Exploring Beta’s Changing Behavior of Swedish Real Estate Stocks

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Abstract

This study aims to analyze the beta and risk behavior of the Swedish listed real estate stocks. Such a study will provide a clearer picture for investors and researchers about the changing nature of that behavior over time.

The research method is based on descriptive statistics and CAPM beta regression analysis of the monthly returns. Correlation analysis is employed to identify diversification benefits within the sector stocks. In order to understand the behavior of beta/riskiness over time, the stationary and time-varying beta estimations are conducted using CAPM market excess-return model and rolling windows technique.

In this investigation, the time period from 2003 to 2012 is analyzed. The results reveal that a) the betas of real estate stocks are asymmetric over time such that their values are higher during market upturns than in market downturns, b) the betas for the various types of real estate stocks are different, and c) there are low correlation coefficients among returns of real estate stocks, and within the various property type stock groups.

While the real estate stock index as a whole is highly correlated to the market and has relatively stable betas over time, there are diversification benefits among Swedish real estate stocks. Hence, understanding the changing behaviors of beta over time of the various property type stocks can help investors optimize their market timing and cost of capital expectations according to the investment horizon.

It is important to notice that a lot of capital for real estate equity investments in Sweden is allocated through non-traded private equity real estate funds. Therefore, transforming these private funds into real estate traded funds might add the data depth and the market efficiency necessary for better research validity and investment optimization. There are currently very few traded real estate securities in the Swedish market.
Acknowledgement

I would to thank Han-Suck Song my supervisor and teacher for his inspiration, positive guidance, research insight and long discussions during the work of this thesis. Also, I would like to thank my teacher Abukar Warsame for his mentorship and support on the path to success. Gratitude is due to all my teachers at KTH real estate economics department for the knowledge that will remain with me forever.

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Table of Contents

1. Introduction ......................................................................................................................... 6
   1.1 Motivation ....................................................................................................................... 6
   1.2 Objective ........................................................................................................................ 8
       1.2.1 Research questions ................................................................................................. 9
   1.3 Thesis structure ............................................................................................................... 9
2. Literature review .................................................................................................................... 9
   2.1 The CAPM beta ............................................................................................................ 10
   2.2 Beta of Swedish real estate stocks: local and global effects ......................................... 11
   2.3 The asymmetric beta of real estate stocks ..................................................................... 11
   2.4 Beta and property type ................................................................................................ 12
   2.5 Practical considerations from previous research .......................................................... 14
       2.5.1 Dividend effect ....................................................................................................... 14
       2.5.2 Relevant market index ............................................................................................ 14
       2.5.3 $R^2$ of REIT beta estimates .................................................................................. 15
3. Methodology, models and data ............................................................................................ 16
   3.1 Methodology .................................................................................................................. 16
       3.1.1 Analyzing beta over time ....................................................................................... 16
       3.1.2 Study period ........................................................................................................... 17
       3.1.3 Outliers .................................................................................................................. 18
   3.2 Models ............................................................................................................................ 19
       3.2.1 Mean returns and standard deviation ..................................................................... 19
       3.2.2 Correlation analysis of returns .............................................................................. 19
       3.2.3 Beta regression Model .......................................................................................... 20
   3.3 Data ................................................................................................................................ 22
       3.3.1 Data intervals .......................................................................................................... 22
       3.3.2 Stock market benchmark ....................................................................................... 22
       3.3.3 Swedish real estate index ...................................................................................... 22
       3.3.4 Swedish real estate stocks ...................................................................................... 22
       3.3.5 Risk free rate ($r_f$) ............................................................................................... 23
3.3.6 Preparation of data ................................................................................................................. 23
3.4 Company property type portfolio .............................................................................................. 24
4. Results ........................................................................................................................................... 26
  4.1 Price evolution ......................................................................................................................... 27
  4.2 Descriptive statistics .............................................................................................................. 32
  4.3 Correlation analysis ............................................................................................................... 34
  4.4 Asymmetry of beta ............................................................................................................... 36
  4.5 Time-varying Beta ............................................................................................................... 38
5. Discussion .................................................................................................................................... 46
  5.1 Beta over time ....................................................................................................................... 46
  5.2 Beta per property type .......................................................................................................... 46
  5.3 Diversification among real estate stocks ............................................................................... 47
  5.4 Implications for investment managers ................................................................................ 47
  5.5 Issues and recommendations .............................................................................................. 48
6. Conclusion .................................................................................................................................... 49
Bibliography ..................................................................................................................................... 51
1. **Introduction**

1.1 **Motivation**

Equity investment capital interested in Swedish real estate has few options when it comes to publicly traded real estate stocks. While there is a considerable number of “private-subscription” real estate funds investing in direct Swedish property, no publicly traded REITS or property ETFs exist in Sweden. There is a very limited number of property companies listed on the stock market and they do not currently receive the proper attention from major institutional investors, even when research has proven there are chances to achieve superior returns in the Swedish real estate stocks (Leimdörfer, 2013). In this context, it becomes imperative both for investors with a mandate of investing in Swedish real estate stocks and for researchers interested in that sector, to understand carefully the return and risk behavior of the few stocks that are publicly traded.

In general, public trading in real estate shares gives an opportunity for investors to apply standard financial models to understand return, risk, and cost of capital for both public and private real estate stocks (Corgel & Djoganopoulos, 2000). This is in addition to the fact that publicly listed real estate stocks i.e. securitized real estate stocks is becoming a more important and easily accessible property investment instruments for international and local property oriented investors (Liow & Webb, 2009) (Bond, Karolyi & Sanders, 2003).

The fact that Swedish capital market has not yet introduced REITS or similar instruments that allow investors to have clear insight into the securitized real estate market in Sweden requires us to look at international studies about REIT; especially, when we notice that almost all modern literature tackling securitized real estate beta are focused on REIT instruments. However there is no other option than to base our study on real estate stocks for real estate investment companies rather than REITs. In this dilemma facing investors and researchers of listed real estate risk behavior in Sweden, shares of real estate companies -that own and run a portfolio of real estate assets- can be used as an indicator of securitized real estate return performance (Eichholtz & Hartzell, 1996).
The cost of capital is hypothesized as the predominant benchmark reference for investors when selecting among several investment opportunities based on the equity cost of capital \((R_c)\). Investors require a minimum return on their capital, equal to or higher than the calculated cost of capital of the security they invest in. One of the main assumptions of CAPM model is that investors need to be compensated for the additional risk taken by investing in a particular asset. This is calculated by taking a risk measure (beta or \(\beta\)) that compares the returns of the asset to the market over a period of time and to the market premium \((R_{mkt} - r_f)\)(Berk & DeMarzo, 2011). Our focus in this study is the investment performance of Swedish real estate stocks, and the CAPM beta is the lens through which we examine that performance.

When it comes to the idiosyncratic component for risk, publicly traded real estate instruments such as REITs and stocks of real estate companies are different from private real estate in the short and medium term. However in the long term i.e. over the full real estate cycle these, the differences in idiosyncratic components between both types of real estate, public and private, disappear. The explanation is that in short and medium term, private real estate, due to its relative illiquidity is not affected by market intermittent shocks. On the other hand, public real estate in short and medium term is more prone to day-to-day or month-to-month market shocks (Ang, Nabar & Wald, 2012). This insight can provide some kind of short and medium term diversification benefit for including both public and private real estate in a real estate oriented portfolio, and is another important reason why understanding the time varying properties of beta is important.

A quick numeric example can demonstrate how, everything else equal, a difference in beta would affect the required equity cost of capital for a company, and accordingly its share value, using the two basic models for CAPM beta and dividend growth-stock pricing model.

**Cost of equity pricing model (CAPM)**

\[
(R_e - r_f) = \beta (R_{mkt} - r_f)
\]

**Dividend discount model**

\[
\text{Value per share} = \frac{\text{Next year dividend}}{\text{Cost of Equity (Re)} - \text{growth rate of dividend}}
\]
**Stock A**

- $r_f = 3\%$
- $R_{mkt} = 9\%$
- $\beta = 0.7$
- Cost of Capital $(R_e - r_f) = 4.2\%$
- Next year Dividend = 3
- Growth rate = 1%
- Share Price = 94

**Stock B**

- $r_f = 3\%$
- $R_{mkt} = 9\%$
- $\beta = 0.8$
- Cost of Capital $(R_e - r_f) = 4.8\%$
- Next year Dividend = 3
- Growth rate = 1%
- Share Price = 79

But this is a very simple example. Research has shown that betas for real estate stocks are far from being stable over time, and that they are asymmetric (not equal) in bull and bear overall market conditions (Chatrath, Liang, & McIntosh, 2000)(Chiang, Lee, & Wisen, 2004)(Chiang, Tsai, & Sing, 2013)(Blume, 1975). This has important implications for investment managers interested in Swedish real estate stocks. In order to maximize their returns and take advantage of market conditions, it is important to understand and continuously monitor the changing beta of their real estate stocks over time.

### 1.2 Objective

The objective of this study is to estimate and analyze “Beta” of the real estate sector index and real estate listed stocks publicly traded in the Swedish stock market, in order to give efficiency-and-transparency-seeking investors or academicians a clearer picture of the time varying behavior of the return and risk of Swedish listed property stocks.
1.2.1 Research questions

To analyze the return behavior and risk betas and its behavior over time for the listed real estate sector, the study will attempt to answer the following questions:

- How do betas of the Swedish real estate stocks change over time? Are betas asymmetric in different market conditions?
- Is there an effect on beta of a real estate stock, due to the type of real estate assets it holds?
- Is there apparent benefit from diversifying among the real estate listed stocks?

1.3 Thesis structure

Next to this chapter, the study will delve into a review of relevant literature. Following that there will be detailed discussion of the quantitative methods and models used, and about how the data was obtained and refined.

Following, the observed results of the study will be described and summarized, and in a following chapter these results will be analyzed and inferred from. The final chapter will conclude the study and provide look-forward suggestions.

2. Literature review

This chapter will discuss previous scholarly research about listed real estate stock beta behavior, and will look into the following points:

- Beta for Swedish stocks in general and for Swedish real estate stocks in particular.
- Understand the asymmetric nature of real estate betas in various financial markets.
- Understand behavior of beta for different property types.
- View the recommendations and practices of previous studies about the practice & techniques of beta estimation to guide our methodology in areas such as:
  - Model specification
One fact to be aware of is that most of the modern literature from developed and emerging markets discussing beta and return and risk behavior of listed real estate stocks focus on the study of REITs rather than individual real estate stocks, due to the fact that REIT is considered, for few decades now, the main listed investment vehicle for the real estate asset class. “Real Estate Investment Trusts (REITs) are the only truly liquid assets related to real estate investments” (Cotter & Roll, 2011).

2.1 The CAPM beta

The CAPM model suggests that the expected excess stock return depends on its sensitivity to the expected market return. Beta is the measure of this sensitivity, with beta being (1.0) when the stock returns behave identically to the stock market portfolio returns over time.

In a study to analyze CAPM Beta of Swedish stocks between 1979 and 2005, the empirical results showed that using multifactor models such as the famous Fama-French three factor model does not prove to be superior to using the basic yet robust CAPM model described above (Novak & Petr, 2010). Interestingly, that study argues that, in general, models rooted in the CAPM theory including multifactor models are not sufficient to explain beta behavior in the Swedish market due to the Swedish corporate governance environment, which differs distinctly from the Anglo-American and German governance systems. Another important consideration to keep in mind is that the relation between real estate stock returns (particularly for REITs) and their local broad stock market is different from one country to another. These differences can mainly be attributed to differences in taxation systems and the size of the real estate stock market relative to its broad stock market (Eichholtz & Hartzell, 1996).

We extend this inference to the Swedish real estate stocks, in particular to stocks of companies with significant residential property portfolio exposure due to the special real estate regulations imposed in the Swedish market such as the residential rent control policy.
2.2 Beta of Swedish real estate stocks: local and global effects

The study of the return & risk behavior of publicly traded real estate stocks from 14 countries in the period 1990-2000 showed that Swedish real estate stocks on aggregate have significant betas of (1.054) and (0.743) against a global market portfolio and country portfolio respectively, while against a factor of country-specific book-to-market value of the stocks, the beta came at a less significant value of (0.432) (Bond, Karolyi, & Sanders, 2003). Results from a very similar research (Ling & Naranjo, 2002) confirm the same outcome. Return data for real estate stocks from 28 countries were analyzed to estimate beta. Aggregate beta of Swedish real estate stocks was found to be (0.727) and (0.733) against a global market portfolio and country portfolio respectively.

However, Even though those empirical readings may reveal that there is systematic risk component of Swedish real estate stocks that is driven from a global capital market performance, still local market factors have a considerable influence as well. As shown by an empirical study of common return factors of securitized real estate in four countries (USA, UK, Hong Kong and Singapore) between years 1993-2003, local economic factors within each of these markets affect the return behavior of the real estate stocks in a significantly bigger way than common international factors (Liow & Webb, 2009). For example, in case of Sweden, well known factors such as the rent control regulations and the chronic supply-demand gap in residential market in major cities, would have an effect on the return behavior of the real estate stocks that is not related to international markets.

2.3 The asymmetric beta of real estate stocks

Many empirical studies have shown that betas of REITs are asymmetric during advancing and declining conditions of the stock market. REIT betas where observed to be higher when market excess returns are positive than when they are negative, and this has been attributed in some cases to the small stock effect of the REITs (Chatrath, Liang, & McIntosh, 2000)(Sing, Chen, & Ma, 2012)(Liow, 2007). This view was confirmed when studying the REIT stocks performance during market decline in October 1997 in New York Stock Exchange. It was found that during that period of market downturn, the values of REIT stocks decrease by only one-half as large as the decrease in value of the non REIT stocks. This fact has prompted some researchers to suggest that from a portfolio management point of view, increasing the
portion of real estate stocks holdings in a portfolio during market declines is a recommended strategy (Wu, Liau, & Wang, 2013) (Glascock, Michayluk, & Neuhauser, 2004). On the contrary, some studies showed that REITs in Asian markets (Taiwan, Hong Kong, Singapore and Japan) had higher market betas during the market chaos that followed the sub-prime crisis in 2007, and therefore are not defensive during financial markets decline (Chiang, Tsai, & Sing, 2013). However, other studies have argued that those asymmetric beta conclusions are due to model errors, namely the exclusion of factors that control for capitalization and book-to-price variable; and using the Fama-French three factor model would result in REIT betas that appear to be symmetrical (Chiang, Lee, & Wisen, 2004).

The bottom line is; if there is an actual asymmetry in the beta behavior of real estate stocks, understanding it could have enlightening implications for investors who a) attempt to select stocks that outperform the market and 2) time the market by buying into defensive stocks that has shrinking betas during market declines (Hirschey & Nofsinger, Assessing Portfolio Performance: Alpha and Beta, 2008)

This substantiates the main question of our study:

- *Are Betas of Swedish real estate stocks asymmetric in bull and bear markets?*

### 2.4 Beta and property type

According to (Leimdörfer, 2013), Scandinavian Asset managers chose the “Property portfolio composition” as the most important investment criteria when selecting which listed property company to invest in. There is no doubt that the differences in risk and cash flow characteristics of different real estate types -whether due to economic properties or contractual and operational terms- affects the investment returns of the companies holding those real estate assets. (Ling, Naranjo, & Ryngaert, 2012)

Because different real estate types are subject to different macroeconomic scenarios and operational norms, the systematic risk component of a traded real estate security i.e. its beta is related to the type of the underlying property asset owned by the security.
For example, unlike other property types, retail property leases typically include percentage rent clauses that ties the cash flow of the property to the variance in cash flow of the tenants. Retail tenants’ cash flow is pro-cyclical to consumer spending and consumer disposable income. Stock market returns are also related to overall good economic performance including increasing disposable income. Therefore, a higher covariance between securitized retail real estate stocks and the broad stock market index can be expected, compared to other types of securitized real estate. For instance, in USA between years 1988-1992, retail REITs had a beta almost 50% higher than their industrial REIT counterparts. In General, The systematic risk (Beta) of USA REITS varies according to the type of underlying properties (Gyourko & Nelling, 1996).

Several studies have attempted to estimate the REIT return characteristics and betas for different real estate types. We summarize that in the following table:

<table>
<thead>
<tr>
<th>Study Period and Benchmark Index</th>
<th>Office</th>
<th>Resort</th>
<th>Residential</th>
<th>Retail</th>
<th>Industrial/ Warehouse</th>
<th>No. of REITS surveyed</th>
</tr>
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<tr>
<td>(Cotter &amp; Roll, 2011)</td>
<td>0.66</td>
<td>0.82</td>
<td>0.64</td>
<td>0.63</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Gyourko &amp; Nelling, 1996)</td>
<td>0.27</td>
<td>0.41</td>
<td>0.56</td>
<td>0.32</td>
<td>58</td>
<td></td>
</tr>
</tbody>
</table>

A study of the asymmetry of US REIT betas between April 2007 and August 2010 revealed that office and residential type REIT betas are the most defensive, i.e. they show the lowest betas during the market down times (Wu, Liau, & Wang, 2013). Another study by (Gyourko & Keim, 1992) shows that beta of real estate firms involved in development were significantly higher than betas of real estate firms that specialize merely in owning and operating real estate (real estate investment firms). This is explained by the stability of real estate investment firms’ cash flow given the long term rent leases regardless of the business cycle of the tenants or the market in general, while development companies are exposed to a much bigger operational and finance risk during the development and construction phase.
On the other hand, an empirical study of East Asian real estate listed stocks in 1992-2002 finds that the return behaviors are not affected significantly by the development activity/exposure of the company (Ooi & Liow, 2004).

It appears from surveying the previous research, that there is no general consensus about the beta or riskiness of different property stock types. This study will attempt to categorize Swedish real estate stocks by property type, and identify any respective beta particularities.

○ Is there a difference in beta of real estate stocks, due to the type of real estate assets it holds?

2.5 Practical considerations from previous research

2.5.1 Dividend effect

The study done on comparing REIT beta estimation methods by financial services firms in the USA, for 60 REITs, showed that there is no statistical difference between beta estimates obtained with the exclusion of dividends, inclusion of dividends, or smoothing of dividends. For the three cases the mean cost of capital was around 9.80%. Thus, we can infer that the dividend effect is muted or irrelevant when estimating beta for real estate stocks (Corgel & Djoganopoulos, 2000). Our study however will use dividend adjusted price data, as described in section 3.3.6, to ensure that it is the total-return values of the stocks that are being examined.

2.5.2 Relevant market index

The same study by (Corgel & Djoganopoulos, 2000), reveals that there was no statistical difference recorded in the beta estimation between using a small cap index like the Russell 2000 and a broader index such as the S&P 500. However, the commercial financial services firms studied used broader market indices, mainly the S&P 500 and NYSE Composite. As well, (Eichholtz & Hartzell, 1996) and (Hirschey & Nofsinger, Empirical Estimation of Beta, 2008) argue to use broader market indices, similar to the S&P 500, when studying beta of real estate stocks, in order to capture a realistic picture of the broader equity market. This industry inclination to use a broader market index for beta estimation will guide this study as it mainly strives to shed some light for the investors interested in the Swedish real estate stocks.
2.5.3 \( R^2 \) of REIT beta estimates

It is worth noting that the stock market return indices were found to be deficient in explaining the change in REIT returns. The average \( R^2 \) of REIT beta estimates was 0.03 and 0.07 in the studies done by Corgel & Djoganopoulos (2000) and Gyourko & Nelling (1996) respectively. One popular explanation for the poor \( R^2 \) values (predictive power of a model using the stock market to explain real estate stock betas) is that real estate stocks are unique in nature. Real estate stocks are traded securities that hold other assets (property) that are traded in their own active secondary market (Corgel & Djoganopoulos, 2000).

Given that there are no REITs traded in Sweden, it would be interesting to detect what the \( R^2 \) for beta estimates of the Swedish real estate stocks. Do they resemble more of the REITs or do they have better predictive power?
3. **Methodology, models and data**

This chapter will describe the design of the methods used to a) describe the returns behavior and b) estimate and analyze beta, including the statistical and econometric models, and considerations for data gathering and refinements. Because estimating beta is an art as much as science that requires a thorough knowledge of the particulars of the industry (Berk & DeMarzo, 2011), this chapter will intertwine literature review of the beta estimation techniques & practice into the sections discussing the method, models and data.

3.1 **Methodology**

3.1.1 **Analyzing beta over time**

The study attempts to study performance of beta of Swedish real estate stocks over different time horizons. So for that reason we will analyze the beta for the following three scenarios:

1. Beta asymmetry in bull and bear markets:

   By estimating beta during specific market rise and falls periods. The periods are shown in Figure 1 below. We use these critical time periods to test the hypothesis of asymmetry of beta previously discussed in section 2.3.

2. Dynamic beta behavior for short term investing (2 yrs. rolling beta):

   We study the changing behavior of a security beta for short horizon (two years or 24 monthly return observations). The period two years was selected for two reasons. First, it allows gaining insight into beta behavior for short term investment strategies. Second and importantly, the period of two years almost correspond to the period of the volatile decline in stock markets during the financial crisis of 2007-2009. We want to be able to pick the effect of that crisis period on beta behavior, if any.

3. Dynamic beta behavior for medium-long term investing (5 yrs. rolling beta):

   The industry standard is to study beta for 60 month return periods (Hirschey & Nofsinger, Empirical Estimation of Beta, 2008). We study the changing behavior of a security beta for this time horizon to understand beta from a standard-industry and long term investor view.
We analyze both scenarios 2 and 3 above by means of rolling window regression analysis, where the beta is estimated for the last 24 monthly and 60 monthly returns respectively starting Jan. 2003, and then the window of the observation is moved one month forward in time, till the last monthly return observation of Dec. 2007. Previous empirical evidence suggests that there is a tendency for betas to regress over time to the grand average of 1.0, regardless of the riskiness or size of the stock is (Blume, 1975).

3.1.2 Study period

After the dot-com bubble and crash between 1997 and 2003 world markets, including Stockholm stock exchange, started a new cycle of development in early 2003. From 2003 till 2012 Stockholm stocks market experienced historically interesting developments due to the global financial crisis of 2007-2009, that development is best described by the Stockholm exchange broad index development in Figure 1.

We will analyze the beta of real estate stock in the period of Jan. 2003 till Dec. 2012. During this whole period will compare beta for asymmetry in the following periods:

3.1.3 Outliers

In numerous studies it has been shown that beta estimates are very sensitive to outliers (excess return observations that are unusually higher or lower than the sample average). Outliers in stock returns occur frequently during bubbles, bust, and other systematic market shocks. Some studies argue that outlier observations, particularly during market crisis periods, should be ignored due to their distortions on beta estimations; however, other practitioners argue to include outliers in order to have a full picture of the stock performance even during market downturns (Berk & DeMarzo, 2011).

Since our study period is for the period of 2003 till 2012, which included a significant world economic boom and crisis, we will keep our outliers. Otherwise, how can a sector or a stock performance be forecasted in a future downturn if we “bury our outliers in the sand”. Outliers are our “coal mine canaries.”
3.2 Models

3.2.1 Mean returns and standard deviation

Since the focus of this study is concerned with the return-risk behavior of Swedish real estate stocks, the study uses descriptive statistics with focus on mean returns and standard deviation of the absolute returns the Swedish real estate stocks, the real estate index in the Swedish stock market, and Swedish stock market as a whole.

Equation 1: Arithmetic average mean of returns

\[ A = \frac{1}{n} * \sum_{i=1}^{n} x_i \]

Where:
A = average (or arithmetic mean)
n = the number of terms (e.g., the number of items or numbers being averaged)
x_i = the value of return in period i

Equation 2: Standard deviation (measure of risk or volatility)

\[ s = \sqrt{\frac{1}{N - 1} \sum_{i=1}^{N} (x_i - \bar{x})^2} \]

Where:
S = standard deviation
N = the number of terms
x_i = the value of return in period i
\bar{x} = average mean of the return series = A (from equation 1 above)

3.2.2 Correlation analysis of returns

The research addresses briefly the correlation analysis between the real estate stocks traded in the Swedish stock market to figure out if stocks are highly correlated or there is a diversification benefit. In other words, if an investor wants to invest in Swedish real estate
stocks, is it good idea to diversify (by creating and efficient portfolio) or can they invest in any stock?

Equation 4 below is used to identify the correlation coefficient between the different stocks in the period of the study 2003 till 2012.

**Equation 3: Sample correlation coefficient.**

\[
    r = \frac{\sum_{i=1}^{n} \left( (x_i - \bar{x})(y_i - \bar{y}) \right)}{\sqrt{\sum_{i=1}^{n} (x_i - \bar{x})^2 \sum_{i=1}^{n} (y_i - \bar{y})^2}}
\]

Where:

\( r \) = correlation coefficient of two stock returns \( x \) and \( y \) for \( n \) periods of return.

**3.2.3 Beta regression Model**

Understanding the behavior of Beta for the Swedish real estate stocks is the prime focus of this study since, as described in the section 1.1 in the introduction, it mainly aims to help investors and researchers alike get a better understanding of the cost of capital and the valuation of investing in real estate stocks in Sweden.

The model for estimating beta for a financial instrument is always driven from a CAPM based model, whether it is a single-factor model or a multifactor model. There has been numerous academic studies performed trying to discover which model type has the cutting-edge. Many studies argue that a multifactor model is more effective (Geltner, 2007), while many others show that a single factor model is the most widely used, robust and reliable model (Berk & DeMarzo, 2011)(Novak & Petr, 2010) as described in section 2.1. The only improvement that was obtained from using the Fama-French multifactor model extension was increasing the average \( R^2 \) from about 3% to 11% (Corgel & Djoganopoulos, 2000). To conclude this everlasting debate, and since this study aims to cater for investors’ benefit and use, we are going to understand how the industry practitioners estimate REIT beta, and from there the study will decide upon the model design.
A survey was conducted of the REIT beta estimation techniques of seven of the top financial services providers in USA including BARRA, Bloomberg, Bridge, Compustat, Dow Jones, Ibbotson and Value Line. With the exception of BARRA, all the financial service providers mentioned use a single-factor market model. The model is either in the form of return level or excess return by using ordinary least squares (OLS) regression. The excess return is the constant security return in excess of the risk-free rate. Due to the variability of the rate of the return of the market, the excess return model is the one usually used for estimating the beta (Corgel & Djoganopoulos, 2000).

Therefore, this research will use a CAPM based, single-factor, ordinary least square (OLS) regression model to estimate beta. The single-factor in our case will be the excess return as shown in the equation 5 below:

**Equation 4: Beta estimation model**

\[
(R_e - r_f) = \alpha_e + \beta (R_{mkt} - r_f) + \varepsilon_e
\]

Where:

- \(R_e\) = stock return
- \(R_{Mkt}\) = market return
- \(r_f\) = risk-free rate
- \(\beta\) = beta (coefficient slope)
- \(\alpha\) = the intercept
- \(\varepsilon\) = standard error

\(\beta (R_{Mkt} - r_f)\) represents the sensitivity of the stock excess returns to market excess returns.
3.3 Data

3.3.1 Data intervals

It is a common practice among professional beta providers to use monthly returns for the period of at least five years, or weekly returns of at least two years to estimate beta of stocks (Berk & DeMarzo, 2011)(Corgel & Djoganopoulos, 2000). This study will use monthly return data for all kinds of analysis mentioned in sections 3.1 and 3.2.

3.3.2 Stock market benchmark

“OMX Stockholm_PI” index is a broader market index that tracks 280 stocks, compared to the “OMX Stockholm 30” index, which tracks 30 companies. The academic and investment industry practices argue in favor of using broader market index when analyzing real estate securities, as described in section 2.5.2 of this study (Corgel & Djoganopoulos, 2000)(Eichholtz & Hartzell, 1996)(Berk & DeMarzo, 2011). Therefore this study uses the “OMX Stockholm_PI” index as the benchmark for measuring real estate index and stock betas.

3.3.3 Swedish real estate index

“OMX Stockholm Real Estate PI” index is the official real estate sector index of the Nasdaq OMX Stockholm exchange. It tracks 17 listed real estate companies. These are Fast, Balder B, Castellum, Catena, Corem Property Group, Diös Fastigheter, Fabege, Fast Partner, HEBA B, Hufvudstaden, JM, Kungsleden, Klövern, Atrium Ljungberg, Sagax, Tribona, Wallenstam, and Wihlborgs Fastigheter.

3.3.4 Swedish real estate stocks

To reach a reliable analysis of the return behavior and beta estimates for the different companies against the stock market, comparability is of a great importance. The time horizon is the premium factor in this context, since this study is mainly concerned about the varying nature and asymmetric behavior of the returns and beta estimates of the studied securities over time. To do so, the study applied the following filtering criteria to choose/eliminate stocks from the 17 stocks listed above:

- Stocks have to have price data in 10 years period of the study (2003-2012).
Applying this filter reduces the numbers of companies that are eligible for the study down to nine companies. These are summarized in Table 2

### 3.3.5 Risk free rate (\(r_f\))

Return rates were obtained for the Swedish 1-Month Treasury bills historical rates (1M T-Bill). Data was obtained from the “Riksbanken” website (Riksbanken, 2012). The 1-Month treasury bills were selected as the risk free rate, since the study is using the monthly price records (and return series) as well for the stocks under investigation.

### 3.3.6 Preparation of data

All data for return series were constructed from raw primary price data that were collected from 2003-2012 (10 years period) to allow for the analysis of returns and betas. The primary price data were collected directly, and are publicly available, from the Nasdaq-OMX-Nordics website (Nasdaq-OMX, 2012).

For “OMX Stockholm_PI” index, “OMX Stockholm Real Estate PI” index, and the individual stocks, the following steps were taken to collect, organize, purge and normalize the data to be clearly comparable and ready for the descriptive statistics and regression analysis:

1. Daily closing prices were downloaded for the period of Jan. 2003 till Dec. 2012 (10 years period), from the Nasdaq-OMX-Nordics online data bank.
2. The price data downloaded was adjusted for corporate actions (including stock splits, dividends, etc.), by using a specific optional utility available on Nasdaq-OMX-Nordics public online data bank.
3. Since the analysis of returns and betas is going to be based on monthly returns, the closing prices of the last trading day for every month were extracted out. Other daily closing prices were purged.
4. Returns data for 1-Month Swedish T-bills were downloaded from Riksbanken website.
5. Therefore, the price data series ended having 121 monthly closing price series, and 120 monthly return rate results were derived for every instrument used in the study.
3.4 Company property type portfolio

According to “Investopedia’s” classification of real estate, the following are the three main types of real estate:

1. Commercial real estate: property that is used solely for business purposes. Examples of commercial real estate include malls, office parks, restaurants, gas stations, convenience stores and office towers.
2. Residential real estate, which is used for living purposes.
3. Industrial real estate, which is used for manufacturing and production.

To classify the stocks according to the property type, this study consulted secondary data from a prime Swedish real estate consultancy report (Leimdörfer, 2013). We used the provided property-type value-breakdown of each company being studied to reach the classification.

Also, the companies’ annual financial reports where investigated for the period of study (2003 till 2012). The property portfolio composition ratios were extracted. There were no significant changes in the composition of the property portfolios in any of the nine companies being studied in the period 2003 till 2012. This shows continuity in the companies’ investment strategy, and accordingly can signal a good prospect for the reliability of the results of analyzing the stocks by real estate type group. Table 2 summarizes the portfolio composition of the companies as of end of 2012.

The study assumed that to classify a company to represent a certain real estate type, this type had to form at least 50% of its portfolio value in order to influence its financials and its stock behavior toward a certain hypothesized performance of such real estate type. If no such criterion is found, the portfolio type of the company is classified as mixed.
Table 2 - Portfolio composition –by value breakdown– of Swedish real estate stocks

<table>
<thead>
<tr>
<th>Portfolio Type</th>
<th>Commercial (Office/Retail)</th>
<th>Residential</th>
<th>Industrial</th>
<th>Other</th>
<th>Portfolio Type</th>
</tr>
</thead>
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<tr>
<td>Atrium Ljungberg</td>
<td>33</td>
<td>62</td>
<td>4</td>
<td>N.A</td>
<td>1</td>
</tr>
<tr>
<td>Castellum</td>
<td>53</td>
<td>15</td>
<td>1</td>
<td>N.A</td>
<td>31</td>
</tr>
<tr>
<td>Fabege</td>
<td>95</td>
<td>2</td>
<td>0</td>
<td>N.A</td>
<td>3</td>
</tr>
<tr>
<td>Hufvudstaden</td>
<td>78</td>
<td>19</td>
<td>0</td>
<td>N.A</td>
<td>2</td>
</tr>
<tr>
<td>Klovern</td>
<td>63</td>
<td>11</td>
<td>0</td>
<td>N.A</td>
<td>3</td>
</tr>
<tr>
<td>Kungsleden</td>
<td>55</td>
<td>11</td>
<td>33</td>
<td>N.A</td>
<td>14</td>
</tr>
<tr>
<td>Heba</td>
<td>0</td>
<td>0</td>
<td>100</td>
<td>N.A</td>
<td>0</td>
</tr>
<tr>
<td>Wallenstam</td>
<td>28</td>
<td>3</td>
<td>64</td>
<td>N.A</td>
<td>5</td>
</tr>
<tr>
<td>Balder</td>
<td>35</td>
<td>9</td>
<td>45</td>
<td>N.A</td>
<td>10</td>
</tr>
<tr>
<td>JM²</td>
<td>Development</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

¹Source: (Leimdörfer, 2013)
²JM owns no property portfolio. It develops and sells mainly residential property.
4. **Results**

The study attempts to differentiate the risks behaviors of different types of real estate stocks. So throughout the results and analysis chapters, the discussion will be approached from the following three dimensions.

- **Real estate stocks by portfolio type**, namely: OMX Real Estate Index, Commercial, Residential, Mixed, and Development.

- **Time**: the behavior of each of these stocks, during the period of Jan. 2003 till Dec. 2012, including analysis for 3 sub periods of clear market trends:

- **Return and Risk Attribute**: Price evolution, correlations analysis, and the main analysis of this study: beta, asymmetric beta, and rolling and expanding betas behaviors.

![Diagram 1 – Three dimensions for beta](image-url)
4.1 Price evolution

Figures 2, 3, 4, 5 and 6 show the evolution of an investment of 100 units made in Jan. 2003 till Dec. 2012 in the OMX Stockholm broad index, OMX real estate index and the nine real estate stocks under study (categorized in commercial, residential, mixed and development real estate types). The following observations can be made:

1. The Swedish listed real estate sector follows the OMX broad market in general. However during the peak volatile times, both boom and bust, the real estate sector tends to overshoot.

![Portfolio of 100 - OMX PI vs. OMX RE index](image)

Figure 2- Evolution of OMX broad index and OMX Real Estate index
The commercial real estate stocks in general tend to significantly outperform the market performance, with the exception of Fabege and Klövern. This is very obvious in the stock market boom phase of 2005 till 2007.
In the residential subsector, while Heba portfolio evolution almost mimics the OMX index, while Wallenstam have rewarded its 10 year investors with 1200% return, almost six folds of what the overall market has returned. There a big disparity between Wallenstam and Heba performance, even though Heba’s has a 100% residential portfolio, while Wallenstam has a 64%.
Figure 5 - Evolution of mixed real estate stocks

Balder which has an almost equal share of residential and commercial property portfolio, has underperformed the market throughout, and is barely breaking even with the OMX index for the ten years period.
JM, the only development company shows an amplified or overshooting performance to whatever the market direction is. This confirms the common belief that real estate development companies perform well during good economic conditions, and equally perform very bad during economic downturn because they are usually caught in high operational risk during the development and construction phases of the development (Geltner, 2007)
4.2 Descriptive statistics

Summary of descriptive statistics for the sample data is exhibited in Table 3 and Table 4. This analysis is for total returns rather than excess returns. The focus is on mean average returns, standard deviation, skewness & kurtosis since these three factors have implications for portfolio managers.

Table 3 - Descriptive Statistics – Monthly Returns: Swedish listed real estate stocks 2003-2012

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>OMX_S_PI</td>
<td>0,79%</td>
<td>0,96%</td>
<td>-17,89%</td>
<td>18,73%</td>
<td>5,16%</td>
<td>2,35</td>
<td>-0,46</td>
<td>120</td>
</tr>
<tr>
<td>OMX_S_RE.PI</td>
<td>0,97%</td>
<td>1,10%</td>
<td>-24,71%</td>
<td>28,15%</td>
<td>6,92%</td>
<td>3,09</td>
<td>0,26</td>
<td>120</td>
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</tbody>
</table>

Commercial R.E.

<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Atrium Ljungberg</td>
<td>1,68%</td>
<td>1,06%</td>
<td>-28,71%</td>
<td>56,25%</td>
<td>10,01%</td>
<td>7,96</td>
<td>1,48</td>
<td>120</td>
</tr>
<tr>
<td>Castellum</td>
<td>1,22%</td>
<td>1,30%</td>
<td>-18,38%</td>
<td>25,35%</td>
<td>7,58%</td>
<td>1,09</td>
<td>0,12</td>
<td>120</td>
</tr>
<tr>
<td>Faberge</td>
<td>0,93%</td>
<td>1,59%</td>
<td>-24,01%</td>
<td>30,92%</td>
<td>9,77%</td>
<td>1,32</td>
<td>0,10</td>
<td>120</td>
</tr>
<tr>
<td>Hufvudstaden</td>
<td>1,11%</td>
<td>1,28%</td>
<td>-14,71%</td>
<td>21,09%</td>
<td>6,55%</td>
<td>0,51</td>
<td>0,33</td>
<td>120</td>
</tr>
<tr>
<td>Klovern</td>
<td>1,05%</td>
<td>0,20%</td>
<td>-21,77%</td>
<td>38,40%</td>
<td>8,91%</td>
<td>2,22</td>
<td>0,58</td>
<td>120</td>
</tr>
<tr>
<td>Kungsleden</td>
<td>1,17%</td>
<td>0,32%</td>
<td>-22,22%</td>
<td>68,22%</td>
<td>11,94%</td>
<td>7,36</td>
<td>1,45</td>
<td>120</td>
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</tbody>
</table>

Residentinal R.E.

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</thead>
<tbody>
<tr>
<td>HEBA</td>
<td>0,87%</td>
<td>0,30%</td>
<td>-12,92%</td>
<td>17,39%</td>
<td>5,31%</td>
<td>0,53</td>
<td>0,42</td>
<td>120</td>
</tr>
<tr>
<td>Wallenstam</td>
<td>2,52%</td>
<td>2,66%</td>
<td>-29,48%</td>
<td>30,04%</td>
<td>8,77%</td>
<td>1,45</td>
<td>-0,05</td>
<td>120</td>
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</tbody>
</table>

Mixed Portfolio

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>Balder</td>
<td>1,62%</td>
<td>0,21%</td>
<td>-59,47%</td>
<td>76,47%</td>
<td>14,18%</td>
<td>8,63</td>
<td>0,84</td>
<td>120</td>
</tr>
</tbody>
</table>

Development

<table>
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</tr>
</thead>
<tbody>
<tr>
<td>JM</td>
<td>1,64%</td>
<td>1,84%</td>
<td>-28,71%</td>
<td>38,71%</td>
<td>12,10%</td>
<td>0,65</td>
<td>-0,02</td>
<td>120</td>
</tr>
</tbody>
</table>
The first observation is that all real estate stocks have an average annual return higher than the OMX broad index (11.48% p.a.), but not necessarily higher standard deviation, although several stocks have higher standard deviation.

Commercial property stocks average annual returns are in the range of (11.48%) to (18.77%). Residential property stocks range between (11.66 %) and (36.56%) annual return. Wallenstam has the best annual volatility-to-return ratio. It is worth noting that it is the best performer among all stocks with a 10-year return of more than (1200%).
Balder the mixed property stock has (17.89%) average annual return. JM the only property development stock has as high average annual return of (32.12%), but a significant risk of return with its (76.99%) standard deviation.

Balder has a high skewness of (+1.14), which means most of its annual return values are concentrated on the left of the mean, with extreme values to the right.

No extreme kurtosis results are reported in the annual return data statistics. In the monthly return statistical analysis, some extreme kurtosis results (> 3.0) are reported. However this shouldn’t be an issue since previous research demonstrated that normal distribution in equity returns is not expected for return series with periods shorter than annual (DeFusco, McLeavey, Pinto, & Runkle, 2007).

4.3 Correlation analysis

Table 5 depicts the correlation coefficient figures between the annual return series of the real estate stocks, the OMX Stockholm real estate index and the OMX Stockholm broad index. It is beneficial to see whether there are diversifications benefits among real estate stocks, or if there returns act in a similar manner, in which case investing in one stock would, at least theoretically, represent investing in several real estate stocks.

Interestingly the OMX Stockholm real estate index has a correlation factor of (0.91) to the OMX Stockholm index which indicates that the Swedish listed real estate sector in general is in tandem with the broad market.

No negative correlation values are reported whatsoever. However Balder reported the lowest correlation coefficient to most of the other instruments.

Among all the stocks, the correlation coefficients varied between (0.00) and (0.91). Among the commercial real estate stocks the coefficients ranged between (0.40) and (0.89). Between the two residential real estate stocks, the coefficient was (0.62). This indicates that there would be diversification benefits among the real estate stocks as a whole, and even among the subtypes of real estate stocks.
Table 5 – Correlations of annual returns series

<table>
<thead>
<tr>
<th></th>
<th>OMX S</th>
<th>OMX RE index</th>
<th>Atrium Ljungberg</th>
<th>Castellum</th>
<th>Fabege</th>
<th>Hufvudstaden</th>
<th>Klovern</th>
<th>Kungsleden</th>
<th>HEBA</th>
<th>Wallenstam</th>
<th>Balder</th>
<th>JM</th>
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<td>OMX S</td>
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<tr>
<td>OMX RE index</td>
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<tr>
<td><strong>Commercial RE</strong></td>
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<tr>
<td>Castellum</td>
<td>0,72</td>
<td>0,84</td>
<td>0,82</td>
<td>1,00</td>
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</tr>
<tr>
<td>Fabege</td>
<td>0,83</td>
<td>0,87</td>
<td>0,58</td>
<td>0,78</td>
<td>1,00</td>
<td></td>
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<tr>
<td>Hufvudstaden</td>
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<td>0,77</td>
<td>0,89</td>
<td>0,82</td>
<td>0,74</td>
<td>1,00</td>
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<tr>
<td>Klovern</td>
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<td>0,85</td>
<td>0,88</td>
<td>0,75</td>
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<tr>
<td>Kungsleden</td>
<td>0,59</td>
<td>0,61</td>
<td>0,73</td>
<td>0,66</td>
<td>0,40</td>
<td>0,54</td>
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<td>1,00</td>
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<td><strong>Residential RE</strong></td>
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<td>HEBA</td>
<td>0,59</td>
<td>0,78</td>
<td>0,91</td>
<td>0,77</td>
<td>0,65</td>
<td>0,90</td>
<td>0,66</td>
<td>0,49</td>
<td>1,00</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Wallenstam</td>
<td>0,93</td>
<td>0,86</td>
<td>0,60</td>
<td>0,85</td>
<td>0,78</td>
<td>0,54</td>
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<td>0,60</td>
<td>0,62</td>
<td>1,00</td>
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<td></td>
</tr>
<tr>
<td><strong>Mixed Portfolio</strong></td>
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</tr>
<tr>
<td>Balder</td>
<td>0,57</td>
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<td>0,26</td>
<td>0,39</td>
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<td>0,41</td>
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<tr>
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</tr>
<tr>
<td>JM</td>
<td>0,80</td>
<td>0,67</td>
<td>0,43</td>
<td>0,47</td>
<td>0,65</td>
<td>0,31</td>
<td>0,53</td>
<td>0,37</td>
<td>0,52</td>
<td>0,73</td>
<td>0,45</td>
<td>1,00</td>
</tr>
</tbody>
</table>
4.4 Asymmetry of beta

In this section, we will test whether the hypotheses of beta asymmetry in time and differences in beta of stock by property types, described in sections 2.3 and 2.4 respectively, apply to Swedish real estate stocks.

Table 6 - Beta regression estimates and beta asymmetry analysis 2003-2012

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<tr>
<th></th>
<th>Jan 03-Dec 12</th>
<th>Mar 03-May 07</th>
<th>Jun 07-Jan 09</th>
<th>Feb 09-Apr 11</th>
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<tr>
<td></td>
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<td>β₁ R² P</td>
<td>β₂ R² P</td>
<td>β₃ R² P</td>
</tr>
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<td>OMX RE index</td>
<td>0.90 0.45</td>
<td>0.63 0.23</td>
<td>1.11 0.43</td>
<td>0.99 0.40</td>
</tr>
<tr>
<td>Commercial Real Estate</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Atrium Ljungberg</td>
<td>0.81 0.18</td>
<td>0.67 0.09</td>
<td>1.04 0.14</td>
<td>0.85 0.20</td>
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<td>Castellum</td>
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<td>0.79 0.24</td>
<td>0.70 0.15</td>
</tr>
<tr>
<td>Fabege</td>
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<td>0.41 0.05</td>
<td>0.11*</td>
<td>1.36 0.39</td>
</tr>
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<td>0.70 0.19</td>
<td>0.60 0.28</td>
<td>0.66 0.19</td>
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<td>Klovern</td>
<td>0.96 0.31</td>
<td>1.10 0.25</td>
<td>1.32 0.39</td>
<td>0.77 0.20</td>
</tr>
<tr>
<td>Kungsleden</td>
<td>1.12 0.24</td>
<td>0.63 0.07</td>
<td>1.55 0.23</td>
<td>1.57 0.40</td>
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<td>Residential Real Estate</td>
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<td>HEBA</td>
<td>0.50 0.23</td>
<td>0.67 0.20</td>
<td>0.40 0.17</td>
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<td>Wallenstam</td>
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<td>0.58 0.08</td>
<td>1.26 0.50</td>
<td>1.31 0.49</td>
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<td>Balder</td>
<td>1.22 0.20</td>
<td>2.00 0.18</td>
<td>1.42 0.48</td>
<td>0.19 0.01</td>
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<tr>
<td>Development Portfolio</td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>JM</td>
<td>1.43 0.38</td>
<td>0.47 0.05</td>
<td>0.11*</td>
<td>1.63 0.36</td>
</tr>
</tbody>
</table>

*The high p-values indicate that the null hypothesis of zero beta cannot be rejected at 10% significance level.

β₀ is beta for the overall study period (Jan. 2003 – Dec. 2012)

β₁ is beta for period 1: Bull Market (Mar. 2003 – May 2007)

β₂ is beta for period 2: Bear Market / Financial Crisis (Jun. 2007 – Jan. 2009)

β₃ is beta for period 3: Bull Market and Recovery (Feb. 2009 – Apr. 2011)
Generally:

With the exception of Huvudstaden and Heba, all the ten real estate instruments have higher betas (β₂) during market downturn (period 2), than their respective betas (β₀) for the overall period of 2003-2012. The respective increase in betas ranges from (8%) for Castellum to (38%) for Klövern and Kungsleden, with an average increase of (16%) and median increase of (19%).

Seven out of the ten stocks have higher β₂ than their betas (β₁) for the market upturn (period 1). The increase ranges between (20%) for Klövern to a whopping (247%) for JM. The average increase is (75%) and the median is (38%). Six out of the ten instruments have higher β₂ than β₃.

OMX real estate index:

OMX real estate stocks exhibited β₂ higher than all β₀, β₁ and β₃. The beta for Swedish real estate stocks index is asymmetrical over time and has higher beta in market downturns than both beta in market upturns and beta for the overall study period; an indication that the listed real estate sector in Sweden is not a defensive stock market investment.

Commercial stocks:

Out of the six commercial property stocks, five have higher β₂ than β₁, and three stocks have higher β₂ than β₃. The higher β₂ might indicate that the commercial real estate stocks are not defensive during the market downturns as implied by common belief.

Residential Stocks:

The two residential stocks in the study give mixed signals. Heba’s β₂ is lower than both its β₀ and β₁, while Wallenstam’s β₂ is higher than both its β₀ and β₁.

Mixed portfolio stocks:

The single stock in this category, Balder, has a β₂ higher than its β₀ and lower than its β₁.

Development stocks:

Clearly the only property development company in our study, JM, among all the stocks has both the highest β₀ (1.43) and the highest β₂ (1.63) during the period Jun. 2007 to Jan. 2009.
(the financial crisis bear market). Also its $\beta_2$ is the highest among its $\beta_0, \beta_1$ and $\beta_3$. This confirms the hypothesis that property development firms experience a significant risk during economic downturns due to the operational risks of exposure to development and constructions activities.

**The $R^2$ values:**

The average of the $R^2$ values for the 40 beta regressions reported in Table 6 is (0.24). This indicates a high predictive power of the regression model in comparison to what previous studies have found out, as described in section 2.5.3

**4.5 Time-varying Beta**

As described in the methodology chapter - section 3.1.1, we estimate the 2 yrs. and 5 yrs. rolling betas to understand the different risk behaviors (over time) of both short term and long term investment horizons in real estate stocks.

It is worth noting that usually big variations particularly occur in estimations of rolling beta due to estimation errors (Berk & DeMarzo, 2011). So, expect quite some noise while reviewing the graphs in this section. The rolling estimates will be a combination of true coefficients and sampling error, and sometimes the sampling error can be large. If the true coefficients are trending we expect the estimate coefficients to display trend plus noise, and if the true coefficients are constant we except the estimated coefficients to display random fluctuation plus noise.

**OMX real estate index:** (Figure 7 & Figure 8)

Two yrs. rolling beta: OMX RE index 2 years beta has been increasing from around (0.30) in 2004, till it peaked in 2006 at around (1.25). At the start of the financial crisis in 2007 this transient two years beta have dropped to around (1.00) and has been moving steadily since then around that level with of course some noise. Then in 2012 the 2yrs. beta started trending down till (0.7)

Five yrs. rolling beta: OMX RE index 5 years beta has trended up from (0.75) in 2007 till around (1.05) in 2008. Since then, it has been steady, till it started inching down to (0.95) in 2012.
**Commercial real estate stocks:** (Figure 9 & Figure 10)

Two yrs. rolling beta: Similarly the rolling beta of commercial property stocks have been trending up from 2004 until 2006-2007 (before the financial crisis), when they dropped significantly, which indicates that they act defensively during market downturns. Since 2007 till early 2012 they have been almost steady in value (with exception of two stocks; Fabege and Kungsleden that have risen up again). Then in mid-2012 all stock betas started trending down.

Five yrs. rolling beta: similar to the OMX RE index, the beta has trended up from 2007 till 2008. Since then, the expanding betas have interestingly flattened out till mid-2009, and then started to trend down till 2012, except Fabege which has trended up.

**Residential real estate stocks:** (Figure 11 & Figure 12)

Two yrs. rolling beta: rolling beta has been trending up from 2004 until 2006. In mid-2007 (during the sharp market downturn), Wallenstam rolling beta has shot up, while Heba’s has dropped significantly almost at the same time. They took opposite trends since then, until mid-2012 when they have started trending down again like all commercial property stocks and OMX real estate index.

Five yrs. rolling beta: the betas has trended in opposite directions till mid-2008 and has been slightly very slowly down since then.

**Mixed real estate stocks:** (Figure 13 & Figure 14)

Two yrs. rolling beta: Balder’s rolling beta has trended from level of (1.50) in 2004 till an extreme level of (4.00) in early 2005. Since then and until early 2010 it has trended down to levels around (0.2), and by end of 2012 it increased to the level of (1.0) again

Five yrs. rolling beta: Balder’s 5 yrs. beta, trended down from around (2.00) in mid-2007, till around (1.00) in mid-2009 and flattened out at that level till end of 2012.

**Development real estate stocks:** (Figure 15 & Figure 16)

Two yrs. rolling beta: unlike all other categories/stocks, JM’s 2-year rolling beta has been steadily trending up from around (0.50) in 2004 to (1.7) in end of 2012. Interestingly, there is a noticeable sharp rise in rolling beta from (1.0) to (1.7) during the financial crisis 2007-2008.
There was another sudden jump in JM’s rolling beta to (2.0) in 2011, the same period that has seen a sharp downturn in the overall OMX S market index. This is in line with the hypothesis that the risk of property development companies increases during market downturns due to their significant exposure to operational risk and uncertainties during the development and construction phase of the property investment cycle (Geltner, 2007).

Five yrs. rolling beta: JM’s 5 yrs. beta increased from (0.9) in 2007 to (1.65) in 2008, and has been steady at that level till 2012.

Summary: Table 7 below summarizes the direction or trend or behavior that the dynamic beta had –in general- for the different real estate stock types, in the two different scenarios (2 yrs. and 5yrs. rolling beta scenarios).

Interestingly, and contrary to the static beta estimate finding in the previous section, the dynamic betas, while still asymmetric in behavior through time, show no evidence whatsoever to being higher in market downturns than in upturns. In fact the real estate index, commercial stocks and development stocks show decreasing beta during market downturns; in line with the popular hypothesis that real estate stocks are defensive.

Table 7 - Summary of time-varying beta behavior

<table>
<thead>
<tr>
<th></th>
<th>2 yrs. Rolling beta</th>
<th></th>
<th>5 yrs. Rolling beta</th>
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</thead>
<tbody>
<tr>
<td><strong>R.E. Index</strong></td>
<td>↑</td>
<td>↓</td>
<td>→</td>
</tr>
<tr>
<td><strong>Commercial Stocks</strong></td>
<td>↑</td>
<td>↓</td>
<td>→</td>
</tr>
<tr>
<td><strong>Residential Stocks</strong></td>
<td>↑</td>
<td>↑</td>
<td>↓</td>
</tr>
<tr>
<td><strong>Mixed Stocks</strong></td>
<td>↓</td>
<td>↓</td>
<td>→</td>
</tr>
<tr>
<td><strong>Development Stocks</strong></td>
<td>↑</td>
<td>→</td>
<td>↑</td>
</tr>
</tbody>
</table>

Legend: ↑-beta increase, ↓-beta decrease, →-beta stable, ↑-unclear direction
Figure 7 - OMX Real Estate Index - 2 yrs. Rolling Beta

Figure 8 - OMX Real Estate Index - 5 yrs. Rolling Beta
Figure 9- Commercial real estate stocks - 2 yrs. Rolling Beta

Figure 10- Commercial real estate stocks - 5 yrs. Rolling Beta
Figure 11- Residential real estate stocks - 2 yrs. Rolling Beta

Figure 12- Residential real estate stocks - 5 yrs. Rolling Beta
Figure 13 - Mixed real estate stocks - 2 yrs. Rolling Beta

Figure 14 - Mixed real estate stocks - 5 yrs. Rolling Beta
Figure 15 - Development real estate stocks - 2 yrs. Rolling Beta

Figure 16 - Development real estate stocks - 5 yrs. Rolling Beta
5. Discussion

This study attempts to provide an analysis for the return behavior and systematic risk component (beta) of Swedish real estate stocks. In doing so the study attempted to answer few questions.

5.1 Beta over time

- How does the beta of the Swedish real estate stocks change over time? Is beta asymmetric in economic upturns and downturns?

Evidence from beta estimation of different types of real estate stocks suggests that indeed betas of Swedish real estate stocks are asymmetric and are higher during bear market conditions. This is contrary to the common belief that real estate stocks are defensive in nature.

On the contrary, the results from a time-varying beta estimation (rolling window regression), tells a different tale of beta behavior over time. For both 2 yrs. and 5 yrs. rolling betas for all real estate stocks categories have shown either lower or at least not higher betas during the broad market downturn period (2007-2009). Still beta is asymmetric in different broad market trends, yet dynamic beta results indicate that real estate stocks and sector are defensive during market downturns.

These are two contradicting indications that come from estimations of beta and time-varying beta. This study is inclined to adopt the results of time-varying beta estimations. That is; The beta of Swedish real estate stocks are asymmetric; they do not increase in market downturns as they do during market upturns, which make these stocks defensive in nature.

5.2 Beta per property type

- Is there an effect on beta of a real estate stock, due to the type of real estate assets it holds?

Evidence from beta analysis shows that development real estate stocks have higher betas than all other types of real estate companies. That is in line with the popular hypothesis of the high market risk of development companies due to their development operational risk.
At the other end of the spectrum, the lowest betas among all stocks were indeed held by a residential property company (Heba); also in line with popular hypothesis of residential property stability in face of economic swings.

Commercial real estate stocks hold a middle place between real estate stocks and development stocks in terms of market risk sensitivity (beta), again in line with popular hypothesis advocating the reasonable effect of economic swings on their prospective risk of cash flow due to short term leases (typically five years in Sweden) or the percentage clauses in retail property leases, as discussed in section 2.4

5.3 Diversification among real estate stocks

- Is there apparent benefit from diversifying among the real estate listed stocks?

Yes. The correlations analysis of annual returns shows low and varying correlations among the annual returns of real estate stocks. Therefore for investors interested in the Swedish listed real estate sector, there is a diversification benefit among the stocks. However the real estate index as a whole is highly correlated to the board market (0.91).

Also, as seen from the price evolution and descriptive statistics, returns of Swedish real estate stocks and index are quiet volatile. So diversification benefits are not only granted, they are indeed recommended.

5.4 Implications for investment managers

Changing cost of capital over time:

As discussed in section 1.1 of this study, the cost of capital is a very important decision making parameter for investors. The cost of capital and a company value are both quite sensitive to changes in beta. Our results show that beta vary over time and in different market conditions. So, continuously monitoring and forecasting the changing beta over time is crucial to sound investment decision making.

Investment duration and market timing:

Investors differ in their time horizons according to their portfolio mandates. In fact, having investors from diverse investment horizons provide the necessary liquidity required for efficient pricing at all times. Our results for 2 yrs. and 5 yrs. dynamic betas show that real
estate stocks particularly commercial and development real estate stocks exhibit different and sometimes opposing betas during a certain market condition. For example a short term (2 years horizon) investor can take advantage of knowing that JM stock beta increases in a market upturn such as the one at the start of 2009, and invest accordingly. While a mid/long term investor (5 years horizon) wouldn’t find a cue that JM’s 5 year dynamic beta increases during market upturn in 2009, and increasing investments at that market time wouldn’t be granted.

5.5 Issues and recommendations

As discussed in the introduction of this thesis, investors interested in listed real estate stocks in Sweden do not have a lot of options. So do researchers. There are only 17 real estate stocks traded in the Swedish stock market. Out of which only ten stocks have trading history of 10 years or more. This in turn, gives us six stocks in the commercial property type, just two instruments to analyze in the residential type and one instrument in the development sector. Inferences about return and risk behavior of a real estate type from one or two stocks are not really the most reliable ones. Perhaps the study can extend to encompass the Scandinavian markets as a whole and include more real estate stocks to give more depth to the inferences from results.

Even though the introduction of REITs in Sweden is unlikely in the near future due to low political interest (Ekborn & Sandberg, 2005), this study recommends that just introducing a form of property REIT or ETF in Sweden, even without any preferential tax benefits similar to the ones given in USA and UK would benefit the market. There are already many local and international real estate investors invested heavily in private Swedish real estate funds (eg. Niam, Carnegie, Aberdeen, SEB Funds, and much more). Transforming these funds into publicly traded ones could provide more liquidity, transparency, depth and efficiency to the real estate traded market. This could provide immense analytic benefits and clarity for the market investors and researches alike. However there are stringent public disclosure requirements from the financial authorities that might discourage the transformation of these funds to being publicly traded.
6. Conclusion

The study concludes the return and risk behavior of Swedish listed real estate stocks for a ten year period (2003-2012), using descriptive statistics and both standard beta and time-varying beta regression estimates.

While the real estate sector index shows high correlation and mostly stable beta over time with the broad stock market, individual real estate stocks exhibit big disparities among their correlations and beta behavior.

The correlation analysis of annual returns reveals that there would be diversification benefits in Swedish listed real estate sector. These benefits are available both within a single property type stocks and among the different property type stock groups as well.

A CAPM based model was used to estimate betas for different Swedish traded real estate stocks against the Swedish broad market index (OMX S PI).

The estimates revealed that betas differ for different property type of real estate stocks. Development companies have the highest betas in line with the popular hypothesis about their significant operational risk during development and construction phases. Next, come betas of commercial property stocks again in line with the popular hypothesis of their relative reasonable risk of economic swings on the cash flows of their relatively short term, and percentage-clause leases. At the other end of the spectrum, the lowest betas were recorded for a residential property stock. Swedish real estate stock betas are in line with the popular hypothesis regarding the different betas or market risk component of different property types.

The estimation of both standard and time-varying betas (through rolling windows technique) of the different stocks reveal that betas of Swedish real estate stocks are asymmetric during market upturns and downturns. The standard beta analysis shows that stocks in general have higher betas during market downturns and thus can be deemed not defensive during market crashes like the one in 2007-2009. The time-varying beta analysis (performed by rolling window beta analysis) proves that stocks have lower or steady betas during market downturns than in market upturns and thus are defensive or at least becomes less risky during economic downturns. The study inclines toward the conclusions driven from the time-varying beta analysis.
Our comparison for 2 yrs. and 5 yrs. time-varying betas show that real estate stocks particularly commercial and development real estate stocks exhibit different and sometimes opposing 2 yrs. and 5 yrs. rolling beta trends during a certain market condition. Therefore, there are benefits in analyzing time-varying beta analysis in different time spans. It can provide investors (of different time horizon) with valuable cues about market timing strategies and the pertinent security’s changing cost of capital over time.

Due to the limited number of traded real estate securities in the market, there is a concern about the validity of making general inferences about betas and risk performance of Swedish real estate stocks. The study recommends, or rather hopes, that transforming the private real estate funds in Sweden to being publicly listed could add vast liquidity to that sector. This in turn will provide much bigger data samples needed for more concrete research results. It will enhance the market transparency and efficiency required by both researchers and investors in the real estate sector.
Bibliography


