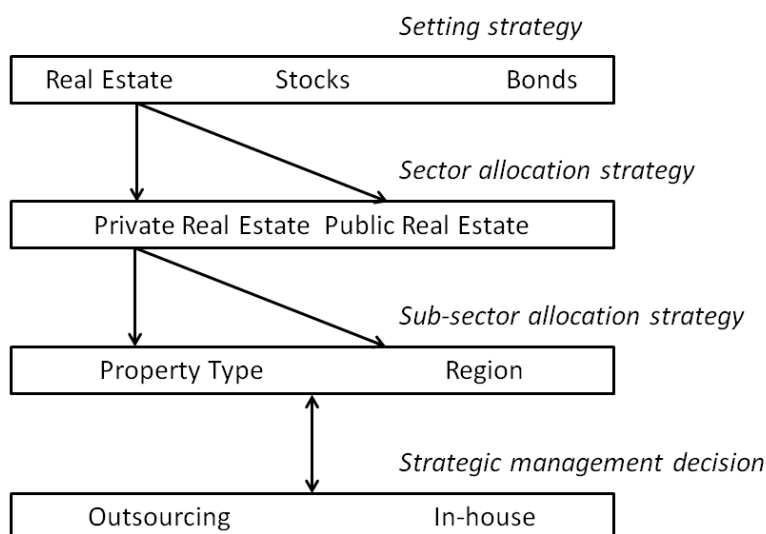
- Setting strategy - long term asset allocation policy for all assets, asset weights, and permissible ranges
- Sector allocation strategy - Property asset class weighting (unlisted/securitized)
- Long-term sub-sector allocation strategy - Property portfolio construction (subsector)

- Approval - Investment committee meeting
- Implement strategy - Invest/disinvest, develop/lease
- Review strategy - Monitor, rebalancing, setting dynamic asset allocation and tactical asset allocation.

The funds studied in the Australian study have the capacity to manage direct property assets in-house, and also through mandates and partnerships. For a more comprehensive description on property investment decisions in the Australian market, e.g. Parker (2014). The hierarchical structure makes sense for implementing a strategic investment policy but there are problems in implementing MPT in this way since the investor cares about risk and return in the entire portfolio rather than any component in isolation (Geltner *et al* 2013), and a property segment that looks appealing in the real estate portfolio due to low correlation with other property segments might have high correlation with stocks and bonds. That being said, a hierarchical model makes sense as an illustration of at what levels strategic investment decisions are made and how they are connected.

An adaption of the three first steps described by Reddy *et al* (2014) can be found in figure I, where the decision process of large institutional investors and fund managers is described as following a top-down approach where the first step is setting a long term allocation policy for real estate and financial assets like stocks and bonds. The second step when regarding the real estate part of the mixed asset portfolio is to decide on the property asset class weighting between public and private real estate. For the private real estate included in the portfolio, a sub-sector allocation strategy has to be decided upon. Intertwined with the decisions on sub-sector allocation strategy is the decision on whether to outsource managerial services for part or whole of the property portfolio. The decision to outsource property management functions is dependent not only on the characteristics of the investor, but also on the composition of the real estate portfolio where management of different property types requires different managerial skills and geographical diversity make management ineffective. (Ling and Archer 2012) For large institutional investors in the Swedish real estate market, it seems that variations in terms of geographical and property type distributions affects the propensity to outsource property management functions, Lindh and Lindmark (2016).

Figure I. A top-down approach to strategic real estate investment decisions



Asset allocation decisions, referring to finding the optimal allocation to various asset classes and sub-classes are based on the mean-variance model created by Markowitz (1952). Since the returns from different assets are less than perfectly correlated over time, diversification gains can be made by combining assets in a systematic way. Asset portfolios that minimize risk at a given level of return, and maximize return at given level of risk are called efficient, and lie on the efficient frontier. Sharpe (1964) developed the Capital asset price model (CAPM) that depicts the level of additional return above the risk free rate of return for each change in the level of risk. The Sharpe ratio is defined as excess return per unit of risk where r_i is the portfolio return, r_f is the risk-free rate of return and δ is the standard deviation of the portfolio. $S = \frac{r_i - r_f}{\delta}$, and higher Sharpe ratio is associated with higher portfolio efficiency.

The quality and availability of real estate data from which to forecast returns and estimate standard deviations and correlations for is limited (Hoesli and MacGregor 2000) and some of the characteristics of real estate data violate the assumptions in MPT. This is described in more detail in section 3.1

In the remainder of this section, literature on topics relevant for strategic real estate investment and management decisions will be described. The topics are; setting strategy, sector allocation strategy, sub-sector allocation strategy and strategic management decisions.

2.1 Setting strategy

Setting strategy in the mixed-asset portfolio is about setting a long term allocation policy for real estate and financial assets (Reddy *et al* 2014) There has been a long and ongoing debate about real estate's role in the optimal mixed-asset portfolio, and one of the most recent contributions is by Pagliari (2016), who study real estate in the mixed asset portfolio in the US for public and private real estate indices, and finds that an empirically derived allocation of 10-15 % should be considered an upper bound. He concludes that for investors preferring low-risk portfolios, private real estate is preferable, and for investors preferring high risk portfolios, public real estate with its embedded leverage serves its purpose better. Portfolio gains in return from including real estate in the portfolio are less compared to reduction in portfolio risk, and benefits tend to increase with a longer investment horizon (Lee and Stevenson 2006).

Since returns of private real estate are appraisal based, the underlying dynamics of real estate return is not captured in the index, and the true variability of real estate return is underestimated, see Fisher *et al* (1994), and Corgel and DeRoos (1999). This is partly because of bias introduced in the valuation process and partly because of how valuations at different points in time are aggregated in the index. Also there is evidence that property valuers who value the same property in consecutive periods anchor onto previous values, resulting in more lagging compared to first time appraisals, (Clayton *et al* 2001). Different quantitative de smoothing techniques have been developed by researchers with the aim of capturing the true volatility of the series (Geltner 1993, Geltner *et al* 2003, Edelstein and Quan 2006, Bond and Soosung 2007).

Studies show that the actual allocation to real estate from institutional investors is lower than portfolio optimization models would suggest (e.g. Worzala and Bajtelsmit 1997, and Hoesli *et al* 2003). Explanations suggested in literature have to do with matching of pension liabilities, (Craft 2001), illiquidity (Bond *et al* 2007) the small market size (Newell and Peng 2008) or management fees and time and staff limitations (Reddy 2012).

There is growing evidence that adding public real estate to a mixed-asset portfolio can both reduce risk and increase return (e.g. Mueller *et al*, 1994, Lee and Stevenson, 2005, Bond and

Glascok, 2006). Newell *et al* (2016) argue that UK-REITs, due to their strong risk-adjusted performance compared to UK stocks, contribute to the mixed-asset portfolio across the risk spectrum. There have been mixed results in literature on the inclusion of public and private real estate in the same portfolio. Stevenson (2001) find that adding public real estate to a portfolio already including private real estate does not have a statistically significant increase on performance, results replicated by Seiler *et al* (2001) and Lee and Stevenson (2005). As pointed out by Moss and Baum (2013b) it is widely accepted that investors are unable to buy index returns to construct optimal real estate allocations, and that in practice the inclusion of public real estate is likely to contribute positively to both a real estate and a mixed-asset portfolio as the direct holdings are unable to mimic the index. According to Kennedy and Baum (2012), a poor diversified private real estate portfolio benefits from the inclusion of REITs. Other studies that have come up with similar results are Feldman 2003, Mueller and Mueller 2003, and Pagliari 2016.

Modern portfolio theory holds when return follows a normal distribution, and when the relationship between asset return is constant. This is not true for most assets as “correlation breakdown” tends to occur during periods of high volatility (Loretan and English 2000) With the introduction of the GARCH model by Bollerslev (1986), and the DCC GARCH model by Engle (2002) time varying volatilities and correlations between assets could be estimated, and several studies have found the covariance matrix of public real estate versus other asset classes to be time-varying (e.g. Liow *et al* 2009, Chong et al 2009, Case et al 2012, Huang and Zhong 2013, Liow 2012 and Heaney and Srianthakumar 2012). The changing nature of relationship between REITs and alternative asset classes is of great importance from a fund managers perspective, and when studying how the correlation of European REITs to other assets have evolved, Niskanen and Falkenbach (2010) find that correlations with equities exhibited an upward sloping trend over the period analyzed. For fixed income securities, the correlation was found to be increasingly negative. Chong *et al* (2009) study U.S. REITs and estimate conditional correlations against a variety of equity, bond and commodity sectors, and find that conditional correlations with equity rose over the period analyzed, while that with bonds and commodities fell. With the exception of U.S. government securities and the commodity market, the correlations tend to rise in periods of above average volatility, reducing diversification possibilities when most needed. For European REITs, during times of extreme volatility in the equity market REITs diversification qualities are diminished, but for the fixed income market the correlation with REITs decreases (Niskanen and Falkenbach (2010).

Liow *et al* (2009) capture the time varying correlations between international publicly traded real estate securities using monthly returns between 1984 and 2006. They detect a strong and positive connection between real estate securities market correlations and their conditional volatilities. They also find that the international correlation structure of real estate securities and the broader stock market are linked to each other. Fei *et al* (2010) examine the dynamics of the correlation and volatility of REITs stocks and direct real estate using monthly data between 1987 and 2008 using an AD-DCC GARCH specification, and find that the time-varying correlations can be explained by macro-economic variables such as term and credit spread, inflation and the unemployment rate. For equity REITs, a robust relationship exists between correlations and future returns, i.e. the higher the correlation between equity REITs and direct real estate, the higher the future returns of equity REITs, and vice versa.

There is a strong case for including real estate in the mixed asset portfolio, and the optimal amount suggested in early literature ranges from 0%, to 67% in a review by Seiler et al (1999). The results from including both public and private real estate are mixed, but in practice, the inclusion of REITs is likely to contribute positively to a portfolio including private real estate as

direct holding are unlikely to be optimal as defined by direct indices (Moss and Baum 2013b). There is evidence that the correlation between public real estate and other assets is time-varying, and connected to volatility in returns. The results are not conclusive, but correlations to equities appear to increase in periods of above average volatility in the equity market. To understand the potential hedging effects of including public real estate in the mixed-asset portfolio, a question that merits further study is how time-varying correlation between public real estate and other assets in a mixed-asset portfolio change over time, and if conditional correlations during different phases of the property cycle can be explained by conditional volatility.

2.2 Sector allocation strategy

The sector allocation strategy regarding the real estate part of the mixed asset portfolio is about deciding on the asset class weighting between public and private real estate. The securitized (public) real estate market has developed to overcome problems with liquidity and transparency in the private real estate market and there are growing requirements for more liquid exposures in real estate (Moss and Farelly 2015). Pagliari *et al* (2005) find that individuals and small institutional investors tend to favor public real estate rather than in direct real estate. Being more liquid and more informationally efficient, prices in securitized real estate are believed to react faster to shocks than direct real estate, and several studies find that real estate stocks lead private property markets (Morawski *et al* 2008, Hoesli *et al* 2015 and Yunus *et al* 2012).

A matter of debate has been on whether public real estate return more reflects the stock market or the private real estate market. Clayton and MacKinnon (2001) examine the link between REIT, financial assets and real estate returns to test if REIT returns better reflect the performance of the underlying asset after the REIT boom in the early 1990s. They find that the REIT market went from being largely driven by the same economic factors that drive large cap stocks to being more strongly related to small cap stocks and real estate factors. These results are confirmed by Hoesli and Oikarinen (2012) who examine whether securitized real estate return reflect direct real estate return or general stock market return for the US, UK and Australia. The econometric evaluation is based on sector level data, and both long term and short term dynamics is compensated for as well as the lack of leverage in the real estate indices. Their results suggest that long run REIT performance is more closely related to direct real estate than to the stock market, and that REITs and direct real estate are relatively close substitutes in a long horizon investment portfolio. When controlling for property type mix, leverage and appraisal smoothing, and then testing if the restated means and volatilities are different from each other. Pagliari *et al* (2005) find no statistical difference between the two, and argue that public and private market vehicles ought to be viewed as offering a risk/return continuum. These results are confirmed by Hoesli and Oikarinen (2016). Finally, when long run relationships between public and private real estate is modeled using a co-integration framework, the two assets are found to share a long run equilibrium, (Liow 2012, Morawski *et al* 2008, Boudry *et al* 2012).

One of the main differences between public and private real estate is the ease with which public real estate is traded, and where the low liquidity in the private market impacts real estate investment risk, (Lin and Vandell 2007, Bond *et al* 2007). Liquidity in itself is not observable, meaning proxies need to be created. For real estate, trading volume is an indirect liquidity measure widely used in literature (IPF 2015). Liquidity in the real estate market has a large impact on private real estate returns (e.g. Ang *et al* 2013), and there is evidence that the liquidity premium in REIT prices relative to property NAV varies systematically with the liquidity of private real estate, and that investors value the liquidity provided by REITs when liquidity in the private real estate market is low (Clayton and McKinnon 2001). Another study that has found a negative correlation between liquidity and the NAV discount is documented in Barkham and Ward (2009). Morri and Baccarin (2016) find a negative correlation for French REITs, but for Dutch, and

British REITs, which trade in markets with a higher number of daily transactions, no discounts were found.

Timing may be an important factor in choosing between public and private real estate, and they offer different diversification possibilities (Baum and Struempell 2006). A review of the literature suggests that there is a common real estate factor that drives the return of both public and private real estate, and that private real estate indices lag public real estate indices. In the short term, public real estate displays similar risk and return characteristics to the stock market rather than the private real estate market, and it appears that liquidity in the private real estate market has an impact on risk and return for direct real estate investments. Therefore the potential link between liquidity in the private real estate market and time-varying correlations between public and private real estate is of great interest to real estate investors.

2.3 Sub-sector allocation strategy

Large lot size/ indivisibility and the heterogeneity of the objects make it difficult to construct well diversified portfolios for small investors, and since mean-variance optimization models cannot be applied to the return of the individual properties, a lot of focus in real estate literature has been on how to group real estate return as a manner of diversification within the real estate portfolio. A common way to group real estate is to use either sectors, or geographic regions where most studies have found sectors to be superior to regions from a diversification perspective (e.g. Lee and Byrne 1998, Fisher and Liang 2000, Hamelink *et al* 2000, Lee 2001 and Gabrielli and Lee 2009). Two exceptions can be found, Eichholz *et al* (1995) investigated both the UK and the US market for income properties to find out whether the sector or regions diversification strategy was more efficient. On the UK market, no statistical difference was found, but in the US market, classifying according to regions showed a greater potential for risk reduction. The same relationship between sector and regional strategies were found in the Nigerian market by Olaleye *et al* (2008).

The theory behind risk reduction through diversifying across geographical regions is that different economic forces influence different geographical regions (e.g. Harzell *et al* 1986, Rabianski and Cheng 1997, Wolverton *et al* 1998 and Brown *et al* 2000). Since local economic drivers are not necessarily linked to spatial factors, but rather economic factors like employment rates or vacancy levels researcher began investigating new ways of grouping local real estate markets, (Malizia and Simons 1991). These economic regions could also be created by ranking local real estate markets according to some criteria and then assigning markets with equal rank to the same region (Mueller 1992).

Hartzell *et al* (1987) divide the US property markets in eight functional regions using economic base, and were followed by Malizia and Simons (1991) who took the analysis a step further by using demand side factors like unemployment, income and population figures to create regions. Mueller and Ziering (1993) compare the standard US geographic categories East, Midwest, West and South with the categories created by Hartzell *et al* (1986) and add two of their own; one category that groups the US by dominant employment category and one by growth in employment rates. Mueller (1992) rank local property markets according to standard industrial classification (SIC), and then assign markets with equal rank to the same region. Ziering and Hess (1995) do the same for socio-economic variables like crime rate and temperature.

In the UK market Heydenreich (2010) finds that strategies based on economic diversification show superior risk-adjusted returns when comparing administrative regions to an economic strategy based on industry specialization. When Byrne and Lee (2011) study the UK market and use a (mean absolute deviation (MAD) portfolio optimisation model to compare the performance

of conventional administrative regions with the performance of functional groups based on data from the 2001 Census. They find that the functional groups provide greater risk reduction and argue that the underlying characteristics of such groups might be more insightful and acceptable to real estate portfolio managers. Lee (2016) examines rental growth correlations between locations in office markets in the U.K. and find that economic distance has significant negative office rental growth correlation with the city of London, whereas geographical distance shows no relationship.

Methods for creating regions grew in sophistication over time, introducing statistical methods like cluster analysis to determine associations between local real estate markets rather than pre specifying them (e.g. Goetzmann and Wachter 1995, Williams 1996, Cheng and Black 1998, Nelson and Nelson 2003 and Smith *et al* 2005). The cluster methodology can also be used to identify submarkets within regions (e.g. Dunse *et al* 2001). In the UK, Hamelink *et al* (2000) used cluster methodology to create regions based on returns, yields and rental data for 157 local markets. The results show strong property type dimensions and only very broad geographical dimensions in the clusters. In the UK, Jackson and White (2005) group local markets using cluster analysis and rental changes with the aim of assessing the appropriateness of existing real estate market classifications. In the retail sector, neither the traditional U.K. regional classification, nor a broader super-regional classification is appropriate. In the office sector however, the super-regional grouping is appropriate, reflecting user-group locational strategies.

For a majority of countries and time periods studied, it seems that diversifying over property type is superior to diversifying over regions, and that economic regions result in more efficient portfolios than geographic regions. However, due to differences between countries affecting the real estate market (like rental legislation for instance), the efficiency of different strategies could be different for different countries. Also, an inherent problem with the data driven methods used to group local property markets is that they can create regions with low inter correlation that are not efficient, i.e. strategies with higher average correlation between subgroups can end up higher on the efficient frontier (Viezer 2000). Therefore it appears that further studies on the strategies for risk reduction within the real estate portfolio are merited.

2.4 Strategic management decisions

An important strategic question for any firm is to decide what operations to perform within the firm, and what services and products to acquire in the market, and for real estate companies one of the most important strategic questions is whether to outsource property management functions, or to manage the properties in-house. Ronald Coase presented his transaction cost theory of the firm in 1937 (Coase 1937), and it was one of the first attempts to define the boundaries of the firm in relation to the market. Thomson (1967) discussed core activities and how to protect them within the organization, a question that has been analyzed further by Hamel and Prahalad (1990). An important addition to the theory of the firm was made by Hart (1988), when discussing the concept of incomplete contracts, residual rights, and its impacts on the boundary of the firm. Yang *et al* (2012) extends the discussion of transaction cost economics and outsourcing to the selection of governance mechanisms for an effective outsourcing transaction.

Within the field of corporate real estate, some attention has been on the strategic decision of outsourcing property management functions, and which functions that should be outsourced.

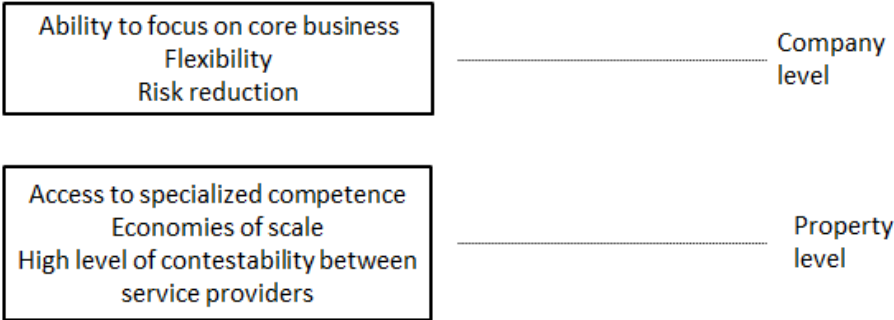
Manning *et al*, (1997) make a comprehensive contribution to the field when they use concepts from the neoclassical theory of the firm to shed light on how much and which of the corporate real estate management functions should be outsourced. Krumm and de Vries (2003) claim that the contribution of corporate real estate at the time of the study was perceived by cost reductions

or capital minimization only. They highlight the value of actively managing corporate real estate and to acknowledge its contribution to the performance of a corporation, both in a financial and a non-financial manner. Farncombe and Waller (2005) argue that outsourcing should not only be about cutting costs, but also about the potential for increase in service quality.

One of the most stated benefits of outsourcing is that it enables the outsourcing firm to focus on core business (Palm 2013, Quinn 1999). In addition, it could increase the flexibility of the firm (Kotabe *et al* 2012, Bartelink *et al* 2015) With its use of outside expertise and minimization of fixed costs, outsourcing provides a means to free up internal resources and to reduce financial and operational risks (Kimblor and Rutherford, 1993). The access to outside expertise in innovating firms and making them more competitive has been highlighted by for instance Quinn (1999) and Matsham and Heywood (2012). For property management firms to enter the market, the investment is mainly the professional and manual labor force rather than capital investments. Therefore, the property service market should have a high number of suppliers and a high degree of contestability (Lam 2012).

It appears that outsourcing of property management functions has different potential to affect results at company versus property level, see figure II. When potential gains at company level come from being able to focus on core business, flexibility and the reduction in financial and operational risk, the potential gains at property level are due to access to specialized competencies, economies of scale and a high level of contestability between service providers.

Figure II. Potential gains from outsourcing at company versus property level



With few exceptions, little can be found in literature on management strategies in the commercial real estate sector. Palm (2013) investigates two strategic pathways regarding real estate management where the first is whether to have own frontline personnel, or to outsource that function, and the second is if the leasing task should be part of the real estate managers task, or be a function of its own in the organization.

Firms outsource business functions to cut expenses and focus on core competence, but any outsourcing relationship face principal agent problems. The principal and the agent uses contracts to reduce the conflict of interest, but since the contracts are incomplete, higher levels of monitoring lead to higher levels of transaction costs Greenberg *et al* (2008). Real estate markets are prone to incomplete contracts because of high asset specificity, and highly imperfect markets. In such relationships, trust may be an important complement to contracts and monitoring to reduce transaction costs, (Freybote and Gibler 2011). Gibler and Black (2009) emphasizes that for the outsourcing to achieve corporate goals, the client must work closely with the provider to ensure that the interests of each party is fulfilled. When they analyze the views of corporate real estate managers and real estate service providers, they find that providers focus more on traditional real estate tasks than on corporate business strategy.

It seems that potential gains from outsourcing in the commercial real estate sector are different at company versus property level where potential gains at company level are mainly due to the ability to focus on core business, the added flexibility, and the reduction in financial and operational risk. At property level, potential gains from outsourcing are access to specialized competencies, economies of scale and a high level of contestability between service providers. Because of high asset specificity, real estate markets are prone to incomplete contracts, and trust may be an important complement to contracts and monitoring. Most literature regarding outsourcing in the corporate sector focus on cost reduction or on potential gains at company level, and a question that merits further study is whether outsourcing of real estate management functions adds to performance at property level.

3 The limitations of real estate data

Due to the characteristics of real estate as an asset class described earlier, there are difficulties in applying models developed for financial assets to real estate data. The validity of the assumptions in MPT when applied to real estate data and how they relate to the four papers presented in this thesis will be discussed in section one. In section two, the quality of the real estate data used in the papers will be discussed together with potential sources of bias.

3.1 The validity of the assumptions in MPT when applied to real estate data

Portfolio theory is based on a set of assumptions about market structure and investor behavior that are problematic in a real estate setting where there are barriers to investment, investors face capital constraints and information is not freely available to all investors (IPF 2012). An important question is whether the asset class return distributions are consistent with the assumptions of portfolio theory, and what the implications are when they are not. Portfolio theory holds when returns follow a normal distribution, and where the relationship between asset returns is constant. If these conditions are fulfilled risk can be fully characterized using asset standard deviation and the covariance between assets (Markowitz 1952). As described in the literature section, since private real estate is not traded in an exchange, investors must rely on appraisals that occur infrequently, and the return series is thereby “smoothed” understating the true volatility of real estate return. To capture the true volatility, different quantitative de smoothing techniques have been developed by researchers (e.g. Bond and Soosung 2007). Several authors have studied private real estate return distributions and found them to be non-normal (e.g. Lizieri and Ward 2000, Young *et al* 2006, Cheng 2005 and Young 2008). Some statistical attempts that have been tried in literature that aims at dealing with non-normality are; mean absolute deviation (MAD) optimization that gives less weight to outliers (Lee and Byrne 1998) the downside risk approach (Sivitanades 1998 and Cheng and Wolverton 2001), and applying a Bayes-Stein estimator to reduce the difference in sample means by shrinking them toward a global mean (Efron and Morris 1977 and Stevenson 2001).

Both paper two, “Methods for comparing diversification strategies on the Swedish real estate market” (see section 4.2) where the average correlation between property types and regions for different time periods differ, and for paper one, “Public real estate- correlation and volatility dynamics in the U.K. mixed-asset portfolio” (see section 4.1) where the DCC GARCH model outperforms the constant conditional correlation (CCC) GARCH model, it is obvious that correlations are not constant over time. The monthly frequency of the data in paper one allows for estimating time-varying correlations, but no such method is applied in paper two or in paper three, “The role of optimal regions in forming efficient real estate portfolios” (see section 4.3).

When investigating risk diversification in the real estate portfolio, smoothing is not considered a problem since it is believed to affect different property types and regions at a similar level (Viezer 2010). In the mixed-asset portfolio, this must be compensated for however, and when investigating the “U.K. mixed-asset portfolio”, the IPD monthly index return is de-smoothed using an autoregressive (AR) process.

3.2 Data

For the study on the U.K. property market in paper one data from the IPD UK Monthly Property Index and the FTSE EPRA/NAREIT U.K Index were used. The IPD UK Monthly property index measures ungeared total returns to directly standing property investments from one open market valuation to the next. In January 2014, the capital value was 35.055.3 £ m. The FTSE EPRA/NAREIT U.K. Index is designed to track the performance of real estate companies and REITS listed on the London Stock Exchange. In January 2015 the market value was 52.203 £ m. Both the IPD and the FTSE EPRA/NAREIT index are recognized as data of good quality. For the financial part of the mixed-asset portfolio investigated in paper one, the MSCI Mid & Large Cap Index U.K. monthly total return index and the The J.P. Morgan, U.K. index of bonds with 7-10 years maturities were used. The MSCI Mid & Large Cap Index Tracks listed mid and large cap U.K. stocks, and has a market value of 2,325,625.19 USD Millions.

The value of the Swedish property market is estimated to 12 000 billion SEK out of which the professionally managed investment market constitutes ten percent of the total property stock. In 2016, twenty-two public property companies owned one third of these properties, institutional investors held 28%, and international investors and funds held 21%. The remaining properties are mostly held by private investors (MSCI). For the studies on the Swedish real estate market (paper two, three and four), data provided from MSCI Swedish property databank is used. The databank is the basis for the IPD Swedish property index that in 2016 covered 40% of the professionally managed investment market described above.

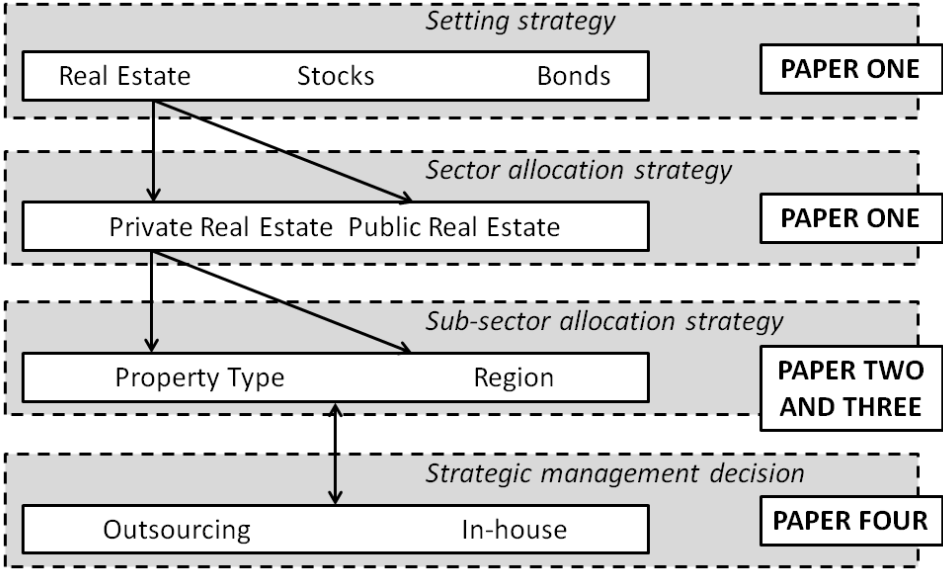
For the two papers on diversification within the Swedish real estate portfolio (paper two and three), the data set included almost 28 000 individual property observations between 1984 and 2012. For the outsourcing study, the data set stretches between 1997 and 2014, and is limited to office buildings only. After removing outliers, 9 528 observations remained. In none of the above data sets can individual properties be identified, making the construction of a panel impossible. This is not problematic when investigating diversification issues in the real estate portfolio but makes it impossible to link future gains from investments to increase in total return in paper four “Will outsourcing of commercial real estate management add to performance? A quantitative analysis of the Swedish market” (see section 4.4) which is a potential bias. Due to confidentiality reasons, the variables describing owner category are omitted, since owner category has potential impact on results. This is also a potential bias, and finally, for one of the years in the study (2008), a data error occurred and the number of observations is very low compared to the other years. Since the reason for the loss is unknown, the authors have no way of knowing the potential bias the omission of the data points has for the results in the study.

4 Papers

Strategic allocation and management decisions at different stages in the investment process are described in figure I, “A top-down approach to strategic real estate investment decisions” in section 2. The figure illustrates how selected allocation and management decisions at different levels are connected. Figure III below equals figure I, but with the addition of where in the

investment process the different papers contribute to literature. Paper one, “Public real estate-correlation and volatility dynamics in the U.K. mixed-asset portfolio” (section 4.1) adds to the knowledge both on the allocation to real estate in the mixed asset portfolio, and to the allocation to public versus private real estate in the real estate portfolio. Paper two “Methods for comparing diversification strategies on the Swedish real estate market” (section 4.2) and paper three, “The role of optimal regions in forming efficient real estate portfolios” (section 4.3) adds to the knowledge on subsector allocation, i.e. how to allocate within the real estate portfolio. Finally, paper four, “Will outsourcing of commercial real estate management add to performance? A quantitative analysis of the Swedish market” (section 4.4) adds to the knowledge on whether to outsource management functions for commercial real estate or whether to manage the properties in-house.

Figure III. How the papers relate to strategic allocation and management decisions at different levels.



In the remainder of this section, the four papers will be summarized in the order in which they appear in figure III. This is not consistent with the order in which they were written, where paper two and three originate from the licentiate thesis (Katzler 2005). Paper number two, “Methods for comparing diversification strategies on the Swedish real estate market” was rewritten with new data and later published in International journal of real estate management in 2016. Paper number three, is completely rewritten with new data and methods. Paper four, and paper one were written most recently. Paper one, three and four are all submitted to peer-reviewed academic journals and in different stages of the review process.

4.1 Paper one: Public real estate- correlation and volatility dynamics in the U.K. mixed-asset portfolio¹

Research problem and aim – Public real estate can offer diversification opportunities both to a mixed-asset portfolio and to a real estate portfolio. The low correlation between public real estate and other assets tend to increase when there are shocks to the market, reducing diversification opportunities when they are most needed (Knight *et al* 2005). With the introduction of multivariate GARCH-models, the nature and extent of time-varying correlations can now be

¹ Co-authored with Han-Suck Song

estimated, and although applications to real estate can be found in literature the drivers of correlations between public real estate and other assets during different phases of the real estate market are not fully understood. Also, to the knowledge of the authors, no studies exist on the time-varying correlation between public and private real estate and liquidity. The aim of this paper is therefore to contribute to the literature on correlation and volatility dynamics for public real estate. This is achieved by (1) estimating conditional volatilities for real estate and financial asset classes, and conditional correlations between public real estate, private real estate and financial assets. (2) determine how public real estate acts as a diversifier in a mixed asset portfolio during different phases of the real estate cycle where conditional correlation is explained by conditional volatilities (3) adding liquidity to the previous model for public and private real estate to see how transaction activity helps explain conditional correlations.

Data and method – The study uses the monthly total return indices, the de-smoothed IPD UK property index, the FTSE EPRA /NAREIT UK index, the MSCI Mid and Large Cap index, and the J.P. Morgan, U.K. index of bonds with 7-10 years maturities for the time period December 1989 to September 2014. In the analysis, conditional monthly returns are estimated adopting an autoregressive (VAR) model, conditional volatilities are modelled in a GARCH framework, and conditional correlations are estimated by a DCC GARCH model. The dataset was divided in four distinct market states according to capital return growth in the IPD-index, and the relation between conditional correlations and the time-varying volatilities is assessed through multiple regression analysis. The DCC GARCH model created by Engle (2002) estimates univariate GARCH models for each asset, and then uses transformed residuals from the first stage to estimate a conditional correlation estimator.

For the mean returns, a VAR (1) model is adopted. In the VAR model all variables of interest are endogenous and all variables are modeled simultaneously. When estimating return volatility over time the conditional variances are assumed to follow a univariate GARCH (1.1) specification:

$$h_{ii,t} = \alpha_{i,0} + \alpha_{i,1}\varepsilon_{i,t-1}^2 + \gamma_i h_{ii,t-1} \quad (1)$$

Where the predictor of the variance in the next period is the weighted average of the long run average variance, the variance predicted for the most recent period, and the squared residual for the most recent period.

The conditional covariance terms are assumed to follow the DCC (1.1) specification,

$$h_{ij,t} = \rho_{ij,t}\sqrt{h_{ii,t}}\sqrt{h_{jj,t}} \quad (2)$$

$$\rho_{ij,t} = \frac{q_{ij,t}}{\sqrt{q_{ii,t}}\sqrt{q_{jj,t}}} \quad (3)$$

$$q_{ij,t} = (1 - a - b)\bar{\rho}_{ij} + a\varepsilon_{i,t-1}\varepsilon_{j,t-1} + bq_{ij} \quad (4)$$

where $q_{ij,t}$ is the conditional covariance between the standardized residuals from the first stage. Equation 4 is the DCC model in which a and b are scalar parameters to capture the effects of previous standardized shocks and previous dynamic conditional correlations, and $\bar{\rho}_{ij}$ is the long run average unconditional correlation between the assets.

Results - When regressing on a time trend, public real estate has become more integrated with private real estate and equities over time, providing less potential for diversifications whereas the integration with bonds has decreased over time. A hedging effect of public real estate versus private real estate can be found in the recent period only. For all other time periods except for the boom period an increased volatility in private real estate return results in increased correlation between the two assets. Considering public real estate versus bonds, a hedging effect is observed in the recovery period (significant at the ten percent level). In the boom and the downturn period, an increased volatility in bond return leads to an increased correlation. When refining the model for public versus private real estate by adding a proxy for liquidity in the private real estate market to the model, liquidity has a significant effect on conditional correlation for two time-periods, the boom period and the present period. In the boom period, an increased number of transactions leads to increased correlation between public and private real estate return, and in the recent period an increased number of transactions leads to decreased correlation between public and private real estate return.

4.2 Paper two: Methods for comparing diversification strategies on the Swedish real estate market

Research problem and aim - For the purpose of risk reduction within the real estate portfolio, real estate can be grouped according to sector type or region, with the underlying assumption that different underlying market drivers affect real estate return. In order to structure fund allocation in direct real estate investments, different methods have been used to evaluate the effectiveness of the two strategies from a portfolio perspective. The aim of the paper is to evaluate whether diversifying over sector or region is the more efficient strategy in the Swedish Real Estate market using different quantitative methods.

Data and method - Using individual observations from the MSCI Swedish property databank between 1984 and 2014 the effectiveness of diversifying over sector versus region is compared using five methods; (1) comparison of correlation matrices using the Jennrich test for formal comparison, (2) comparison of efficient frontiers, (3) comparing Sharpe ratios using the F-test, the Lagrange multiplier test, and the likelihood ratio test, (4) comparing coefficients in equations explaining total returns, (5) comparing R-square values in equations explaining total return. The evaluation methods are applied to both value weighted and equally weighted indices calculated by the author.

Results - All methods show that diversifying over property types is a better strategy on the Swedish market than diversifying over regions. No test yields significant support for regional diversification. The support for the property type strategy is stronger when using equally weighted indices.

4.3 Paper three: The role of optimal regions in forming efficient real estate portfolios

Research problem and aim - While diversifying over regions, most studies find economic regions to be superior to geographic regions as a manner of grouping local real estate markets. Economic regions (clusters) can be created by applying clustering algorithms to real estate return variables. An inherent problem with the data driven methods is that they can create regions with low inter correlation that are not efficient, i.e. strategies with higher average correlation between subgroups can end up higher on the efficient frontier. The aim of the study is to identify optimal regions for diversification by using an allocation optimizer, and then determine how large the

gains are from a risk/return perspective compared to a strategy using geographic regions, economic regions, and regions created using k-means cluster analysis.

Data and method - Using yearly total returns from the Swedish MSCI index at property level for the years 1984 to 2014, regions are created using two different approaches; a k-means cluster approach, and an allocation optimizer where the starting point is first finding the optimal portfolios on the efficient frontier, and then identifying the group constellations creating them. The K-means clustering is a partitioning method, where an algorithm is used to find a partition in which objects within each cluster is as close to each other as possible, and as far from objects in other clusters as possible. K stands for the number of clusters chosen, and the cluster algorithm uses the dissimilarities or distances between objects when forming the clusters. The chosen type of distance is the Squared Euclidean distance which is the geometric distance in multidimensional space, and each centroid is the mean of the points in that cluster. The Squared Euclidean distance is computed as

$$\text{distance}(x, y) = \left\{ \sum_i (x_i - y_i)^2 \right\}^{1/2}$$

To identify the optimal regions an allocation optimizer was created using MATLAB software. A partitioning algorithm was carried out to achieve all possible ways of dividing the municipalities in the study in four groups (the number of divisions in the other strategies used for comparison) and then average yearly return was calculated for the divisions and used as input in the mean variance analysis. Out of all possible combinations, the regions resulting in the global minimum variance portfolio, together with the regions resulting in the portfolio with the highest average Sharpe ratio were identified. The regions created using the k-means cluster and the allocation approach are then compared with economic and geographical regions in the Swedish real estate market, both in terms of average correlation between divisions, and in terms of their risk return ratio on the efficient frontier. In order to determine whether the number of regions chosen for comparison is reasonable, silhouette values are calculated to determine optimal number of clusters.

Results – Although practical from a property management perspective, asset allocation based on purely geographical regions have limited support in literature as an efficient way of grouping real estate with the purpose of creating mean variance efficient portfolios. Surprisingly enough, the results on the Swedish real estate market contradict these findings as the pure geographical grouping is superior to both economic regions, and groupings created using k-means cluster algorithms on real estate return. When the allocation algorithm, created to find the most efficient strategies is used to find the global minimum variance portfolio, and the highest maximum Sharpe ratio the resulting portfolios are most efficient in their respective risk segments. The gains are moderate however, and must be balanced against the fact that the resulting portfolios are scattered geographically, resulting in difficulties in predicting future return and creating easily manageable units.

4.4 Paper four: Will outsourcing of commercial real estate management add to performance? A quantitative analysis of the Swedish market²

Research problem and aim - An important strategic decision for property investors is whether to outsource property management functions or to manage the property in house. In the property management literature, the focus of attention has been on corporate real estate, not on strategic decisions for commercial real estate owners. Most literature regarding outsourcing in the corporate sector focus on cost reduction, but there is a lack of empirical studies linking different levels of outsourcing to return. The aim of the study is to examine how outsourcing of different

² Co-authored with Björn Berggren and Christina Gustafsson

managerial functions affects profitability in the commercial property sector at property level, and more specifically if the level of outsourcing affects properties of different size, and location differently, and if the level of outsourcing has different effect on profitability during different phases of the property cycle.

Data and method - Using yearly return from the Swedish MSCI index for office buildings, multiple regression analysis has been used to test the effects outsourcing of different managerial functions has on total income, total cost, and net income. The analysis is made in three steps, where in the first step; the only independent variables are levels of outsourcing, in the second step, control variables regarding property characteristics are added to the model and in the third and final step, interaction variables between levels of outsourcing and some of the control variables are added.

With the addition of interaction variables it is possible to measure how a combination of independent variables affect the dependent variable, and when analyzing how levels of outsourcing affects profitability at property level, interaction variables are added to the model to investigate whether the level of outsourcing affects properties with different characteristics differently.

Results - It appears that outsourcing for large institutional investors and real estate companies where ownership of commercial real estate is core business have limited power to increase net income and reduce costs at property level. Outsourcing of technical management has a large positive effect on net income for the smallest size category, but due to the relatively small sample size of the smallest size category, the results should be interpreted with caution. For full outsourcing a positive effect on net income can be seen on the most attractive segments Stockholm CBD and Stockholm central area, which could be due to high competition in the market for property management services in these segments, increasing quality and reducing costs compared to in-house management. When looking at total income, outsourcing of technical management separately seem to increase the total income for Stockholm central area, and several of the size groups and cycles. For full outsourcing, the gains on total income are limited, and a positive effect can be seen on Stockholm central area only. The discrepancy between mixed and full outsourcing in this study might indicate that outsourcing of managerial management has negative effect on rental income. Outsourcing of technical management reduces costs for the smallest size category, and for the time period between 2001 and 2004, but increases costs for the segment rest of greater Stockholm. Full outsourcing decreases costs for two size groups and one property cycle. For Stockholm CBD and the smallest size category, full outsourcing increases total costs. Two results that appear contra-intuitive are how outsourcing of technical management can result in increased total income and how outsourcing of managerial management functions affects total costs. Part of the answer might lie in how the contracts between property owners and property managers are written and whether the incentives are for increasing income or controlling costs.

5 Contributions and future research

The thesis makes an overall contribution to the literature on strategic decisions for real estate investors. Apart from reviewing literature relevant for strategic decisions at different levels and using a top-down approach to illustrate how selected allocation and management decisions are connected, four separate empirical studies are made to investigate the nature of selected strategic decisions for real estate investors. Each empirical study is presented in a separate research paper. In the following section the papers' individual contributions to research will be presented together with a discussion on contributions to practice. In the final part, suggestions on future research are presented.

5.1 Contributions

Due to the characteristics of real estate as an asset class, using financial theories developed for stocks and bonds for allocation decisions at different levels in the portfolios management process is challenging. At sub-sector level, decisions on allocation and outsourcing are intertwined making strategic decisions complex. In the thesis, valuable insight is gained on the time-varying volatilities and correlations for public real estate and other assets in the mixed-asset portfolio, and on the drivers of said correlations. To the knowledge of the authors, it is also the first time a connection between liquidity in the private real estate market and the conditional correlations between public and private real estate is identified. Given the distinct features of the Swedish market for commercial real estate as pertaining to rental legislation, results still confirm sector to be superior to region as a strategy for diversification, confirming results from the U.K, and the U.S. The thesis also adds to the knowledge on the best manners of grouping real estate return for the purpose of risk reduction within the real estate portfolio and on the potential use for computer algorithms in identifying optimal groupings of local real estate markets. The results confirms earlier findings that lower correlation between regions doesn't necessarily lead to more efficient portfolios and shows that an allocation optimizer can be used to find the most efficient portfolios at all risk levels.

Adding to the literature on outsourcing in the real estate sector, this is, to the knowledge of the authors, the first empirical study linking different levels of outsourcing to return in the commercial real estate sector at property level. The study also provides valuable insight on the topic of what should be considered core business in commercial real estate companies.

Concerning overall contributions to practice, strategic decision making in the real estate investment market is supported, where paper one helps investors and portfolio managers incorporate time-varying relationships in their decision making as it adds to the understanding of the potential hedging benefits of including public real estate in the mixed-asset portfolio during different phases of the real estate cycle. Timing may be an important factor in choosing between public and private real estate, and they offer different diversification possibilities. When choosing the sector allocation strategy it is evident that investors may be unable to buy index return used to construct optimal direct real estate allocation (Baum and Struempell 2006) and public real estate has to be included in the portfolio due to problems implementing the strategy for private real estate. By analyzing the time-varying volatilities and correlations between public and private real estate and showing that liquidity in the private real estate market has an effect on the time-varying correlation between public and private real estate, an important contribution is made to the understanding of public real estates' role in the real estate portfolio.

For property as an asset class, quality and availability of data together with high transaction costs makes application of MPT difficult. Although high transaction costs are a relevant objection against frequent rebalancing of the real estate portfolio, real estate portfolios are built one deal at a time, and the investor still has to decide on type, location and amount of property to include in

the portfolio. To consider how prospective properties of certain qualities adds to the risk/return ratio of an existing portfolio adds an important dimension to real estate investment decisions, Viezer (1999). Finally, the decision to outsource property management functions in the real estate sector is dependent on size, liabilities and core competencies of the investor, but also on the characteristics of the real estate portfolio. Although diversification over sectors rather than regions is important from a strategical perspective, managing different property types requires very different skills, and diversification gains might be offset by losses on property level. The study shows that outsourcing of real estate management functions has limited potential to increase profitability at property level for large institutional investors, and that the decision to outsource should be more dependent on investor type and the composition of the property portfolio.

5.2 Future research

It is obvious that some topics still remain to be analyzed in the future, especially regarding public real estate correlation and volatility dynamics, and outsourcing of commercial property management functions.

Regarding public real estate correlation and volatility dynamics, when explaining time-varying correlations using conditional volatilities, the explanatory power of the model is sometimes low, indicating that not all factors driving conditional correlations are included in the model. It would be interesting to expand the model by including macro-economic variables like unemployment and GDP for instance. Alternative ways of choosing sub-periods more reflecting drivers of capital markets could then be used. When explaining conditional correlation between public and private real estate, a constant de-smoothing parameter is used for the private real estate index. The value of the smoothing parameter is believed by some to be variable, and dependent on the liquidity in the private real estate market. As a step towards a better understanding of the relationship between time-varying correlations for public and private real estate, a time varying smoothing parameter estimated using a Kalman filter could be used.

Regarding outsourcing of property management functions in the real estate sector, three interesting follow up studies come to mind, where the first would be tenant satisfaction in the commercial real estate market for properties with outsourced management. This would then be compared to results from properties where the management is handled in-house, with the purpose to determine where in the property management process customer value is created.

In the Swedish real estate market, the relationship between the outsourcing companies and the property management consultancy firms is changing more towards a partnership than an outsourcing relation. The second topic would be to use a contract theoretical perspective on the question on how to write contracts that guarantee an alignment between the interests of principals and agents regarding functions concerning tenant relations. A topic of special interest to study would be how the management fee should be set.

Finally, since the effects of outsourcing only has been studied at property level in the commercial real estate market, an interesting follow-up study would be to examine the effects of outsourcing at company level using annual reports, and compare real estate companies using different strategies. When appropriate, the effects over time for companies changing their strategy during the time period could be investigated as well.

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