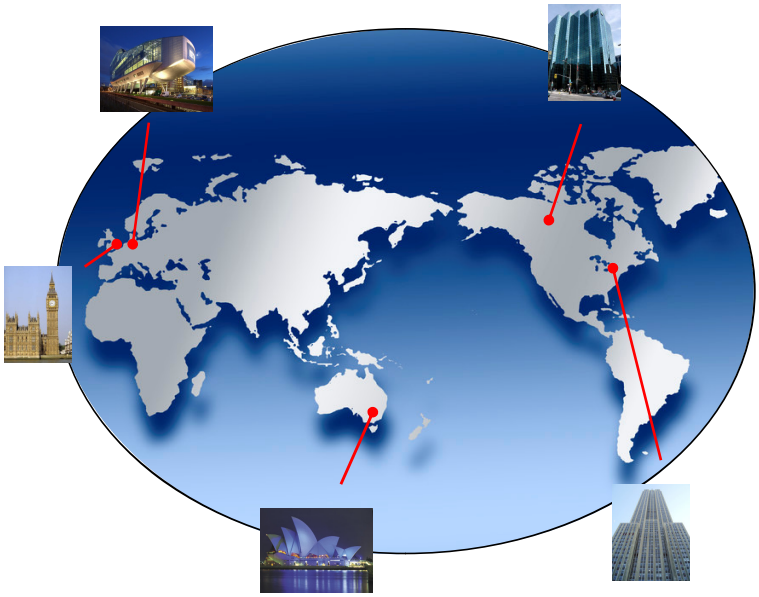
Global portfolio diversification

The effects for Dutch private real estate investors



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The effects for Dutch private real estate investors

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Master thesis: *Vastgoedkunde*
Netherlands, The Hague, July 2007

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ING REAL ESTATE

Preface

This Master thesis has been written in order to graduate for my Master of Science in Real Estate Studies at the Faculty of Spatial Sciences of the University of Groningen. ING Real Estate provided me the opportunity to perform an internship of which this thesis is the result. This internship started at the first of March and ended at the first of July in 2007.

My interest in real estate emerged after having participated in the course 'Real estate investments' during my study Economics at the University of Groningen. As a result of this interest, I started with the Master of Science in Real Estate Studies at the University of Groningen after having graduated in Economics. Towards the end of this Master study I spoke to Prof. dr. Nozeman and became interested in the allocation issues of real estate investments. Furthermore, the fact that there is so little research aimed at private investors drew my attention. For that reasons I decided to study the effect of global portfolio diversification explicitly to private real estate investors.

The completion of this Master study would not have been possible without the help of others. First of all, I would like to thank Ido Esman, who provided me the opportunity to perform this study at ING Real Estate. I have not only learned a lot from his practical feedback regarding this thesis but also from sharing his thoughts and experiences with me. Furthermore, I would like to thank all the other employees within Private Clients Europe for their interest in the progress of this thesis. Furthermore, I would like to thank Marcel Theebe and Chris Hoorenman of the research department of ING Real Estate on spending time with me brainstorming during the research process. Finally, special thanks go out to Prof. dr. Nozeman, from the University of Groningen for supervising the entire graduation project and for providing constructive feedback and suggestions during my graduation period.

Executive summary

This thesis focuses on global diversification potentials for privately held real estate portfolios in the Netherlands. The empirical study of this thesis, takes the perspective of a Dutch based private investor investing in Dutch properties and considering diversifying this portfolio globally. As a consequence of limitations on the availability of long-term return series, the diversification effects are only studied in the Netherlands, the UK, Canada, Ireland, Australia and the US. In these countries the IPD total return indices and the NCREIF total return series (for the US) are modified and used as a proxy for returns to private investors. This dataset has been studied in the 1985-2006 period.

In the empirical study, three data sets in two different scenarios have been investigated. The three different studies include the effects of diversifying real estate assets as an asset class in general, effects of diversifying a pure office portfolio and effects of diversifying a pure retail portfolio. These data sets have been studied in two different scenarios where foreign currency risks are considered either hedged or unhedged.

The study concludes that by including foreign real estate assets to a Dutch property portfolio the risk-return profile improves. The consideration to hedge foreign currency risks does not have major impacts on results. Hence, the conclusion has been drawn that global diversification of real estate portfolios is favourable to Dutch private real estate investors.

One remark needs to be made; Dutch private investors can not be distinguished by the same typical features. Private investors owning large funds and private investors with limited investment alternatives are at the extreme ends of this spectrum. This study does not consider that there is a minimum amount of funds needed in order to benefit from global diversification effects. However, it is advised to invest in at least five properties in a specific country. By investing in at least five properties the unsystematic risk is reduced by 55 percent of the unsystematic risk to which a portfolio of only a single property is exposed to. The total value of a global real estate portfolio depends on the preferences concerning the value of the individual properties a private investor chooses to invest in. In order to obtain an efficient portfolio, the total value of the properties in a particular country should equal the relative weights in that country which have been determined by the mean-variance model.

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Chapter I Introduction

Real estate investments in a historical perspective

The use of real estate assets as an investment alternative is an ancient phenomenon. Already in the Roman era, lands and houses were rented out to fellow residents who were unable to afford to buy a house themselves. However, real estate assets were primarily used from a production and housing perspective instead of an investment perspective. This was about to change during the Industrial Revolution. As a consequence of specialization of labour and the growth and clustering of cities the demand for business accommodations increased rapidly. At this period the investments in commercial real estate assets emerged.

The Industrial Revolution in the Netherlands occurred not until 1890, but resulted primarily in an expansion of the agricultural industry. As a consequence, the demand for business accommodations did not arise at that moment. It was not until the Sixties when investments in commercial real estate assets became popular in the Netherlands. Business developments accelerated due to an economic expansion. The latter required high investments in the modernization of the business process. As a result of scarce resources, entrepreneurs often decided to rent the properties instead of buying additional business spaces. The demand for business objects shifted from owner occupied to rented properties. Real estate investments began to flourish as wealthy investors anticipated at the growing demand for rental business objects (Gool van, Jager and Weisz, 2001). Over the last three decades another shift has taken place. The integration of political and economic climates, deregulation and growth of international financial markets resulted in a tremendous increase of international investments.

Research on international investments

As cross-border investments increased, the amount of research into effects of global diversification extended. A significant amount of research indicates that international investing does provide diversification benefits and thereby enhances portfolio performance for stocks and bonds (Worzala and Newell, 1998). It is only for the last ten years that the attention raised to effects of including international real estate investments within a mixed-asset portfolio. The majority of these studies demonstrated that investments in shares of international real estate companies results in positive diversification effects. However, the results on diversification effects of direct real estate assets have been mixed. Chapter II includes a literature survey where some of these studies will be reviewed.

The research to date is primarily aimed at institutional investors. This is not remarkable, as most private investors make investment decisions on gut feeling and opportunities, while institutional investors use investment analyses on making investment decisions (Nijmeijer, 2005). Therefore, institutional investors benefit mostly from studies that have been performed on international portfolio diversification. Due to the lack of appropriate research that is aimed at private investors, the professionalization process for these investors is difficult.

As will be represented in Chapter II, most private investors are actively investing in small-scale, local niche markets. In these markets they face a competitive advantage with their specific local market knowledge. The lack of research on global diversification effects to private investors does not convince these investors to make global investments until now.

Structure of the thesis

This thesis extends the earlier analysis on portfolio diversification of direct real estate assets. It provides information explicitly to private real estate investors about effects of global diversification. Because of a lack of available research to private investors, this thesis does contribute considerably to the existing literature on this subject. The study takes the perspective of a Dutch based private investor investing in Dutch real estate assets and considering diversifying his portfolio globally. This results in the following central research question:

- ***Is it favourable to Dutch private real estate investors to diversify their property portfolios globally?***

The thesis is structured as follows: Chapter II presents a theoretical framework, which includes insight in the characteristics of private investors, real estate investment alternatives, the Modern Portfolio Theory and a review of literature. Chapter III deals with the methodology of the empirical study that is part of this thesis. This empirical study tries to answer the following research question:

- ***Does the risk-return profile of a portfolio improve by diversifying real estate assets globally?***

Chapter IV presents the results of this empirical study. Chapter V ends with a summary, conclusions and discusses further research recommendations.

Chapter II Theoretical framework

2.1 The characteristics of Dutch private real estate investors

What are the characteristics of Dutch private real estate investors? It is rather complicated to answer this seemingly simple question, as private real estate investors are quite reserved in handing out information about their investing strategies in direct real estate assets. Furthermore, most of them avoid publicity. As a consequence, there are many uncertainties about the private investors' investing behavior and the size and value of their portfolios. A private investor is an investor who acts for his own account and who is not employed by a company, is not partner, or does not belong to any other entity related to his financial investments (Encyclopedia of Economics).

Real estate investors can be differentiated into private and institutional investors. The last group includes pension funds, mutual funds, insurance companies and investment funds or other such group that has a large amount of money or assets to invest. This breakdown is coming about due to different investment objectives between private and institutional investors. The main investment targets for private investors include: the maintenance of purchase power, the insurance of future income, maximizing investment returns, or a combination of these objectives. On the contrary, the main objective to institutional investors is to manage clients' equities in order to make repayments at some point of time in the future. Especially, pension funds and life insurance companies are obliged to wisely manage these funds to ensure a future income to the participants. So, risk control is a major target for institutional investors. Moreover, as to match the duration between cash in- and outflows these companies aim at stable income generating projects. Due to these different objectives, the investment criteria may differ between private and institutional investors on the following points (Gool van, Jager and Weisz, 2001):

- The preferred short and long run returns;
- The acceptable level of risk;
- The preferred level of debt financing;
- Considerations on ethical issues.

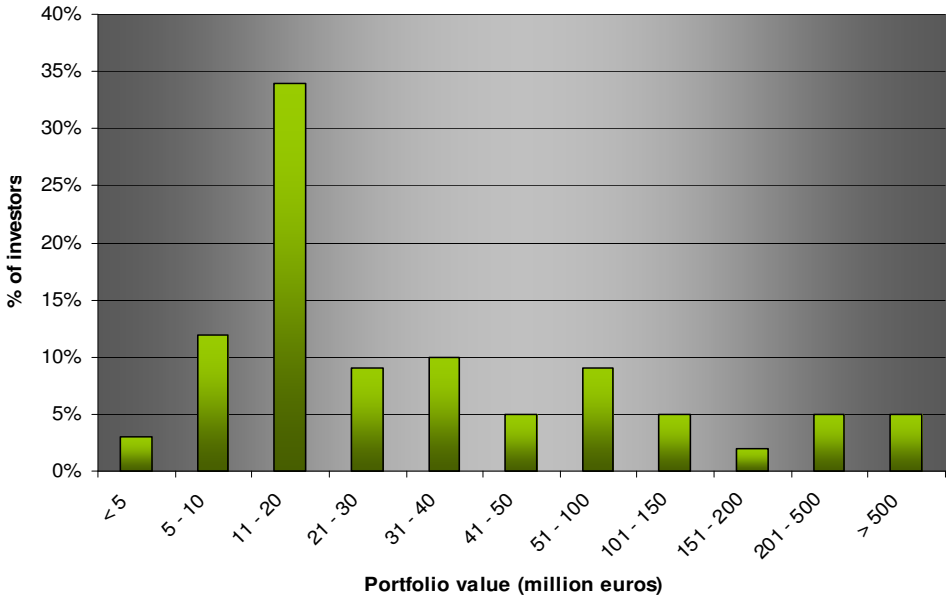
As a consequence of different investment criteria the investment behavior of private investors differs from that of institutional investors. This is reflected in portfolio sizes, values and

investment strategies. In this first section a couple of investment characteristics of Dutch private direct property investors will be discussed. This insight into the investment strategies is a useful starting point to investigate benefits of international portfolio diversification to Dutch private real estate investors.

2.1.1 Size and value of portfolios

A typical private investors' portfolio does not exist. There are enormous differences in investors' portfolio values. Some investors are holding small portfolios with values of less than five million euros, while others are holding portfolios that are valued at more than half a billion euros (figure 2.1). These large portfolio owners frequently compete successfully with institutional investors due to their professionalism and availability of capital. The fact that these investors own more than the average total amount invested by private investors, indicates that the market is mostly dictated by just a small group of investors. As can be seen in figure 2.1, the absolute majority of Dutch private investors own property portfolios between 11 and 20 million euros (Weisz, Hoven, Lokerse, Pastor and Prins, 2007).

Figure 2.1. Size of Dutch private investment portfolios



Source: Weisz, Hoven, Lokerse, Pastor and Prins, 2007

The gap existing in portfolio values is a consequence of large differences in the total number of properties held in portfolios among the private investors. Portfolios including less than ten up to portfolios including more than five thousand properties are at the two extreme ends of this spectrum. These differences are especially considerable in the residential property portfolios. The ownerships in offices, retail and logistics/industrial are more equally divided among the investors. Each asset class is characterized by its own risk and distinguishing

features. These distinguishing features and different risk profiles make investors want to diversify their portfolios. How well are private investors' portfolios diversified?

2.1.2 Diversification of property portfolios

Investors care about the expected return and risk of their portfolio of assets. Risk can be measured as the volatility of the expected returns (variance or standard deviation). The contribution of an asset to the risk of a portfolio depends on how its return varies with the other holdings (co-variance). In that way diversification can reduce the total variability of the portfolio. More details about portfolio diversification will follow later on in this thesis.

Private investors diversify their portfolios among different asset types quite decently. It appears that 72% of the investors invest in at least three different asset types. Besides, the majority of these investors hold portfolios where each asset class represents at least ten percent of the total investments on average. The different asset types (offices, retail, residential and logistics/industrial) are reasonably equally represented in investors' portfolios (Exhibit 2.1). Eleven percent of the private investors indicate to invest in alternative property assets. These investors invest particularly in homes for the elderly (21 %), parking places (18 %), and distribution centers (16 %) (Weisz, Hoven, Lokerse, Pastor and Prins, 2007).

Exhibit 2.1. Investments in different property asset types

Property asset type	Percentage investments
Offices	32 %
Retail	37 %
Residential	45 %
Logistics/industrial	24 %
Alternative asset classes	11 %

Source: Weisz, Hoven, Lokerse, Pastor and Prins, 2007

The real estate market is segmented by asset types as well by geographical regions. Although, it is proven that diversification among asset types is more efficient than diversification by region (Firstenberg, Ross and Zissler, 1988), it is interesting to see how private investors allocate their properties.

In the year 2006, a lot of investors preferred to invest in properties in one of the four largest cities in the Netherlands (Amsterdam, Rotterdam, The Hague and Utrecht). However, 38 % of the private investors hold none of their properties in one of these cities. Explanation of this large percentage can be found in the following characteristic: Dutch private investors hold a substantial part of their portfolios in the immediate proximity of their place of residence.

Private investors are actively investing in these small-scale, local niche markets. In these markets they face less competition of institutional investors and they take advantage of their specific local market knowledge.

2.1.3 Capital structure

When an investor considers to purchase a property, it can either be financed with own funds or with debt capital. Debt financing has an important advantage. The interest payments of a Dutch investor on a mortgage loan are tax-deductible. This interest tax shield is a valuable asset, compared to financing the properties with own funds completely. If borrowing provides an interest tax shield, the implied optimal debt level should be a hundred percent. However, there is also a cost on debt financing; the cost of financial distress. At moderate debt levels the probability of financial distress is insignificant and therefore the tax advantages of debt dominate. But at some point the probability of financial distress increases rapidly with additional borrowing. This is called the trade-off theory of debt: the theoretical optimum is reached when a chosen debt level balances interest tax shields against the costs of financial distress (Brealey, Myers and Marcus, 2001).

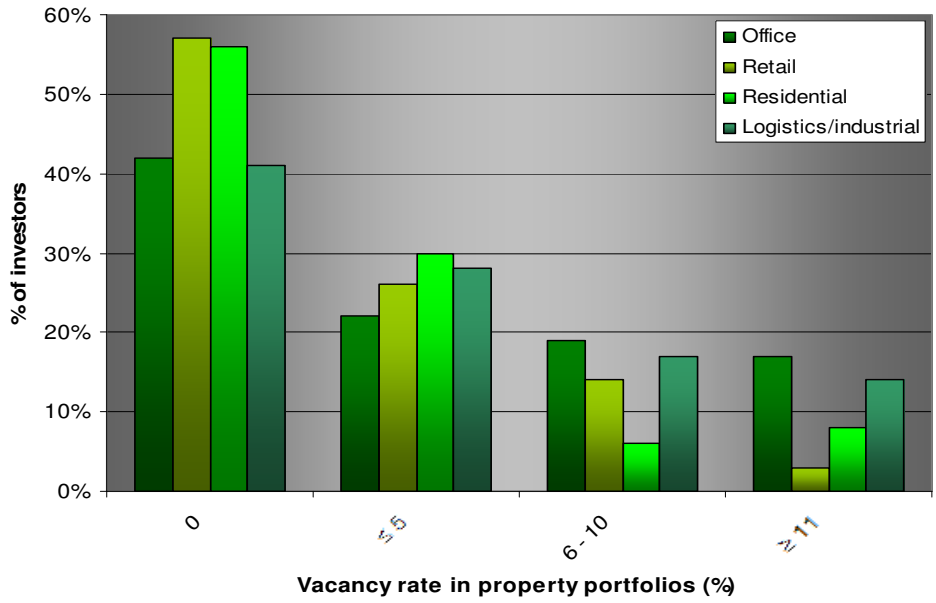
Due to debt financing the value of property portfolios can be significant larger. A lot of private investors (46 %) declare to finance properties with as much debt as they can get. The existence of a trade-off theory of debt is probably not taken into account by these private investors. Or it could be that the optimal debt level for a private investor is on a higher ratio than institutional investors, due to potential differences in costs of financial distress. As firms are charged with premiums on interest costs by additional debt at high debt levels, a private investor may have other financing opportunities that are less expensive. However, as a consequence most properties are financed with a leverage ratio of at least 75 %. Most investors (52 %) use flexible interest rate debt, or fixed interest rate debt with durations of five up to ten years (30 %) (Weisz, Hoven, Lokerse, Pastor and Prins, 2007).

2.1.4 Vacancy rate in property portfolios

As most real estate investors, a lot of private investors struggle with the problem of vacancy in property portfolios. Private investors seem to deal in a more entrepreneurial way with the problem of unoccupied properties than most institutional investors do. Private investors are taking advantage of holding small-scale portfolios. Because of the small-scale portfolios, the private investors are pouncing on the investments and are dedicated to realize low vacancy rates. They try to find new tenants or redevelop the properties to deal with losses of rents. Institutional investors usually sell off the unoccupied properties or give incentives (for example: rent-free periods) to deal with the vacancy problem.

Research indicates that differences in vacancy rates among investors' portfolios are considerably. Some investors face less than one percent vacancy in one or more asset classes, where others face more than eleven percent vacancy (Figure 2.2). Figures on this subject may not be very accurate. Private investors may not be willing to be open about their vacancy rates (Weisz, Hoven, Lokerse, Pastor and Prins, 2007).

Figure 2.2. Vacancy rates



Source: Weisz, Hoven, Lokerse, Pastor and Prins, 2007

2.1.5 Holding period of properties

An interesting issue is the holding period of properties held in private investors' portfolios. Investments in real estate assets are in general characterized by long investment horizons. Direct real estate returns consist of a direct and an indirect component. This direct return component is the excess of rents and exploitation costs (Income return). The indirect return depends on the growth of the property value. The technically long life expectancy of real estate assets makes it suitable for long holding periods, with a relative high return at the selling moment.

However, private investors seem to keep their properties relative short in portfolio. No less than 45 % of private investors indicate to hold an office for not more than five years in portfolio. Also, a lot of investors say to hold residential and logistics/industrial properties for only a couple of years (Weisz, Hoven, Lokerse, Pastor and Prins, 2007). Apparently, investors manage their property portfolios very intensively. The fact that these properties are resold in a short period of time could indicate that investors try to anticipate on new market developments. This anticipating behavior contrasts with the (normal) long term investment horizons of institutional real estate investors.

2.1.6 Success factors

Some private investors are able to compete successfully with institutional investors and foreign investments funds. Success is not uncommon due to the fact that these private investors are professionally organized and hold large amounts of capital. Furthermore, with a low interest rate level private investors are able to finance properties at a relative low cost of capital in contrast with non-leveraging institutional investors. Private investors indicate that successes are achieved thanks to entrepreneurial skills, fastness in decision making, management skills in rental and administration, timing and gut feeling.

2.1.7 Foreign property investments

The investment in foreign properties can be profitable to Dutch private investors. Favorable foreign market developments, lack of local real estate investment opportunities, interest-rate differentials etcetera, may result in high returns. Besides, diversification of the portfolio improves the risk-adjusted performance. Arguments on international diversification will be dealt with later on in this thesis.

As already discussed, private investors are actively investing in small-scale, local niche markets. In these markets they face a competitive advantage with their specific local market knowledge. Therefore, most private investors indicate not to invest in foreign properties because of a lack of this knowledge. Private investors are unfamiliar with different cultures, user demands, and local government regulations and feel that returns are harmed by this uncertainness.

2.1.8 Summary of private investors' characteristics

The first part of Chapter II dealt with characteristics of private direct property investors to get insight in their investing behavior. These characteristics are summarized in exhibit 2.2.

Exhibit 2.2. Summary of private investors' characteristics

Characteristics of Dutch private property investors	
I.	A private investor is an investor who acts for his own account and who is not employed by a company, is not partner, or does not belong to any other entity related to his financial investments.
II.	A typically private investors' portfolio does not exist. There are enormous differences in size and value of real estate portfolios.
III.	Most real estate portfolios are diversified in at least three different asset types.
IV.	Substantial part of portfolios are held in small-scale, local niche markets, usually in the immediate proximity of own place of residences.
V.	A lot of private investors are financing properties with as much debt as they can get. Most properties are financed with a leverage ratio of at least 75 %.
VI.	Private investors try to find new tenants or redevelop the properties to deal with the vacancy problem. Because of the small-scale portfolios, the private investors are pouncing on the investments and are dedicated to realize low vacancy rates.
VII.	Properties stay relatively short in portfolio. Indicating that private investors manage their portfolio very intensively.
VIII.	Success factors include: entrepreneurial skills, fastness in decision making, management skills in rental and administration, timing and gut feeling.
IV.	Foreign property investments are relatively rare, due to a lack of foreign market knowledge.

2.1.9 Different investment characteristics between private and institutional investors

Exhibit 2.2 provided insight into the characteristics of Dutch private investors. Nijmeijer (2005) performed in cooperation with Troostwijk Makelaars O.G. a research to differences in investment characteristics between private and institutional investors. The main differences between private and institutional investors include:

- Private investors use higher leverage ratios. Most properties are financed with a leverage ratio of at least 75 percent.
- Private investors hold in general smaller portfolios than institutional investors.
- Private investors face fewer obligations to their investments and are generally less risk-averse. This is foremost a consequence of the fewer restrictions they face on investments compared to institutional investors.
- Private investors make investment decisions mostly on gut feeling and opportunities, while institutional investors use investment analyses on making investment decisions.
- Institutional investors diversify their portfolios in general more sophisticated among different regions and asset classes.
- Institutional investors have economies of scale and scope in the management of properties. Private investors on the other hand have benefits in local market knowledge.

The understanding of these differences is important when studying the effects of global diversification to private investors explicitly. Due to these different investment characteristics, methods used in earlier studies on diversification effects are not appropriate in this study into these effects explicitly to private investors. Paragraph 2.3.2 will elaborate on this matter.

2.2 Several alternatives for investing in real estate

Before dealing with international portfolio diversification, this section will give a view on general real estate investment alternatives. There are several alternatives for investing in real estate. One can consider investing in direct (physical) or indirect (securitized) real estate. Further, investments in indirect real estate can either be made in listed or unlisted real estate. Instead of a direct investment (buying 'bricks and mortar'), an indirect real estate investment is buying a share of an investment fund. The essential difference between a direct and an indirect investment is the level of authority an investor has over the investment. In a direct investment the investor has as well a controlling interest (at least 50%) as a say in the management over the property. In an indirect investment the investor has only a limited controlling interest and a limited influence on the management of the property, due to voting rights on the shares. The choice of investing in direct or indirect real estate assets depends mainly on the nature of the organization/investor, the investment objectives and the value of available funds (Gool van, Jager and Weisz, 2001).

2.2.1 Indirect real estate investments

An indirect real estate investment is characterized as a basket of assets in which investors participate in a portfolio of professionally managed properties. An indirect investment is accessible to every investor with funds of a couple of hundred euros till over a billion euros. For a portfolio manager seeking a real estate investment in direct real estate, there are a number of 'issues' to be taken care of. For example, the large lot size (fund outlay) of such property investments, the lack of a central market, low liquidity, high transaction costs, maintenance expenditure, the need of local market knowledge and management requirements. To avoid these 'issues' one could buy a share in an investment fund. An investment fund issues stock and debt to invest this capital in direct and/or indirect real estate assets. Indirect investments can be made in listed or unlisted real estate (Gool van, Jager and Weisz, 2001):

- Buying a share in a listed real estate fund results in a return that depends on the share price of the company and the amount of dividends paid. The shares are fully transferable at every moment in time. An investor has several alternatives in listed real estate funds to invest in: internationals, multinational sector funds, national multi-sector funds, funds of funds and investments by external fund managers.
- Unlisted real estate in the Netherlands refers to Mutual Partnerships, F.B.I.'s (*Fiscale Beleggingsinstellingen*) and Opportunity funds. Usually, these funds invest in small-scale real estate portfolios and transfer initial deposits and returns to the participants after a specific period of time. Unlisted real estate participations are not or hardly transferable. Furthermore, these funds are lacking the disciplined functioning of a stock exchange market. Finally, the appraisal against intrinsic values is considered over optimistic. However, there are also gains due to smaller risks and costs compared to the listed companies.

2.2.2 Direct real estate investments

A direct investment requires intensive management and a large fund outlay. By investing in direct real estate an investor has several alternatives which include residential properties, office buildings, retail properties, industrial properties and undeveloped land. As with any type of investment each asset type has its own investment characteristics (Geurts and Nolan, 1997).

Especially, for a starting investor an investment in residential properties is attractive due to the corresponding features with his own residence. As with all properties the locations of rental houses and apartments have major impact on rental values. Due to relative high tenant turnovers rents can be adjusted to increasing inflation levels. However, high turnovers also result in relative instable cash flows. The main disadvantage of residential property

investments is the maintenance problem: the costs on repairs and frequent redecorating can be considerably.

Investments in office buildings demand a specific knowledge in property management and market developments and are thereby considered as relative risky. In general the length of lease contracts on office buildings is longer than rental periods of residential properties. The main advantages of office building investments include: lower turnovers result in relative stable cash flows and many operating expenses can be charged to tenants. A substantial higher purchase price and the fact that returns are influenced by cyclical fluctuations are disadvantages of this type of investment.

On the market in retail properties and shopping centers, the competition is significantly more severe. In order to compete successfully in this market: properties should be well located, tenants should be of a high credit rating and property management should be sophisticated. The returns on well managed properties are in general secure and stable. External factors may have a major impact on returns. Examples of external factors include the entering of new competitors, outdated designs and fluctuations in income levels and population densities.

Industrial properties refer to factories and industrial parks. Industrial properties are usually built on specific user demands. This makes this asset class risky as it is not easy to convert the property into other use or to transfer it to a new user.

The most risky asset in direct real estate investments is undeveloped land. In a raw state the land is cheap to acquire and may experience an enormous increase in value when the zoning is changed. Investors make educated guesses on these zoning changes. However, when the zoning does not change the net present value on the investment is in general negative. Therefore, before investing in undeveloped land one must have a forecast view on the future growth paths of cities.

2.2.3 Pros and cons of investing in direct and indirect real

Investment features differ due to the different characteristics of direct and indirect real estate assets. Exhibit 2.3 summarizes the main pros and cons of investing in direct and indirect real estate (Gool van, Jager and Weisz, 2001).

Exhibit 2.3. Pros and cons of investing in direct and indirect real estate

	Direct real estate	Indirect unlisted real estate	Indirect listed real estate
Control (Authority)	+	-	-
Fluctuations in value	+	+	-
Real estate 'caliber'	+	+/-	-
Diversification	-	+	+
Liquidity	-	-	+
Homogeneous product	-	+	+
The need of property management expertise	-	+	+
Benchmarks	-	-	+

Authority

In an indirect investment the investor has only a limited influence on the management of the property and on investment strategies.

Fluctuations in value

The value of listed real estate shares fluctuate stronger than the underlying value of the real estate assets. Furthermore, the returns on listed indirect investments are influenced by sentiments on the stock market.

Real estate 'caliber'

Listed indirect real estate has a lower real estate 'caliber' and is therefore a less appropriate tool for diversification. Direct real estate has a lower correlation coefficient with respect to inflation and other financial assets like stocks and bonds.

Diversification

A careful diversified portfolio including assets of several regions, markets and asset types in indirect real estate is much easier to realize because of the low unit prices of shares.

Liquidity

The liquidity in the listed indirect real estate markets is significant stronger than in the direct real estate markets. Indirect real estate assets have lower transaction costs, can be bought and sold at every moment in time and new information is quickly absorbed in asset prices. The unlisted real estate shares are not liquid because shares are not transferable and positions can usually not be sold before duration.

Homogeneous product

Indirect real estate shares are homogeneous, which means that a fund consists of many identical shares. Physical real estate assets are heterogeneous. Every property is considered unique; there is not a second identical property in the world.

The need of property management expertise

An investment in direct real estate assets requires expertise of the investor on property management in order to be successfully. When investing in indirect real estate an investor takes advantage of the economies of scale in a specialized management mechanism.

Benchmarks

Although, the total number of reliable direct real estate benchmarks is increasing, at this moment there is not an appropriate worldwide benchmark for the comparison of direct real estate returns. In order to apply a benchmark for the comparison of portfolio returns, a long-term reliable index is needed. Most European indices (like IPD's) are constructed in the last decade. Indirect real estate returns can well be compared to worldwide real estate stock indices like: the GPR 250, the EPRA NAREIT, Morgan Stanley REIT Index or the UBS Global Investors index.

The previous paragraphs indicated that different characteristics of direct or indirect real estate investments have consequences for portfolio composing strategies. It is up to individual portfolio managers to consider if a direct or an indirect investment is more suitable in a specific portfolio.

The purpose of this study is to investigate the benefits of global portfolio diversification. In this study the diversification effects on including direct real estate to private investors' local property portfolios have been chosen to investigate. Direct real estate investments are more suitable for diversifying purposes due to its low or negative co-movement with other assets. Besides, a study to direct real estate diversification has a larger contribution to the existing studies in the Netherlands on this subject.

2.3 Global diversification of real estate portfolios

Paragraph 2.1 provided insight into Dutch private investors' characteristics. Among other things, it indicated that a lot of private investors do not invest in foreign properties in the absence of foreign market knowledge. This lack of foreign market knowledge is one of the disadvantages of investing in foreign property markets. However, there are also benefits in diversifying property portfolios globally. Motives for investing in foreign real estate markets include:

- Economic diversification;
- Political diversification;
- Lack of local real estate investment opportunities;
- A potential stronger liquidity in foreign real estate markets;
- Favorable foreign markets developments;
- Favorable exchange rates;
- Interest-rate differentials;
- Tax incentives;
- Fewer ownership restrictions;
- Reputation incentives.

The main motive for investing in foreign real estate markets and the reason not to put all your eggs in one basket is that diversification improves a portfolios' risk-return profile. Portfolio diversification is crucial to investors because asset returns do not move in perfect harmony. If returns collapse in one segment of a diversified portfolio, other returns should be insensitive for this decline and protect the value of the portfolio. This insensitivity depends on the extent of integration between different assets and their markets. The more markets are integrated; fewer benefits can be gained as these same markets are affected by the same economical, political or financial fluctuations. Low correlations between international property assets in a portfolio will ensure a protection against economic cycles. If a domestic real estate market is global integrated, the benefits of diversifying globally will diminish.

2.3.1 Modern Portfolio Theory

A tool to allocate assets for a diversification purpose is found in the Modern Portfolio Theory (MPT). This theory supports portfolio managers in making asset allocation decisions. In 1952, Markowitz laid the groundwork for the MPT. Markowitz demonstrated that risk is quantifiable and can be divided into two parts: the systematic part and the unsystematic part

of risk. In general, the systematic part is unavoidable and is tied to a particular asset class or market. Unsystematic risk is firm/asset specific and can be reduced by creating a mixed-asset portfolio. In an optimal diversified portfolio (Market Portfolio) all the firm specific risk is diversified away so that only the systematic part of risk is remained.

One of the assumptions of MPT is that investors are risk averse and mean-variance optimizers; no additional expected return can be gained without increasing the risk of the portfolio. Or alternatively, no added diversification can lower the portfolio's risk for a given expected return. It is further assumed that investors are only interested in the expected returns and the volatility of portfolios. Characteristics on the distribution of returns, like the skewness are not relevant because it is assumed that returns are normally distributed (Brealey, Myers and Marcus, 2001).

In order to describe the MPT, Exhibit 2.4 provides an overview of the terms and quotations used in equations.

Exhitbit 2.4. Quotations.

Term	Notation
Portfolio return	$\tilde{R}_p$
Expected portfolio return	$E(\tilde{R}_p)$
Portfolio return variance	$\text{var}(\tilde{R}_p)$
Portfolio weight on asset i	x_i
Asset i's return	$\tilde{r}_i$
Asset i's expected return	$E(\tilde{r}_i)$ or $\bar{r}_i$
Asset i's return variance	$\text{var}(\tilde{r}_i)$ or σ_i^2
Covariance of asset i and asset j's return	$\text{cov}(\tilde{r}_i, \tilde{r}_j)$ or σ_{ij}
Correlation between asset i and asset j's return	$\rho(\tilde{r}_i, \tilde{r}_j)$ or ρ_{ij}
Beta of asset i	β_i
Risk-free return	r_f
Market Portfolio return	R_M

The mean-variance analysis describes mathematically how the risk and return of individual assets contribute to the risk and return of a portfolio (Grinblatt and Titman, 2002). The model considers an asset return as a random variable. A portfolio contains assets whereby the return is defined as the weighted combination of these assets' returns.

The portfolio weight on asset i, is the fraction of a portfolios' wealth held in asset i:

$$x_i = \frac{euros\ held\ in\ asset\ i}{euro\ value\ of\ the\ portfolio} \tag{1}$$

For *N* assets the portfolio return formula is:

$$\tilde{R}_p = \sum_{i=1}^{N} x_i \tilde{r}_i \tag{2}$$

The mean variance analysis focus on the future expected returns on investments. In order to estimate these expected returns one should weight each of the potential return outcomes by the probability of the outcome and sum the probability-weighted returns over all outcomes.

For *N* assets in portfolio, the expected return is the portfolio-weighted average of the expected returns of the individual assets in the portfolio:

$$E(\tilde{R}_p) = \sum_{i=1}^{N} x_i E(\tilde{r}_i) \tag{3}$$

As a portfolio manager adds securities to a portfolio, the variance (risk) is reduced when the additional securities do not co-vary perfectly with other securities in the portfolio. Because assets from similar geographic regions and industries tend to move together, diversification is most effective if a portfolio contains assets from a variety of regions and industries. To estimate the portfolio variance, one must first compute the variances of the individual assets and the covariance between assets of the portfolio.

The variance of a return on asset *i* is computed by:

$$\text{var}(\tilde{r}_i) = E\left[(\tilde{r}_i - \bar{r}_i)^2\right] \tag{4}$$

The variance of a portfolio return depends mainly on the covariances of the assets in the portfolio. The covariance indicates the degree to which asset returns tend to move together. In practice the forward-looking approach in estimating co-movements is difficult to apply. Therefore, the covariances are often estimated on basis of historical returns. The covariance between two assets returns *i* and *j*, is computed by the expected product of the demeaned outcomes:

$$\sigma_{ij} = E\left[(\tilde{r}_i - \bar{r}_i)(\tilde{r}_j - \bar{r}_j)\right] \tag{5}$$

Now, the variance of a portfolio of assets can be computed by the weights of the assets in the portfolio, the variances of the returns of each asset and the covariances between the returns of each pair of assets in the portfolio:

$$\text{var}(\tilde{R}_p) = \sum_{j=1}^{N} x_j^2 \sigma_j^2 + 2\sum_{i<j} x_i x_j \sigma_{ij} \tag{6}$$

Note that equation 6 includes two components that influence the variance of the portfolio. The first part of the equation represents the variance of the assets and the second part of the equation deals with the covariance of the portfolio assets. By including more assets in a portfolio the first part can be diversified away (unsystematic part of risk). In an optimal diversified portfolio only the covariances between the assets (second part of the equation) have influence on the variance of the portfolio.

Often the variance of a portfolio is represented by using correlation coefficients. The correlation between two returns is the covariance between the returns divided by the product of their standard deviations:

$$\rho(\tilde{r}_i, \tilde{r}_j) = \frac{\text{cov}(\tilde{r}_i, \tilde{r}_j)}{\sigma_i \sigma_j} \tag{7}$$

A positive correlation coefficient indicates that the assets move together on average over time, and a negative value indicates movement in the opposite direction. When composing a global diversified portfolio a manager should therefore worry about the correlation coefficients between assets. For the variance of a portfolio in terms of correlations and standard deviations this means:

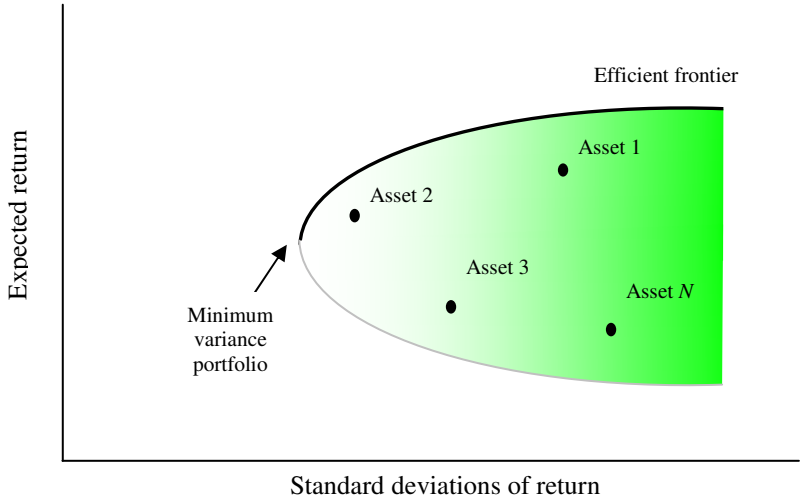
$$\text{var}(\tilde{R}_p) = \sum_{i=1}^{N}\sum_{j=1}^{N} x_i x_j \rho(\tilde{r}_i, \tilde{r}_j)\sigma_i \sigma_j \tag{8}$$

Risk-return diagram

The next step is using the expected portfolio returns and risks (variances) to illustrate the importance of the portfolio weights. A risk-return diagram maps the trade-off between expected returns (*Y*-axis) and standard deviations (*X*-axis). Thereby, it gives insight in the consequences of the determined portfolio weights for the risk-return profile of a portfolio. In a risk-return diagram every possible portfolio combination of assets can be plotted. This is called the feasible set –the green shaded area– in figure 2.3. As can be seen in this figure, an investor achieves higher expected returns and lower risk by choosing portfolio weights that results in 'moving to the northwest' within the feasible set. The most left point on the

boundary describes a portfolio with the lowest risk (minimum variance portfolio) when a risk-free asset is not available.

Figure 2.3. The feasible set



Source: own version of Grinblatt and Titman, 2002

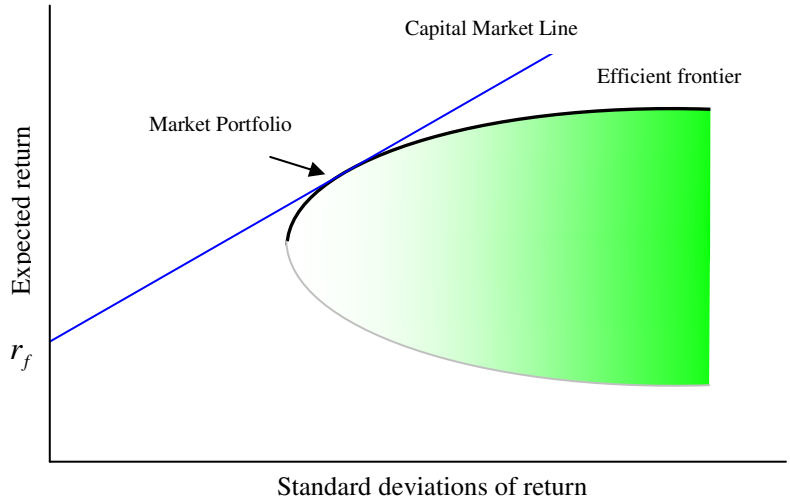
The black-line along the upper edge of the boundary is known as *the efficient frontier*. The region above the frontier is unachievable when holding only risky assets. The area below the frontier is characterized by suboptimal portfolios. For example, a portfolio that contains only Assets 1 provides a higher expected return with lower risk compared to a portfolio that contains only Assets *N*. A portfolio that contains only Assets *N* is therefore stated as suboptimal. Combinations along the efficient frontier represent portfolios for which there is lowest risk for a chosen level of return. The efficient frontier is where an investor wants to be, given the assumption that investors are risk-averse and a risk-free asset is unavailable. A personal trade-off between risk and return determines which portfolio on the efficient frontier is most suitable for a specific investor.

Adding risk-free assets to the efficient frontier

In figure 2.3, the feasible set was presented given the assumption that a risk-free asset was not available. By definition, a risk-free asset has zero variance in return (risk-free) and thereby is uncorrelated with other assets. In practice, a risk-free asset does not exist. However, a short-term government security is often used as proxy for this risk-free asset. As a result, including risk-free assets in a portfolio of risky assets changes the shape of the optimal portfolio choices. Figure 2.4 presents this relationship; the shape of the optimal portfolios function changed from a hyperbola to a straight line. The minimum variance portfolio moved from the most left point on the boundary of the feasible set to the interception of the straight line with the *Y*-axis. The mean variance portfolio is now a portfolio that contains only risk-free assets.

The blue-line in figure 2.4 represents the Capital Market Line (CML). The points on the CML have superior risk-return profiles to any portfolio on the efficient frontier. The CML represents portfolios that combine all investments optimally. As can be seen in figure 2.4, by combining risk-free assets to a risky portfolio a higher level of return -for a given amount of risk- can be achieved (points above the efficient frontier).

Figure 2.4 Combining risky portfolios with a risk-free asset



Source: own version of Grinblatt and Titman, 2002

The Market Portfolio is a unique optimal portfolio that contains no risk-free investments and can be found at the point where the CML tangent the efficient frontier in figure 2.4. A relatively risk neutral/loving investor chooses to invest in a portfolio that lies to the 'north-east' of the point of the Market Portfolio at the CML by taking a short position in r_f (leverage). A moderately risk-averse investor may determine to invest in a portfolio at the point of the Market Portfolio. While, a risk averse investor may choose to invest in a portfolio on the CML that lies closer to r_f. The CML is represented by:

$$E(\tilde{R}_p) = r_f + \frac{\overline{R}_M - r_f}{\sigma_M}\sigma_p \qquad (9)$$

Where $\overline{R}_M$ and σ_M are the expected return and standard deviation of the Market Portfolio.

As mentioned before, a rational investor wants to determine the portfolio weights so as to get a portfolio that lies on the CML. Once the investor knows the portfolio weights of the Market Portfolio, he can just add more or less risk-free assets or Market-portfolio-assets to move up or down on the CML according to his own preferred risk-return profile.

Since the market contains numerous assets available to form a portfolio, finding the correct portfolio weights is best left to a computer. For identifying the Market Portfolio one should find the portfolio that has a covariance with each asset that is a constant proportion of the asset's risk premium. For the completeness: this calculation should contain the following two steps (Grinblatt and Titman, 2002):

1. Find weights that make the covariance between the return of each asset and the return of the portfolio constructed from these weights equal to the assets' risk premium;
2. For obtaining the Market Portfolio: rescale the weights to sum to 1.

In finding the weights that make the covariances equal to the assets' risk premium, the following equation is used:

$$\frac{\bar{r}_i - r_f}{\text{cov}(\tilde{r}_i, \tilde{R}_M)} = \frac{\bar{R}_M - r_f}{\text{var}(\tilde{R}_M)} \tag{10}$$

Capital Asset Pricing Model

After Markowitz (1952) laid the groundwork for the MPT several researchers made contributions to the existing literature on this subject independently. A simplification of the portfolio theory was created for making the theory applicable in practice. This simplified model is known as the Capital Asset Pricing Model (CAPM). CAPM was established by William Sharpe (1964) and later developed by John Lintner (1965) and Jan Mossin (1966).

The CAPM elaborates on how assets should be priced regarding investors' expectations of risks and return. The assumption that the market portfolio includes all investable assets of the world means that all the specific risk is diversified away completely. Therefore, the systematic risk equals the total risk of the market portfolio. Sharpe introduced Beta (β), which is another measure of risk. Beta indicates the volatility of an asset with respect to the market portfolio (all the systematic risk). In the previous was stated that a portfolios' risk depends on the variance and covariances of its asset returns. However, in determining the expected rate of return of an asset with the help of CAPM the *marginal* variance of assets is important. The marginal variance of return is the relevant risk and is represented as the beta computed with respect to the Market Portfolio (Grinblatt and Titman, 2002).

In order to find the relation between the relevant risk of an investment and its expected return, one can reformulate equation (10) as:

$$\bar{r}_i - r_f = \frac{\text{cov}(\tilde{r}_i, \tilde{R}_M)}{\text{var}(\tilde{R}_M)} (\bar{R}_M - r_f) \tag{11}$$

Knowing that β_i is characterized as the movement of an asset with respect to the Market Portfolio:

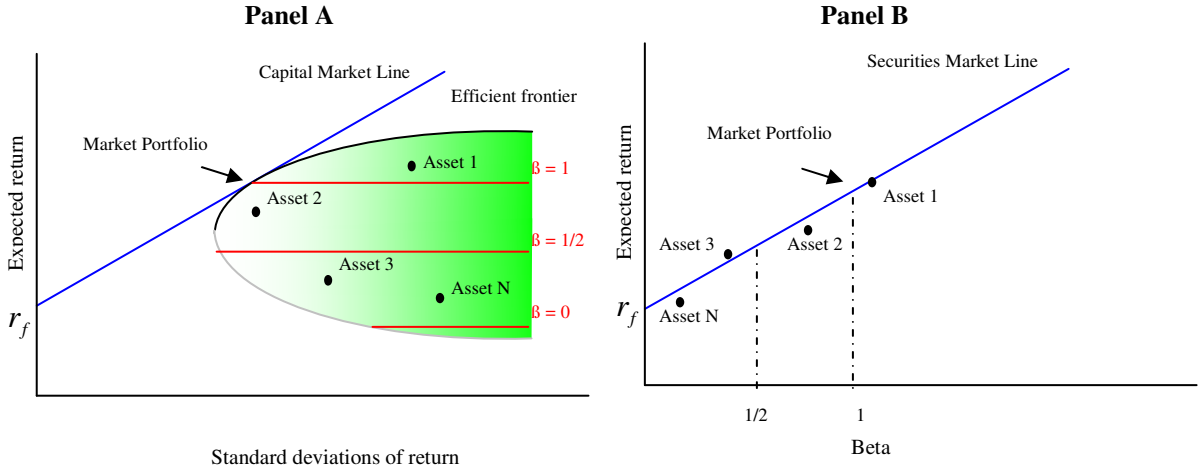
$$\beta_i = \frac{\text{cov}(\tilde{r}_i, \tilde{R}_M)}{\text{var}(\tilde{R}_M)} \tag{12}$$

Therefore the return of an individual asset as an expression of its risk can be found by (CAPM):

$$\bar{r}_i = r_f + \beta_i(\bar{R}_M - r_f) \tag{13}$$

The notation of β as a measure of risk is further useful because it represents the slope coefficient of the CML. The Security Market Line (SML) is another way to represent the relationship between expected return and risk. The SML uses beta as a measure of risk on the *X*-axis (marginal variance) and can be plotted as a straight line in an expected return-beta diagram. The SML can be seen in figure 2.5, where the same assets and the same Market Portfolio are plotted in panel A and B. The main difference between panel A and B is that beta represents the marginal variance of an asset in panel B, instead of the standard deviation as an assets' measure of risk in panel A. Therefore the slope of SML is represented by the market risk-premium ($\bar{R}_m - r_f$).

Figure 2.5. Mean-Standard Deviation Diagram vs. the Securities Market Line



Source: own version of Grinblatt and Titman, 2002

The superiority of plotting the risk-return diagram as in panel B is that all investments come to lie on a straight line (the SML). The risk-return profile plotted in a linear function, instead of in a hyperbolic function makes it more appropriate for calculations with statistical tools. Both the efficient portfolios and the suboptimal portfolios of panel A represent points on the

SML in panel B. As can be seen in panel A, investments with the same expected return may have different standard deviations. However, as indicated by the red horizontal lines, they must have the same beta. Therefore, all portfolios on the red line to the right of the Market point in panel A have the same beta as the Market Portfolio ($\beta = 1$) and are plotted in the same point in panel B.

Note in panel B that r_f has a beta of zero (uncorrelated with other assets) and the Market Portfolio has a beta of one. The beta of the Market Portfolio is one, because the numerator and denominator to compute the beta are identical as can be seen in equation 12. Of course, this must be true because the co-movement of the Market Portfolio with respect to itself is identical. Recapitalized: All points on the SML represent portfolios where the proportional distances on the line represent the marginal variances with respect to the Market Portfolio.

Diversifying assets globally

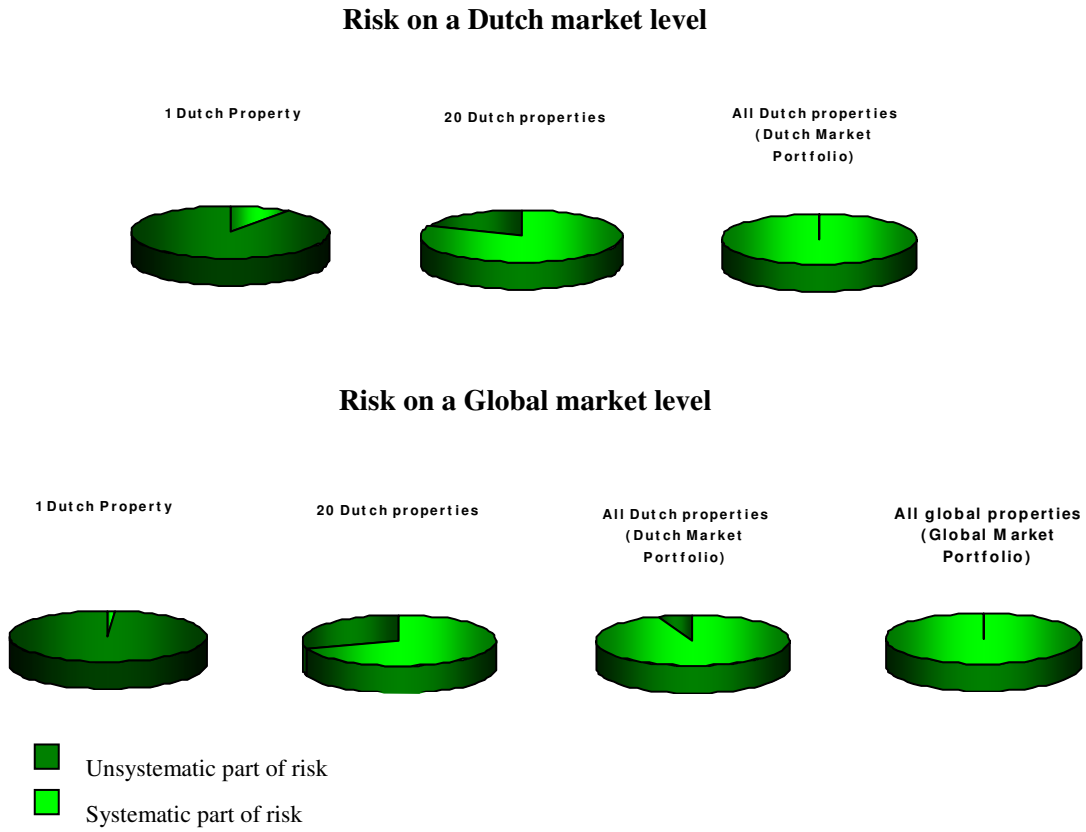
As mentioned in the beginning of this paragraph: Markowitz demonstrated that risk can be differentiated into a systematic part and an unsystematic part. In general, the systematic part is unavoidable and is tied to a particular asset class or market. Unsystematic risk is asset/firm specific and can be reduced by creating a mixed-asset portfolio. Thus, the unsystematic part of risk is reduced by adding securities to a portfolio with low or negative correlation coefficients. However, this reduction of unsystematic risk is in essence not an explanation for the reason why portfolios should be diversified globally.

The statement that the systematic part of risk is unavoidable is made under the assumption that an economy contains only one market. Examples of systematic risk include inflation, recession and high interest rates, which have an impact on all firms and assets in the market and thereby can not be avoided. Nevertheless, in reality the global economy consist of several markets. In understanding why global diversification is important consider the following:

When looking at the Dutch property market, an investment in only one property is exposed to a relatively large amount of unsystematic risk. The effect of adding additional properties to the portfolio is inverse related to the part of unsystematic risk. All the unsystematic risk is theoretically diversified away by holding the Dutch Market Portfolio. The only risk the investor is exposed to is the systematic risk of the Dutch market. Now, this investor decides to invest abroad and includes more and more assets from foreign markets in his portfolio. This is illustrated in Figure 2.6. The investor should reposition his market perception from a domestic to a global level. On a global level, investing in the Dutch market portfolio does not eliminate

all the unsystematic risk in the global market. By adding foreign assets in his portfolio, at some moment he reaches the point where he holds the *global* Market Portfolio. By holding the Global Market Portfolio a part of domestic systematic risk is diversified away, because on a global level it 'turned' into unsystematic risk. By holding the global Market Portfolio a part of domestics' country risk (political and economical) is diversified away. This is in essence the reason why investors should diversify their portfolios globally.

Figure 2.6. Relationship between unsystematic and systematic risk on a domestic and global level.



Naïve diversification

International diversification improves the risk-adjusted performance of a domestic portfolio, assuming that the property markets are not highly integrated. As mentioned before, when composing a global diversified mixed-asset portfolio a manager should worry about the correlation coefficients between properties. A correlation coefficient measures the degree of co-movement between two assets. A positive correlation indicates that the assets returns move together on average over time, and a negative correlation indicates movement in the opposite direction (Moore and McCabe, 1993). For private investors it may be impossible to explore correlation coefficients. An investor, not taking into account the correlation coefficients, could just simply invest in a number of different assets in several countries and hope that the variance of the expected return on the portfolio is lowered. This is called naïve diversification.

This strategy may be acceptable as long as investors are able to move their capital and assets freely across countries (Geurts and Nolan, 1997). Most markets for stocks and bonds are approximately fully integrated and efficient, but real estate markets are certainly not. The physical real estate market is characterized by relative lack of liquidity, large purchase size, heterogeneity, and high transaction cost (Exhibit 2.3). In these markets it is obvious that investors are not able to move their properties freely. Therefore, especially in composing a portfolio of real estate assets the physical locations of the properties are enormous important. An investor should focus on the different economic characteristics between countries when composing a well diversified property portfolio (Geurts and Jaffe, 1996).

2.3.2 Problems of applying the Modern Portfolio Theory in practice

The previous paragraph dealt with the theoretical framework of the Modern Portfolio Theory (MPT). It provided insight in how assets should be allocated in order to create a well diversified portfolio. The betas and the weights of the portfolio assets appeared of decisive importance. However, implementing the MPT in practice, especially on real estate assets results in a few problems:

1. Assumptions of CAPM;
2. Means and covariances are generally unobservable;
3. The allocation to real estate assets can not always be realized;
4. Defining return series that are appropriate to use as a proxy to private investors.

1. Assumptions of CAPM

Simplifying the MPT resulted in a model (CAPM), which is more appropriate for estimations with statistical tools. However, in simplifying the theory the researchers did base the model on a couple of assumptions, whereby the model moved further away from being a perfect reproduction of reality. The assumptions of CAPM include (Brealey, Myers and Marcus, 2001):

- Capital markets are strongly efficient;
- Perfect markets;
- Returns are distributed normally;
- There are no arbitrage opportunities;
- All investors have rational and homogenous expectations;
- No inflation and no change in the level of interest rates;
- Risk-free rates exist and equal borrowing and lending rates;
- Unlimited borrowing and universal access to capital.

Capital markets are considered efficient if assets are priced correctly with respect to the available information to investors. If perfect information is available to all investors, it is impossible to consistently sell assets above the equilibrium price, without harming another investor (A Pareto Optimal situation). Fama (1976) distinguished three forms in which the efficient market hypothesis is commonly stated: weak form efficiency, semi-strong form efficiency and strong form efficiency. In a weak form efficient market is assumed that prices adapt to information from historical market prices. No excess returns can be earned by using strategies based on historical financial data. In a semi-strong efficient market is assumed that market prices reflect all the public available information. Fundamental analysis techniques will not be able to obtain excess returns. Finally, in a strong efficient market all the information is absorbed in the capital market and no one can consistently earn excess returns. Real estate markets are considered weak form efficient or slightly semi-strong efficient. Brown and Matysiak (2000) used two techniques to analyze if the returns of real estate properties follow random walks: unit root tests and variance ratio tests. The results of these non-parametric runs test support the hypothesis that international commercial real estate markets are weak form or slightly semi-strong efficient.

Another assumption of CAPM is that expected returns are distributed normally. A non-normal distribution of returns has implications on expected returns and risk. The mean return is thereby statistical not a correct representation of expected return. Further, exceptional peaks or troughs result in asymmetrical distributions by which portfolio variances are not sufficient as an appropriate measure of risk. The distribution can be corrected for exceptional peaks or troughs, but then the question arises if removal of this information results in a distorted view on portfolio risk. The more thorough a portfolio is diversified, the better chances are that distributions are approximately normal. A well diversified portfolio includes sufficient properties and tends to have a normal distribution due to contrasting correlation coefficients of the asset returns.

A perfect market is characterized by unrestricted market functioning. The capital market has the strong form efficiency. In the market is utility maximization and perfect competition and there are no transaction costs, no economies of scale or scope and homogeneous products (Grinblatt and Titman, 2002). Most economic theories assume perfect capital markets; while in reality a perfect capital market does not exist.

It is obvious that the real estate market is certainly not a perfect market. Already, this was briefly mentioned in Paragraph 2.2.3. Physical real estate markets are distinguished by the following characteristics (Gool van, Jager and Weisz, 2001):

- Real estate assets are heterogeneous. Every property is considered unique; there is not a second identical property in the world. Besides, there is not just one market but real estate markets are segmented by region as well as by asset class;
- Real estate markets are considered weak form efficient or slightly semi-strong efficient. The risk-return profiles of properties are reasonably reflected in market prices (Brown and Matysiak, 2000);
- Real estate assets have large purchase sizes and are not or hardly separable in smaller parts;
- In real estate markets is price forming not continuously. Asset prices are established by appraisal. Transaction information is thereby subjective, often incomplete and often held confidentially;
- Real estate assets are not movable. Therefore, the value of a property depends for a large part on its location;
- Real estate markets face several market imperfections: high transaction costs, unsatisfying transparency, information asymmetry and illiquid assets;
- Real estate assets have long production periods. Because of this, supply on real estate assets reacts delayed on demand. The price elasticity on supply of real estate assets is negative on the short-term. While on the long-term the price elasticity on supply is quite large.

Real estate markets do not meet the assumptions of a perfect market. Besides, other criteria of CAPM are also based on false assumptions. There is no such thing as homogenous market expectations by all investors, a truly risk-free asset, no inflation or a perfectly efficient market. But, does the fact that these assumptions do not meet the reality imply that CAPM is a useless tool on portfolio diversification?

This question should be answered negatively. One can conclude that the unrealistic assumptions of CAPM and the imperfect real estate markets make the model useless in modeling the real world perfectly. However, what is gained by the model is the ability to simplify the world so that we can understand it better. CAPM enables investors to obtain insights in the way assets are priced, which can not be seen in the complex world. So in spite the limitations and shortcomings of the model, CAPM is a useful tool in creating an approximately mean-variance efficient portfolio. In recognizing the shortcomings of the model it is important to see which part is useful and which part of the model may be modified to improve its relevance for real estate markets.

From a descriptive perspective, the CAPM describes what the real world looks like under the given assumptions. Investors can use this information in trying to predict what will happen in the nearby future. Some assumptions are in practice not far from the truth. Asset markets are reasonably efficient; information is relative quickly absorbed in market prices. Investors do not hold the same market expectations, but in practice most investors hold fairly similar expectations. Beta does not cover the total explanation of risk and expected returns, but it covers the most part. Further, CAPM suggests that all investors should hold the same (market) portfolio. In reality this goes much too far, but the suggestion that investors should diversify their portfolios is appropriate and is also seen in the real world (Geltner and Miller, 2001).

To imply CAPM on real estate markets the model needs some adjustments for outcomes to be more meaningful. First, according to the CAPM theory the market portfolio should include all the assets in the world that are appropriate to invest in. For this overall wealth portfolio is often a stock market used as a proxy. For a portfolio of stocks this might work quite well, but it is certainly not an appropriate risk benchmark for real estate assets portfolios. In order to estimate an appropriate beta, one should use a mixed-asset portfolio including real estate assets that serves as a proxy for the market portfolio.

A second problem of using CAPM to real estate assets is the way data are used to calculate the beta. As mentioned in Chapter 2.3.1, for calculating beta and variances periodic returns time-series data are necessary. The readily available daily closing prices in the stock markets provide an appropriate measure for computing betas on stocks. In the case of traded real estate assets, however, transaction values or appraised values of properties are used to measures the periodic indirect returns. Transaction values are often not available or held confidential. Further, transaction values suffer the problem of the Random Noise effect. The problem with appraised values is that prices are based on the opinion of appraisers, who foremost base their appraisal on backward looking to prices of comparable traded properties. Besides the Random Noise effect, two other types of errors will occur due to the use of appraisal values: the Temporal Lag effect and Smoothing (Geltner and Miller, 2001).

The Random Noise effect

The noise effect appears through differences between the empirical observable valuations and the unobservable true contemporaneous market values. Random noise does not change the expected value of the periodic return because the expected value of the error term is zero. But it does change the volatility; the standard deviation of the periodic returns across time. By adding ‘extra’ volatility to the returns over time the volatility increases. Thus, noise can make it appear as if two real estate market segments are less correlated than they actually are. Noise

does not affect the theoretical covariance between the returns and any exogenous series because a purely random variable has no covariance with any other series. Therefore noise does not affect the beta (systematic risk). The noise component will be most interfering in smaller portfolios. Because of the *Square Root of N Rule*, noise will be a minor problem in large portfolios or indices.

The temporal lag effect and smoothing

The temporal lag effect arises due to different moments of appraising the properties that a portfolio consists of. In composing portfolios or indices, not all the properties are appraised at the same moment. So, the portfolio usually contains out-dated values of properties. For example, if unobservable true returns have been rising, the returns of a portfolio containing 'older' properties will tend to be low biased. Further, the most import problem of using appraise-based values is that it reduces the apparent beta of the real estate returns measured with respect to a nonlagged mixed-asset portfolio. This is referred to as appraisal smoothing. One should compare smoothed periodic returns with a lagged mixed-asset portfolio or unsmoothed periodic returns when including real estate assets to a nonlagged mixed-asset portfolio. The correlation-coefficient and beta of lagged real estate series with respect to a similarly lagged portfolio shows only a very slight bias. Because, the empirical study of this thesis compares the risk-returns profiles of pure real estate portfolios the effects of appraisal smoothing and lagging are slim to none. Returns series need only be adjusted for these effects when comparing real estate returns to returns of portfolios that contain stocks, bonds or other financial assets[1] (Geltner and Miller, 2001).

2. Means and covariances are generally unobservable

In finding mean-variance efficient portfolios it is problematical that means and covariances are unobservable. In applying mean-variance analysis in reality these values need to be estimated. These estimations are often based on historical returns. By doing so, ex-ante values are estimated on ex-post basis. This results in two practical issues. First, the calculation of all the necessary inputs seems to be a heroic undertaking, given that there are countless amounts of investable products. Second, the estimated means and covariances will not be exactly the same as the 'true' means and covariances for virtually all of the assets. The past is not always representative for the future.

These considerations are however far less important for the applicability of mean-variance analyses on portfolio allocations issues, than on individual assets. The estimations of means

[1] Appendix A will elaborate about effects of smoothing, lagging and about unsmoothing techniques.

and covariances on portfolios returns are closer to their 'true' values than the estimation of means and covariances on individual stock returns. Estimations on means and covariances are more accurate because random estimation errors across assets tend to mule out one another in a portfolio (Grinblatt and Titman, 2002). So, usage of ex-ante values based on ex-post estimations does not limit the use of mean-variance analysis in this study.

3. The allocation to real estate assets can not always be realized

The MPT is a tool to allocate assets in order to compose a mean-variance efficient portfolio. In estimating asset weights the assumption is made that investors are able to realize these assets weights in reality. For financial assets like stocks and bonds this is usually feasible in practice. However, for real estate assets there are a few practical issues.

As mentioned before, real estate assets are, among other things, characterized by large purchase sizes and the fact that they are not or hardly separable in smaller parts. Further, in practice it is not always possible to buy the specific amount of real estate assets in a specific city, industry or country. Finally, it is practically impossible to find properties that exactly produce the same returns as the outcomes of the model indicate.

One can conclude that the outcomes on portfolios' assets weights are not possible to duplicate exactly in reality. However, the outcomes of the model are not considered useless. The outcomes of the mean-variance analysis can be used as a guideline. Investors should pursuit the outcomes of the model in composing their asset portfolios in order to approach a mean-variance efficient portfolio. In an attempt to realize a mean-variance efficient portfolio, investors could 'fine-tune' their portfolios by including indirect real estate assets. The indirect real estate assets face less liquidity problems than physical real estate assets do.

4. Defining return series that are appropriate to use as a proxy to private investors

In applying mean-variance analysis, portfolio managers use benchmarks to compare the returns of their property portfolios. In MPT this benchmark is found in the Market Portfolio. In order to apply a benchmark in practice, one should use a long-term reliable index as a proxy for the Market Portfolio. In general, a risk benchmark should possess the following characteristics: unambiguous, investable, measurable, appropriate, reflective of current investment opinions, and specified in advance (Bailey, 1992).

The Anglo-Saxon countries have the longest track-record on long-run returns indices for commercial properties. The United Kingdom and the United States were the first countries where property indices were established. The British IPD and the American NCREIF go back

for 34 and 27 years respectively. Years later started the Australian PCA (21 years) and the Irish IPD (20 years) indices. IPD started relatively recently more indices on the European continent. An IPD index in the Netherlands was started in 1995 and was followed in Germany (1996), Sweden (1997), France (1998), Denmark (2000) and Norway (2000). As a result of the persisting demand by the investment industry for sufficiently long and broadly based indices the Dutch indices for returns on offices, retail and residential real estate assets were constructed dating back to the year 1977 (Hordijk, 2005).

The ROZ-IPD Netherlands Property Index is established by ROZ in cooperation with the Investment Property Databank (IPD) in London. The ROZ-IPD index measures the performance of physical real estate assets in the Netherlands owned by 30 participating institutional investors. For the year 2006, the index comprises 5.368 assets with a combined value of at least 45 billion euros. The ROZ-IPD is considered a reliable benchmark for physical real estate returns earned by institutional investors. Is it however an appropriate proxy for real estate returns earned by private investors?

The answer to this question should be answered negatively. The ROZ-IPD index enables institutional investors to make an objective comparison between the benchmark and their property returns. However, private investors have different investment strategies by which the use of the index' returns are not an appropriate proxy for returns to private investors. Therefore, it is valuable to see if the returns of the IPD benchmark can be modified in order to create a more appropriate proxy for returns to private investors.

Paragraph 2.1 provided insight in the characteristics of Dutch private investors. A closer look at the differences between institutional and private investors' investment strategies is helpful to understand in what way the index needs modifications. Paragraph 2.1.9 emphasizes on these differences. The main differences between private and institutional investors include:

- Private investors use higher leverage ratios. Most properties are financed with a leverage ratio of at least 75 percent.
- Private investors hold in general smaller portfolios than institutional investors. Because of the small-scale portfolios, the private investors are pouncing on the investments and are dedicated to realize low vacancy rates.
- Private investors face fewer obligations to their investments and are generally less risk-averse. This is foremost a consequence of the fewer restrictions they face on investments compared to institutional investors.

- Private investors make investment decisions mostly on gut feeling and opportunities, while institutional investors use investment analyses on making investment decisions;
- Institutional investors diversify their portfolios in general more sophisticated among different regions and asset classes.
- Institutional investors have economies of scale and scope in the management of properties. Private investors on the other hand have benefits in local market knowledge.

When considering these different characteristics one can conclude that private investors should compare their returns to more volatile and higher returns than the returns of the index that is used by institutional investors. Private investors seem to be less risk averse and use higher leverage ratios and should therefore expect higher returns. However, these higher expected returns should result in stronger volatility (risk) in returns due to small-scale portfolios and unrefined market analyses. How can the IPD index be modified to this different risk-return profile?

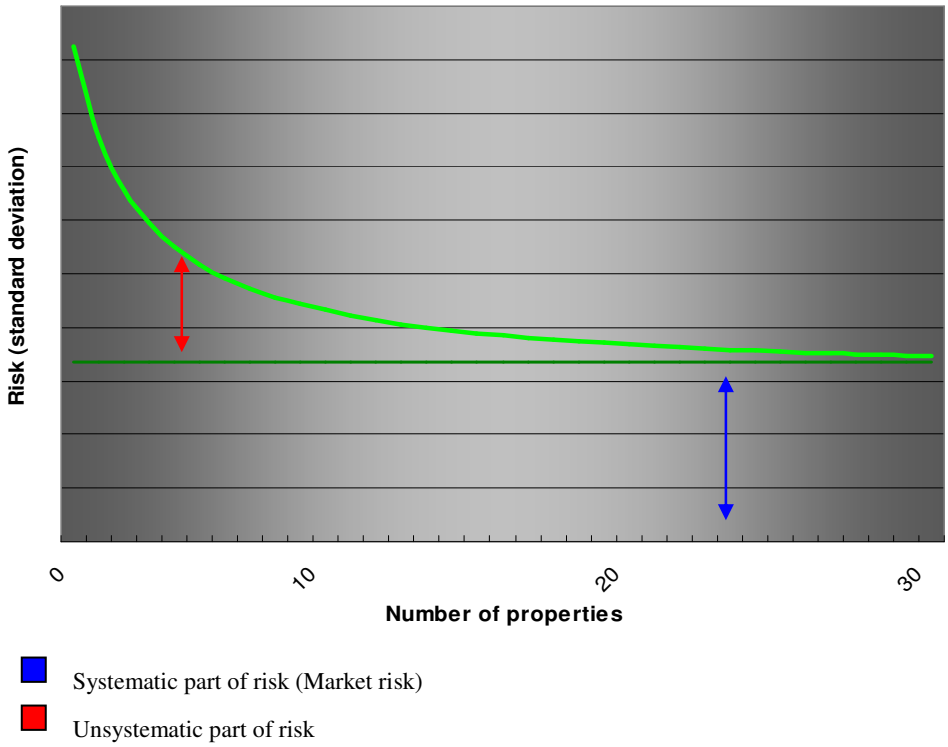
The returns of the IPD index should be modified on at least two aspects:

1. Poorly diversified portfolios should result in a higher risk level.
2. The effect of leverage.

1. Poorly diversified portfolios should be exposed to a higher level of risk

Because private investors hold relatively small-scale portfolios the level of unsystematic risk in returns is larger than on returns for institutional investors. Institutional investors hold in general more sophisticated diversified portfolios and thereby suffer hardly any unsystematic risk. The theoretical influence on the amount of properties to the level of risk is represented in Figure 2.7. The IPD index consists of many properties and is therefore only exposed to systematic risk (market risk).

Figure 2.7. The effect of diversification on portfolio risk



A private investor holding a small-scale portfolio of five properties suffers, besides the systematic part also unsystematic risk. While in general, institutional investors invest in at least thirty different properties and thereby suffer only the systematic part of risk. A private investor expects the same level of return but at a higher level of risk due to unsophisticated diversification. In modifying the returns of the IPD index in a way that they are appropriate to use by private investors the returns should therefore have a larger volatility around the mean. In order to create more volatility in the benchmark each individual IPD index return should be adjusted:

$$R_{p,t} = IR_{i,t} + \alpha\left(IR_{i,t} - \overline{IR}\right) \tag{14}$$

Where:

$R_{p,t}$ = The portfolio return to private investors in period t

$IR_{i,t}$ = The individual index return in period t

$\overline{IR}$ = The average return of the index

α = Level of adjustment

In adjusting the individually IPD returns an appropriate level for α should be estimated. Chapter III Methodology will deal with an appropriate estimation for the level of α.

2. The effect of leverage

In constructing the IPD property index is assumed that properties are completely financed with equity (Hordijk, 2005). The compilers of the index consider that investors use a leverage ratio of zero. In practice, private investors finance their properties with at least a leverage ratio of 75 percent on average. To adjust the benchmark returns to the amount of leverage the following equation is used (Brealey, Myers and Marcus, 2001):

$$r_T = r_d\left(\frac{D}{D+E}\right) + r_e\left(\frac{E}{D+E}\right) \tag{15}$$

Rewriting equation 15 results in an equation for returns which are adjusted for leverage:

$$r_e = r_T + \left(\frac{D}{E}\right) * \left(r_T - r_d\right) \tag{16}$$

Where:

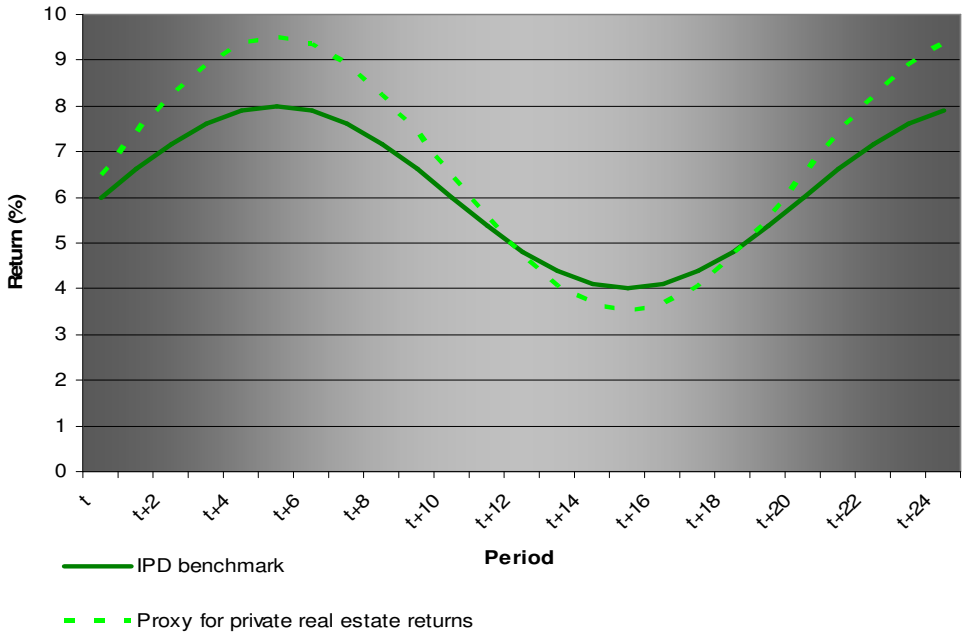
r_e = Return on equity
r_T = Total return (= return on the IPD index)
r_d = Cost of debt
D = Debt level
E = Equity level

When making assumptions on the value of r_d and the level of leverage that is used by private investors, the IPD returns are adjusted for the effect of leverage.

Summarizing the adjustments

By adjusting the IPD returns for leverage and additional risk, the returns of the IPD index can be used as an appropriate proxy for returns to private investors. Figure 2.8 represents a graph of these adjustments and gives insight in how the returns to private investors differ from the original unadjusted returns of the IPD index. As can be seen the dotted line represents a higher average (expected) return and represents a stronger volatility (risk) around its mean.

Figure 2.8. the IPD index versus a proxy for private real estate returns



A critical note on the use of the IPD index returns

The returns of IPD indices in several countries are adjusted and used as a proxy for returns to private investors in an empirical study of which the methodology is described in the next chapter. A lot of companies use the IPD indices as a benchmark. However, one should put some question marks with respect to the reliability of the input variables of these indices. The inputs for the composition of the IPD indices are originating from participating organizations from within the real estate industry. There is not an audit commission that accurately monitors if the inputs of these participating companies are correctly.

Further is assumed that, although not all properties of a country are included in the index, the IPD index is a representative proxy for returns on direct real estate assets.

2.3.3 Market evidence on diversification

Much has been written about benefits as a result of diversifying portfolios globally. Real estate markets are segmented by geographic regions as well as by asset class. Each region and each asset class has its own characteristics, and thereby its own risk-return profile. Therefore portfolio risk can be reduced by investing in properties of different asset types and in different geographic regions. However, about the benefits of global diversification is no consensus. In literature there are two contrasting opinions as to the level of benefits of global diversification. The first school of thought claims that there are significant benefits to be gained from holding real estate properties spread across several countries (Asabere, Kleiman

and McGowan, 1991, Wit de, 1997, Conover, Friday and Sirman, 2002). While other authors question the benefits of global diversification to improve portfolios' risk-profiles (Ziobrowski and Curcio, 1991, Mull and Soenen, 1997). Why do research outcomes differ on this matter?

These conflicting opinions are mainly caused by two factors. The first is that different research methods in analyzing direct or indirect property investments have major impacts on results. Analysis of characteristics and behavior of real estate funds show that these funds act more like stock than like real estate (Myer and Webb, 1993). Thus in a diversified portfolio, physical real estate assets result to larger diversification benefits in general. Due to differences in return-profiles, liquidities and transaction costs between direct and indirect property investments research outcomes differ.

Secondly, the financial markets around the world are becoming more integrated. The more markets are integrated; fewer benefits can be gained from global portfolio diversification. So chances are that early researches show more evidence for a positive effect than recent analysis. This problem is not a problem specific to real estate markets, but a burden for all portfolio managers (Wilson and Zurbruegg, 2003).

The next section will discuss recent research papers on international real estate diversification. Because this thesis focuses on diversification benefits to real estate investors in direct foreign property investments, only the research papers on direct property investments are reviewed.

Research papers that support diversification benefits

In 1996, Newell and Webb published a research paper on real estate diversification among five countries (the United States, Canada, the United Kingdom, Australia and New Zealand). This study examined the performance of real estate, stocks and bonds over the period 1985-1993. Currency-adjusted returns and risks were estimated for investors from each of these five countries. The adjustments for currency risk led to significant increases in investors' risk profiles. However, additional portfolio diversification was achieved by spreading direct real estate investments among these five countries.

In the same year, Geurts and Jaffe (1996) argue that the institutional characteristics of countries should receive more attention. In this study they emphasize that institutional characteristics among countries are potential sources for diversification benefits. The significant differences in the institutional framework influences property returns and should deserve the attention of investors. Political risk is a dependent factor of the institutional

framework in a country. Political risk is especially important prior to acquisition of direct property in a country. Geurts and Jaffe mention the possibility of unfair administration laws, the lack of law enforcement, corruption levels, nationalization and expropriation threats, as examples of political risk.

Pagliari, Webb, Canter and Lieblich (1997) analyzed commercial real estate returns in Australia, Canada, the United Kingdom and the United States over the 1985-1995 period. The analysis was made from the perspective of an US investor diversifying in real estate with an equally weighted portfolio in each country. In order to distinguish the effects of different asset types (Office, retail and warehouse) on diversification the returns in the national benchmark indices were separated. Furthermore, also the total returns were divided into their fundamental components: initial yield, growth in income and shifts in capitalization rates. The following conclusions were found: 1. Exchange rate fluctuations had positive effects on UK holdings, but negative affects on Australian holdings. 2. Despite international diversification benefits differed across sectors they were in general beneficially to the US investor.

A later study by Chua (1999) analyzed the consequences of including international real estate in a diversified mixed asset portfolio. Chua corrected returns in the period 1978-1997 for appraisal smoothing and made adjustments for higher transaction costs of direct property compared with other asset classes. Using mean-variance portfolio optimization the study concludes that the optimal allocations to real estate assets range from 3.7 % to 20.7 %, depending on the preference of an investors' risk level.

Hoesli, Lekander and Witkiewicz (2004) also used mean-variance portfolio optimization to investigate the benefits of including real estate assets in mixed-asset portfolios. In this research they include direct real estate in portfolios of financial assets in seven countries (the United States, the United Kingdom, France, the Netherlands, Sweden, Switzerland and Australia) for the 1987-2001 period. Like Chua these researchers also unsmoothed asset returns for a correct comparison motive. Further, both hedged and unhedged currency rates were analyzed in this research paper. They concluded that real estate is an effective portfolio diversifier. Benefits are largest when both domestic and international real estate are included in a portfolio. It is found that the optimal allocation to real estate is 15% to 25%, which is higher than Chua indicated.

Research papers that do not support diversification benefits

The Modern Portfolio Theory suggests that international diversification enhances the mean-variance portfolio efficiency. Ziobrowski and Curcio (1991) have empirically tested this

diversification hypothesis with globally mixed-asset portfolios. They studied benefits of adding U.S. real estate to British and Japanese investors' portfolio for the 1973-1987 period. For this purpose alternative risk-return efficient frontiers from the British and the Japanese perspective were generated. Although U.S. real estate appears to have low correlation with British and Japanese domestic assets, the gains on diversification were more than offset by currency losses.

Because the free-floating exchange rates appear to override any potential diversification benefits, Ziobrowski and Boyd (1991) extended the previous research. In order to hedge the exchanger risk exposure corporate managers borrowed funds in the home-country currency of their foreign assets. This strategy is used in this study to test if diversification benefits are significantly present. The same dataset is used to generate efficient frontiers for British and Japanese investors. Ziobrowski and Boyd concluded that diversification benefits to foreign investors are offset by higher levels of financial risk due to the high degree of leverage.

Unsatisfied with the previous conclusions the data-set was adjusted and four years later once more investigated by Ziobrowski and Ziobrowski (1995). The time period and the number of assets were extended. In periods of volatile exchange rates the efficiency of the mean-variance portfolio appeared to decrease when the amount of property transactions was increased. Besides real estate assets a mix of various assets was used in the construction of optimum mean-variance portfolios. In terms of diversification they concluded that it is more effective to diversify common stock among several countries than real estate assets. It appeared that exchange rate fluctuations had less influence on the correlation structure of common stocks compared to other types of assets.

In contrast with the previous studies, Myer, Chaudry and Webb (1997) did not use mean-variance techniques to investigate diversification effects. They used a *Johansen co-integration analysis* on three direct property indices (US, UK and Canada) over the period 1987-1992. A co-integration analysis gives insight in the extent that markets are integrated. The presence of co-integration indicates that external factors that hit those markets have the same influences on these markets' assets. The more markets are integrated; the fewer benefits can be gained by diversification. Myer, Chaudry and Webb found a co-integration at a 10% level. While this does not suggest that there are none diversification benefits, but it does indicate that benefits of diversification are certainly small on the long-run.

In the same year Quan and Titman (1997) performed a regression analysis on the relationship between stock market returns and commercial real estate. Data of 17 countries were analyzed

in the 1978-1994 period. The real estate returns are unsmoothed and dummy variables were used for cross-country control in the regression. The time-series evidence indicates that there is a strong positive relation between stock and real estate returns. Some countries, especially countries in the Asia/Pacific region, show large significant positive correlations, while in other countries the correlations are less positive. In the U.S., Australia, Canada and Hong Kong the relationship turned out insignificant. Quan and Titman conclude that since there is mostly a significant relationship between real estate prices and stock market returns there may be limited diversification benefits in holding real estate and stock in the same portfolio.

In principle, Case, Goetzman and Rouwenhorst (2000) believed that property markets around the world should be fairly independent of each other due to markets being location-specific. However, in their research using appraisal based property data over 22 countries over the period 1987-1997 they found evidence on strong globalization in property markets. The price changes in real estate markets appeared surprisingly correlated. Property markets are inter-linked as a result of the common exposure to world economic conditions. This indicates that long-term diversification benefits are slim to none.

One can conclude that research outcomes differ on the subject of diversification benefits. This is foremost a result of different data being investigated and different methods being used. Should returns be unsmoothed, should currency risk be hedged and should markets be poorly integrated to see benefits of diversification? The next Chapter will elaborate on these subjects in an empirical study to benefits of portfolio diversification to Dutch private investors.

Chapter III Methodology

Chapter II started with insight into the investment characteristics of Dutch private investors. Insight into their investment strategies and differences with respect to institutional investors provides a useful starting point in this thesis investigating diversification effects. In contrast with most other studies on portfolio diversification, this thesis focuses explicitly on diversification benefits to private investors. Paragraph 2.2.2 dealt with problems of applying the Modern Portfolio Theory in practice. An important conclusion of that paragraph includes the understanding that an appropriate proxy for returns to private investors differs from the available benchmark for institutional investors. The ending of Chapter II concludes that previous research outcomes differ due to different research methods used in studies to diversification effects. This chapter deals with the methodology used in the empirical study of this thesis.

3.1 Modern Portfolio Theory in practice

As addressed in Chapter II, there are a couple of problems by using CAPM in an empirical study to real estate diversification effects. For that reason a mean-variance analysis is used in this study. Mean-variance analysis is a tool that mathematically describes how the risk and return of individual assets contribute to the risk and return of a portfolio. The impact of an individual asset to the risk and return of a portfolio depends on the expected return, the risk of the additional asset and the covariance of the additional asset with the other assets of the portfolio.

Inputs of the model

A mean-variance model determines the weights on individual assets to obtain an efficient portfolio. As mentioned before, an efficient portfolio is a portfolio with lowest risk for a given level of return. In order to solve these asset weights the following input variables need to be determined:

1. The historical return series of all the potential assets.
2. An expected return for each potential asset.
3. A covariance matrix of the potential assets.

A mathematical model solves the asset weights at which the portfolio risk (standard deviation) is minimized given a specific target level of portfolio return. An investor holds an efficient portfolio by investing in assets according to the weights the model has determined.

1. Historical return series

To study the effects of global portfolio diversification one of the most important issues is the choice of the countries in which the real estate assets are situated and the portfolio is composed of. In this study is assumed that in constructing a diversified portfolio, private investors can only invest in properties situated in the Netherlands, the United States (US), the United Kingdom (UK), Canada, Ireland and Australia. The reason for the choice of properties in these markets is made because of the availability of long-term reliable historical return series in these markets. The indices in these countries are used as a proxy for historical return series for privately owned physical real estate assets. Exhibit 3.1 presents an overview of property indices in several countries. As can be seen the United Kingdom and the United States were the first countries where property benchmark indices were established. The IPD started relatively recently with indices in Germany, Sweden, France and other countries on the European Continent.

Exhibit 3.1, Property indices

Country	Data provider	Start date	Reporting Frequency
United Kingdom	IPD	1971	Annually
United States	NCREIF	1978	Quarterly
The Netherlands	IPD/WOZ	1979	Annually
Ireland	IPD/SCS	1984	Quarterly
Australia	IPD/PCA	1985	Annually
Canada	IPD/ICREIM	1985	Annually
Germany	IPD/DIX	1996	Annually
South Africa	IPD	1996	Annually
Finland	IPD/KTI	1997	Annually
Sweden	IPD/SFI	1997	Annually
France	IPD	1998	Annually
Denmark	IPD/DEI	2000	Annually
Norway	IPD	2000	Annually
Portugal	IPD	2000	Annually
Spain	IPD	2001	Annually
Italy	IPD	2003	Annually

Source: The IPD Index Guide, 2007.

In order to study diversification effects in a sophisticated way, it is important that long-term reliable historical return series are used. The results of a study that uses historical returns series dating back for only ten years or shorter are controversial. A historical time-series include returns that are influenced by trends or cycles. A reliable return series should include

several cycles or trends in order to be an appropriate benchmark (Pindyck and Rubinfeld, 1991, Chatfield, 2004). Especially, the usage of reliable long-term data is important in making statistical estimations on basis of these benchmarks. The historical IPD series in Germany, Sweden, France, Spain and other countries on the European Continent are too short to include several cycles and are therefore not used in this empirical study.

The quarterly US NCREIF and the quarterly IPD returns of Ireland are transformed in yearly returns. The yearly total return series from the NCREIF in the US and the yearly total returns series from the IPD in the UK, The Netherlands, Ireland, Australia and Canada for the 1985-2006 period are used in this study[2]. As mentioned before, these indices need to be modified in order to be an appropriate proxy for returns to private investors. Paragraph 3.2 will deal with these modifications.

2. An expected return for each asset

In finding mean-variance efficient portfolios it is problematic that expected returns are unobservable. In applying mean-variance analysis these returns need to be estimated. These estimations can either be based on historical returns or by making a forecast of expected returns. By estimating expected returns on based on historical return series, ex-ante values are estimated on ex-post basis. This results in a practical issue. When doing so, the assumption is made that the past results will repeat themselves in the future. The past is not always representative for the future. When looking at the past returns of the historical indices it is not very likely that these will be repeated in the future. The real estate markets now and in the nearby future are far more developed than they were in the mid eighties. This can be seen in the high volatility (risk) of the returns in the mid eighties and nineties compared to the volatility in the last couple of years. Further, real estate returns are for a large part influenced by interest rate levels. Thanks to the stabilization of macro economic structures it is not very plausible that the high historical volatility in returns as a result of unmonitored interest levels will be repeated. Therefore, expected returns are estimated on basis of a relatively simple forecast. A sophisticated forecast of the real estate returns would be preferred, but exceeds the scope of this thesis. This relatively simple forecast of expected returns is based on the sum of the income returns of the properties in the year 2006 and the expected average capital growth in the nearby future. In Exhibit 3.2 the estimation of the expected returns is represented.

Exhibit 3.2. Expected total returns

	NCREIF US	IPD Can	IPD Aus	IPD UK	IPD Ire	IPD Nether
Income return 2006	6,80%	7,10%	7,04%	4,90%	6,91%	5,60%
Aver. Cap. Growth	2,48%	2,28%	2,48%	1,95%	2,80%	1,70%

[2] See Appendix B for the methodology and coverage of the IPD and the NCREIF indices

Expected return	**9,28%**	**9,38%**	**9,52%**	**6,85%**	**9,71%**	**7,30%**

The average expected capital growth is found by computing the average of the forecasted capital growth from 2007 till 2010 in these countries. The capital growth is found in the Consumer Price Indices of these countries (source: DataStream Systems BV). The expected returns as represented in Exhibit 3.2 are the expected returns for an all property portfolio consisting of physical real estate assets in these countries. These returns are not yet adjusted to be an appropriate proxy for the expected returns to private investors. The next paragraph will deal with adjustments in order to obtain appropriate expected returns.

3. A covariance matrix of the assets

The last input variable of the model is a covariance matrix that represents the co-movements between the assets. As mentioned before, portfolio risk is reduced when a portfolio is composed of assets with low or negative correlation coefficients. Like the problem with expected returns, the expected covariances are also unobservable. Therefore these covariances need to be estimated. These estimations of covariances can best be made on basis of historical return series. Thereby the assumption is made that the co-movements between the real estate markets in the past are a proxy for the co-movements between the markets in the future. This assumption is plausibly and is in this case best practice. It exceeds the scope of this thesis to make a more reliable matrix of co-movements on the basis of a forecast. As markets have become stronger integrated in the last couple of years the use of such a matrix may result in slightly different covariances. Exhibit 3.3 represents the covariance matrix of the asset returns between the countries' indices.

Exhibit 3.3 Covariance matrix of historical Index returns (1985-2006 period)

	NCREIF US	IPD Can	IPD Aus	IPD UK	IPD Ire	IPD Nether
NCREIF US	*0.0034*	0.0032	0.0031	0.0029	0.0044	0.0005
IPD Canada	0.0032	*0.0044*	0.0043	0.0034	0.0047	0.0004
IPD Australia	0.0031	0.0043	*0.0076*	0.0057	0.0032	-0.0008
IPD UK	0.0029	0.0034	0.0057	*0.0077*	0.0038	-0.0006
IPD Ireland	0.0044	0.0047	0.0032	0.0038	*0.0132*	0.0024
IPD Netherlands	0.0005	0.0004	-0.0008	-0.0006	0.0024	*0.0014*

This covariance matrix is constructed before the historical returns series were adjusted to the investment characteristics of private investors. The covariance of a countries' index with itself represents the variance of the real estate index in that particular country. These are the *leaning numbers* in Exhibit 3.3. These variances can be seen as a measure of risk for investing in the market portfolio in these countries.

Adjustment of historical return indices

As mentioned in Paragraph 2.3.2 the returns of the countries' indices are not an appropriate proxy for the returns to private investors. These indices should be adjusted for the effects of unsophisticated diversification and the effects of using leverage.

1. Poorly diversified portfolios should result in a higher level of risk

When using the unadjusted countries' property indices as a proxy for returns on real estate assets, it is assumed that a private investor holds the market portfolio. In other words, an investor holds that many properties that the amount of unsystematic risk is completely diversified away. In general, a private investor is not able to invest in that many properties, especially when he invests in several countries. For that reason the countries' indices returns need to be adjusted for the additional unsystematic risk that a private investors' portfolio is exposed to.

A private investor expects the same level of return but is exposed to a higher level of risk due to unsophisticated diversification. In modifying the returns of the countries' indices in a way that they are an appropriate proxy to private investors, the returns should therefore have a larger volatility around the mean.

$$R_{p,t} = IR_{i,t} + \alpha\left(IR_{i,t} - \overline{IR}\right) \tag{17}$$

Where:

$R_{p,t}$ = The portfolio return to private investors in period t

$IR_{i,t}$ = The individual index return in period t

$\overline{IR}$ = The average return of the index

α = Level of adjustment

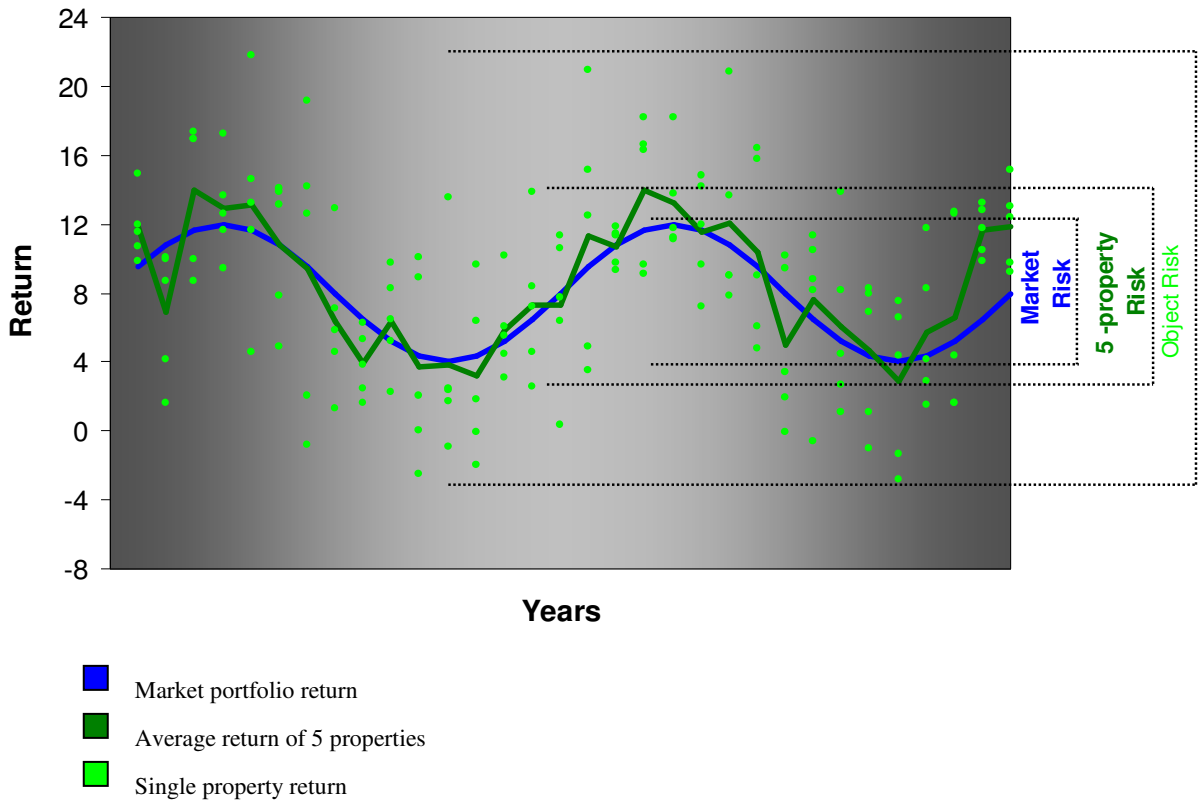
In adjusting the individually index returns, an appropriate level of α needs to be chosen. The level of α depends on the assumption that is made on the level of unsystematic risk to which the portfolio of a private investor is exposed to. A level of 4% unsystematic risk is commonly used in practice when an investor invests in only a single real estate asset (Hoorenman, 2007). This level of unsystematic risk is a consequence of imperfect diversification due to the small size of the portfolio. In this study an additional unsystematic risk of 1% is assumed as an additional premium for the fact that the investment in only a single property is not representative as an investment in an all property portfolio (i.e. investments in a portfolio that contains offices, retail, residential and industrial/logistics assets). A level of 5% of

unsystematic risk is therefore used when studying the effects of investing in an all property portfolio.

In this study, a private investor is assumed being able to invest in at least five properties in each specific country the model insists to invest in. By investing in five instead of in only a single property the level of unsystematic risk is reduced as a result of diversification. Investing in more than five properties would even be more desirable, but is considered as unfeasible for most Dutch private investors. Therefore is assumed that a private investor invest in five properties per country.

Figure 3.1 represents a graph where randomized returns are plotted. In this graph the green dots represent single property returns.

Figure 3.1 Object diversification



As can be seen in this figure, the risk of investing in a single property is much higher than investing in the market portfolio. When holding a portfolio of five properties the distributions of returns become a lot closer to the distribution of the market portfolio returns. This is a result of the reduction of unsystematic risk due to the effect of diversification. A portfolio of five properties is represented by the green line where the average return of five single

properties is plotted. One can see that by investing in five properties instead of in a single property the level of unsystematic risk is for a large part reduced.

Equation 18 represents a formula to which the level of unsystematic risk is reduced by holding an x amount of properties instead of a single property (Hoorenman, 2007).

$$Risk\ reduction = 1 - \sqrt{\frac{1}{x}} \tag{18}$$

One can calculate that by investing in five properties the unsystematic risk is reduced by 55% of the unsystematic risk to which a portfolio of only a single property is exposed to. To private investors this results in an unsystematic risk of 2.24% (55% reduction of 5% risk) when an all property portfolio is hold. By investing in a portfolio of only offices or only retail assets, an unsystematic risk of 1.97% (55% reduction of 4% risk) is added. This part of unsystematic risk is added to the systematic part of risk that a property portfolio is exposed to in a particular country. The systematic risk in a particular market equals the standard deviation of the historical returns of the index in that particular country.

2. The effect of leverage

In constructing the property indices is assumed that properties are completely financed with equity. The compilers of the index consider that investors use a leverage ratio of zero. In practice, private investors have indicated to have used a leverage ratio of at least 75 percent on average in 2006 (Weisz, Hoven, Lokerse, Pastor and Prins, 2007). This leverage ratio is used by private investors who invest at the interest level in the past year. This current interest level is relatively very low compared to interest rates in the past.[3] To adjust the index returns for the amount of leverage that private investors use, the following equation is used (Brealey, Myers and Marcus, 2001):

$$r_e = r_T + \left(\frac{D}{E}\right) * \left(r_T - r_d\right) \tag{19}$$

Where:

r_e = Return on equity
r_T = Total return (= return on the IPD index)
r_d = Cost of debt
D/E = Debt to equity ratio

In applying this equation to adjusting unlevered returns into levered returns, the following assumptions are made:

[3] See Appendix C for historical interest rates in the US, Canada, Australia, UK, Ireland and the Netherlands.

1. Debt to equity ratio $\left(\frac{D}{E}\right)$

Private investors indicated to have used 75% of leverage on property investments in 2006 on average. This high leverage ratio is a consequence of a relatively low cost of debt in the last year. To make a rather conservative assumption of a historical leverage ratio from 1985 till 2006, it is assumed that private investors use 60% debt when debt financing is prudent to them. The total return on real estate assets can be separated in income return and a return on capital growth. The income returns result in a cashflow to the investor, which can be used to make debt payments. It is assumed that private investors act rather rationally. When the cost of debt is higher than the expected income return on the properties it would not be wise to use any debt on investments. Hence, the historical unlevered returns are only adjusted for leverage when the cost of debt to the investors is lower than the expected income return on their property investments. Hereby is assumed that private investors do not use leverage when the cost of debt is higher than their expected return. Because, private investors do not refinance their total portfolios every year, an additional assumption is made. Private investors have indicated to hold a property five years in portfolio, on average (Weisz, Hoven, Lokerse, Pastor and Prins, 2007). So, it is assumed that every year 20% of the portfolio (1 property) is renewed. Therefore, when it is prudent to an investor to use leverage on the investments, only 20% of the effect of leverage is taken into account.

2. Cost of debt

The cost of debt to private investors depends mostly on the following factors: the term of the mortgage loan, the collateral security on the mortgage loan, the expected cashflows of the investments, the credit spread of the loan, the credit rating of the investor and the interest rate levels in the countries were the investment are made. Because, it is unfeasible to absorb all these factors in a practical model the cost of debt to private investors should be determined in another way. In making a practical assumption about the cost of debt to private investors that can be used in all the countries and through all the examined periods (1985-2006) it is assumed that local banks charge the private investors with a premium above the inter bank interest rates. A feasible premium to be charged equals the percentage of leverage that is used on investments (Biermans, 2007). The use of this multiple method is best practice and is used as a rough estimator in reality too. In this study the cost of debt to private investors is found by adding 60 basic points on the three months variable interest rates in the countries were the investments are made.

When the returns on the countries property indices are adjusted for the effect of leverage it results in higher expected returns by private investors, because their portfolios are exposed to a larger level of risk.

The effect of currency hedging

Paragraph 2.2.3 dealt with the methods used in previous studies to the effects of diversification. One of the conclusions of that paragraph is that researches outcomes differ due to the fact that different methods or data were being used. An often heart criticism is the lack of considering currency risks in studies. When studying diversification effects in foreign countries a lot of researches do not consider currency risks. These researches make the assumption that foreign currencies are perfectly hedged.

In this study two scenarios are investigated. The first scenario, as most other studies do, considers a perfect hedge on the foreign currencies. However, this scenario is a little bit unrealistic because costs of hedging are not considered. It is unfeasible to consider transaction costs in the model that is used in this study. The second scenario considers that investments are made and returns are earned in foreign currencies. The returns in these foreign currencies are then converted into euros. This scenario considers a risk to the exposure of investments in a foreign country. The return to private investors consists of a return earned on the investments in the properties and on a return on the foreign currencies. Both of these returns can either be positively or negatively. This is represented in equation 20 (Pagliari, Webb, Canter and Lieblich, 1997).

$$R_{currency\,adjusted} = (1 + R_{i,t})(1 + E_{i,t}) - 1 \qquad (20)$$

The return on foreign currency i is determined by using the spot exchange rate ($E_{i,t}$) in the studied date period between the Euro and the currency in country i.

3.3 Research method

Once the historical return series have been constructed, the expected returns and the covariance matrix have been estimated; a mathematical model solves the asset weights at which the portfolio risk is minimized given a specific level of portfolio return. These are the inputs of the model by which this study tries to investigate the effects of global portfolio diversification to Dutch private investors.

This study tries to simulate the situation to a Dutch private investor as realistic as possible. In an attempt to isolate the pure effect of global property diversification the following assumptions are made:

1. The Dutch private investor does not hold a mixed-asset portfolio (shares, bonds, real estate assets, etcetera), but only invests in physical real estate assets and holds a small amount of cash at a Dutch bank account. From the perspective of a mixed-asset portfolio, including real estate assets to such a portfolio results probably anyhow in a better risk-return profile. This is a result of the low or negative correlations between real estate assets and the other investments alternatives. The pure effect of including real estate assets from different regions/countries to a portfolio can not be determined in that way.
2. Because, this thesis focuses on effects of global diversification of real estate assets in general it is assumed that private investors invest in 'all property' portfolios. An all property portfolio represents investments in office properties, retail, residential and industrial/logistics assets. However, private investors often have a strong drive to hold portfolios of a very specific asset class. This is a result of the specific knowledge they have by investing in a particular asset class and is usually a result of their backgrounds and experiences in their jobs (Nijmeijer, 2005). Further, research indicates that private investors are actively managing their portfolios. Some private investors have clear expectations about returns of specific asset classes and are therefore only interested in investments in these categories (Weisz, Hoven, Lokerse, Pastor and Prins, 2007). Hence, besides providing information to private investors about diversification effects of real estate assets in general, also effects on investments in specific asset classes are studied. As a result of the lack of reliable data on residential and industrial/logistics assets returns in one or more countries, only investments in office portfolios and retail portfolios are studied.

Besides these assumptions, this study considers effects of using leverage and effects of currency risks on foreign investments to make the simulation as realistic as possible. However, it does not consider taxes, transaction costs or short-selling of assets in order to prevent the model from being to complex. The research question is stated as follows:

- ***Does the risk-return profile of a portfolio improve by diversifying real estate assets globally?***

The effect to the risk-return profile is studied by including foreign real estate assets to a portfolio consisting of Dutch real estate and a small amount of cash. As mentioned before, in this study the restriction on the foreign real estate is that these properties can only be situated in the US, the UK, Canada, Ireland and Australia.

A private investor is assumed being able to invest in five properties in each country in which the model insists to invest in. In order to obtain an efficient portfolio, the total value of the properties in a particular country should equal the relative weights which have been determined by the model. The total value of a global real estate portfolio depends on the preferences concerning the value of the properties a private investor chooses to invest in.

Further is assumed that the private investor takes own responsibility for the asset management (purchasing and selling decisions of properties). The property management (maintenance, rent levels, etcetera) is however outsourced to local real estate agents. On average these agents charge 2,5% till 5% of rents as a fee for managing the properties. So, besides investing in properties, a private investor should also consider taking costs in account for managing the properties.

Output of the mean-variance model

Once the input variables are determined, the model calculates for every possible target return the required weights on the portfolios' assets at which the level of risk is minimized. The target return level depends on the amount of risk a private investor is willing to take. In this study is chosen for a target return of 15 percent.

The Sharpe ratio is a measure that enables a portfolio manager to investigate if the risk-return profile of a portfolio improves or deteriorates. A higher Sharpe ratio means a better risk-return profile of the portfolio; a lower Sharpe ratio means the opposite.

$$Sharpe\,ratio = \frac{r_p - r_f}{\sigma_p} \tag{21}$$

Where:

r_p = Return of the portfolio

r_f = Risk free rate

σ_p = Standard deviation of the portfolio

As a proxy for the risk free interest rate the current European three months variable inter bank rate is used.

Hence, if a global diversified portfolio results in a higher Sharpe ratio than a portfolio that consists of only Dutch real estate, the positive effect of global diversification is demonstrated. The results of this study are presented in Chapter IV.

Chapter IV Results

The previous chapter dealt with the methodology of the empirical study and described how this study will be implemented. Three different data sets are examined in two different scenarios. Recapitulating, the three different data sets include the returns series to private investors of all-property portfolios, office portfolios and retail portfolios. These data sets are studied in two different scenarios. The first scenario considers that all currency risks are hedged and the second scenario considers unhedged currency risks. The results of these studies are presented in this chapter.

The exhibits 4.2, 4.3, and 4.4, in which the results are presented should be read as follows. Exhibit 4.1 serves as an example of these exhibits in which the results are presented. Column A represents a portfolio of an investor whose portfolio consists of only Dutch real estate assets and a small amount of cash at a Dutch bank account. Columns B and C represents a situation, whereby an investor has the ability to invest in properties anywhere in the six countries (global portfolio). The weights are determined at that specific level at which the private investor gains a 15% return at the smallest possible level of risk. By these weights an investors holds a mean efficient portfolio. The difference between column B and C is the consideration that currency risks are either hedged or unhedged. The last row in the exhibit represents the Sharpe ratio in every situation. As mentioned before, a higher Sharpe ratio means a better risk-return profile of the portfolio.

Exhibit 4.1 Example of an exhibit in which results are presented

	A. Dutch portfolio	**B. Global portfolio - currency risks hedged**	**C. Global portfolio - currency risks unhedged**
Weights in the US	0,0%	x %	x %
Weights in Canada	0,0%	x %	x %
Weights in Australia	0,0%	x %	x %
Weights in the UK	0,0%	x %	x %
Weights in Ireland	0,0%	x %	x %
Weights in the Netherlands	x %	x %	x %
Weights in Dutch Cash	x %	x %	x %
Portfolio return	**15,0%**	**15,0%**	**15,0%**
Portfolio risk (St. dev)	**… %**	**… %**	**… %**
Sharpe ratio	**…**	**…**	**…**

4.1 Results of diversifying an all-property portfolio globally

The effects of investing in an all-property portfolio are studied and presented first. This study tries to capture the effects of global diversification on real estate assets in general. Exhibit 4.2 represents these results.

Exhibit 4.2 effects of diversifying an all-property portfolio globally

	A. Dutch portfolio	**B. Global portfolio - currency risks hedged**	**C. Global portfolio - currency risks unhedged**
Weights in the US	0,0%	0,0%	0,0%
Weights in Canada	0,0%	0,0%	0,0%
Weights in Australia	0,0%	28,7%	22,4%
Weights in the UK	0,0%	0,0%	0,0%
Weights in Ireland	0,0%	3,8%	5,2%
Weights in the Netherlands	97,8%	67,4%	72,5%
Weights in Dutch Cash	2,2%	0,0%	0,0%
Portfolio return	**15,0%**	**15,0%**	**15,0%**
Portfolio risk (St. dev)	**13,3%**	**10,8%**	**11,3%**
Sharpe ratio	**0,896**	**1,105**	**1,059**

First the results of the situations that are represented in column A should be reviewed. In this situation a private investor gains a 15% return by investing for 97,8% in an all-property portfolio of Dutch real estate assets and 2,2% in cash. At these portfolio weights the risk level is minimal at 13,3%, which results in a Sharpe ratio of 0,896.

Then, consider the situation that the private investor decides to diversify his portfolio globally. These results are represented in column B and C. First, consider the situation that the private investor hedges all the foreign currency risks (Column B). By investing for 28,7% in real estate assets in Australia, 3,8% in Ireland and 67,4% in Dutch real estate assets the investor gains the same return but is exposed to a 2,5% point lower level of risk. This results in a higher Sharpe ratio. The portfolio weights on the assets in the US, Canada, the UK and Dutch Cash are zero because for this target level of return (15%), investments in these assets are not able to lower the portfolios' risk level. When an investor prefers another target level of return the model determines other portfolio weights, whereby investments in these countries

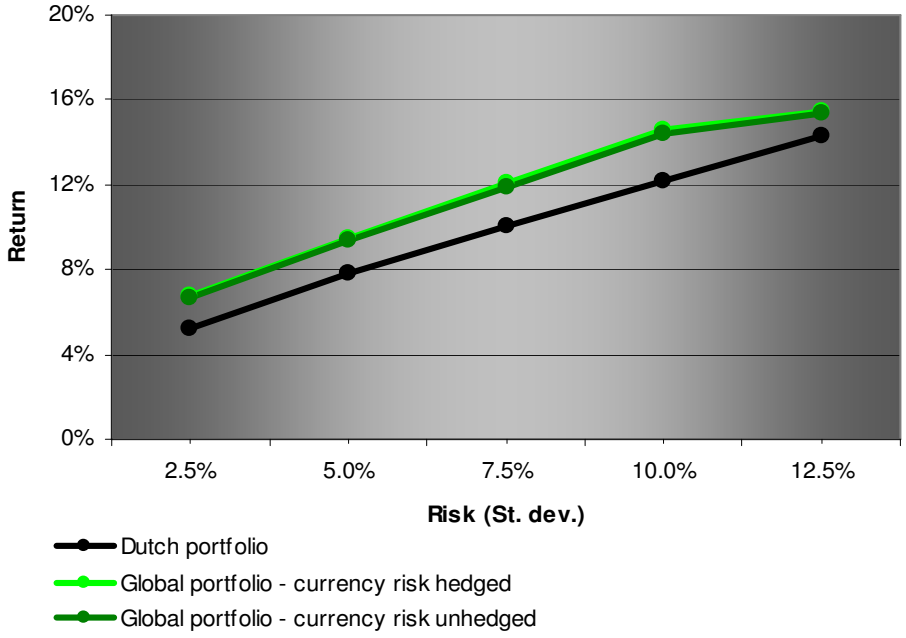
may add value.[4]

Even, when considering that foreign currency risks are unhedged (Column C), the Sharpe ratio is at a higher level then in the situation where a private investor holds only Dutch assets in portfolio. As can be seen by the asset weights presented in Column C, the investor reduces his portfolio weights in the Australian market when the currency risks are unhedged. The portfolio weights on real estate assets in Ireland and the Netherlands are raised, because investments in these countries are not exposed to currency risks.

Efficient frontiers

The efficient frontiers of the three scenarios are plotted in figure 4.1. Both the efficient frontiers of the global diversified portfolios are situated above the efficient frontier of the portfolio of pure Dutch investments. This indicates that these portfolios earn higher returns at a same level of risk, or are exposed to a lower level of risk at a same level of return.

Figure 4.1 Efficient frontiers of an all-property portfolio



4.2 Results of diversifying office portfolios globally

Besides the study of global diversification of real estate assets in general, this study also investigated the effects of diversifying a portfolio that contains a specific real estate asset

[4] See Appendix D for portfolio weights that would be determined at other target return levels.

class. Unfortunately, as a result of the lack of reliable data on return series in one or more countries, only the effects of diversifying office and retail portfolios are studied. In exhibit 4.3, the results of investing in office portfolios are presented.

Column A represents the scenario whereby a private investor invests in Dutch office properties and owns a relatively small amount of cash at a Dutch bank account. As can be seen, by diversifying his office portfolio by investing in office properties in Australia and the UK (Column B) the risk-return profile of his portfolio improves. Also, when considering currency risks (Column C), his global portfolio is on a higher Sharpe ratio than his pure Dutch portfolio.

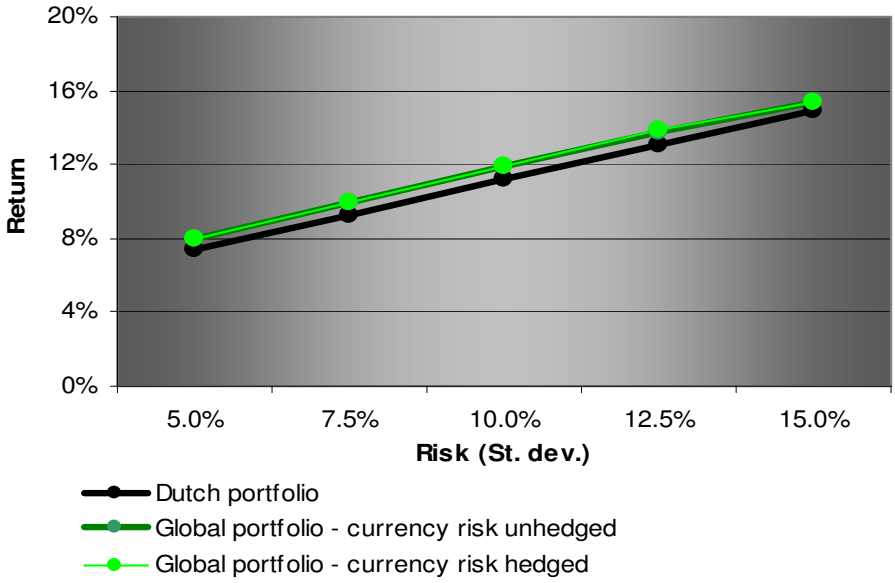
Exhibit 4.3 effects of diversifying office portfolios globally

	A. Dutch portfolio	**B. Global portfolio - currency risks hedged**	**C. Global portfolio - currency risks unhedged**
Weights in the US	0,0%	0,0%	0,0%
Weights in Canada	0,0%	0,0%	0,0%
Weights in Australia	0,0%	27,6%	22,9%
Weights in the UK	0,0%	1,0%	0,0%
Weights in Ireland	0,0%	0,0%	0,0%
Weights in the Netherlands	95,8%	71,4%	77,1%
Weights in Dutch Cash	4,2%	0,0%	0,0%
Portfolio return	**15,0%**	**15,0%**	**15,0%**
Portfolio risk (St. dev)	**15,1%**	**13,9%**	**14,0%**
Sharpe ratio	**0,790**	**0,859**	**0,851**

Efficient frontiers

The efficient frontiers of the three scenarios are plotted in figure 4.2. Both the efficient frontiers of the global diversified portfolios are situated above the efficient frontier of the portfolio of pure Dutch office investments. However, the positive effect of diversifying office portfolios is much smaller than diversifying a portfolio that contains all-properties. The efficient frontiers of the global diversified portfolios are only on a modestly higher level than the Dutch office portfolio.

Figure 4.2 Efficient frontiers of office portfolios



4.3 Results of diversifying retail portfolios globally

The last data that have been analyzed is the effect on diversifying retail portfolios globally. The results of this study are represented in exhibit 4.4. An investor with an expected target return of 15% on Dutch retail properties should invest 99,8% of his portfolio in Dutch retail assets and the remaining in cash. This same level of return can be gained by diversifying the portfolio with retail assets situated in the US, Australia and the Netherlands (Column B). This portfolio is however exposed to a 1,7% point lower risk level. When considering the risk to the exposure on foreign currencies (Column C), the portfolio weights on retail properties in Australia are more then halved. However, also this retail portfolio is at a higher Sharpe ratio than the pure Dutch retail portfolio.

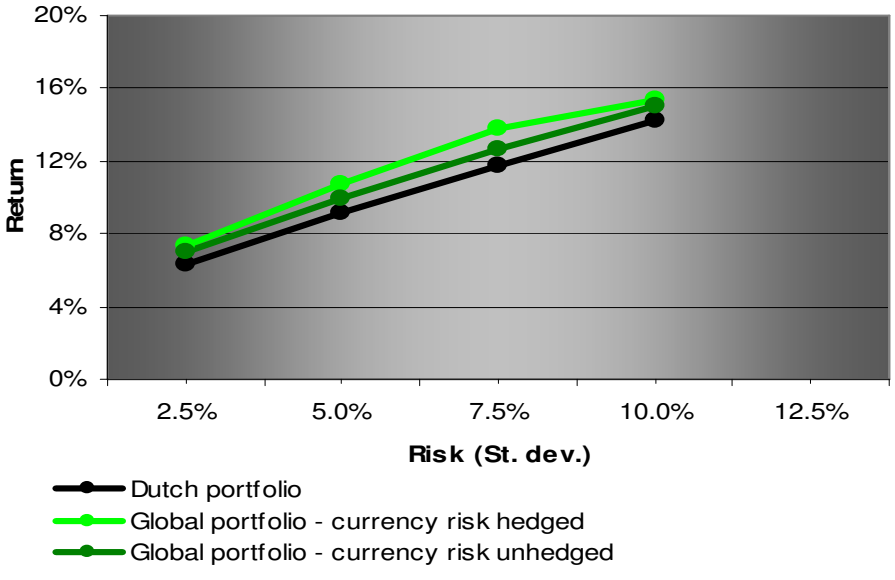
Exhibit 4.4 effects of diversifying retail portfolios globally

	A. Dutch portfolio	B. Global portfolio - currency risks hedged	C. Global portfolio - currency risks unhedged
Weights in the US	0,0%	13,5%	13,7%
Weights in Canada	0,0%	0,0%	0,0%
Weights in Australia	0,0%	31,9%	14,2%
Weights in the UK	0,0%	0,0%	0,0%
Weights in Ireland	0,0%	0,0%	0,0%
Weights in the Netherlands	99,8%	54,7%	72,1%
Weights in Dutch Cash	0,2%	0,0%	0,0%
Portfolio return	**15,0%**	**15,0%**	**15,0%**
Portfolio risk (St. dev)	**10,7%**	**9,0%**	**9,9%**
Sharpe ratio	**1,114**	**1,326**	**1,203**

Efficient frontiers

The efficient frontiers of the three scenarios are plotted in figure 4.3. In line with the results of the all-property portfolios and the office portfolios, also the efficient frontiers of the global diversified retail portfolios are situated above the efficient frontier of the Dutch retail portfolio. In this study is a more clearly effect noticeable of the impact of foreign currencies hedging. The global portfolio that considers hedging foreign currencies is on a remarkably higher level then the unhedged scenario. This is in contrast with the results on all-property portfolios and office portfolios, where effect of currency hedging had smaller consequences.

Figure 4.3 Efficient frontiers of retail portfolios



Summarizing the results

The empirical study tried to answer the following research question:

- ***Does the risk-return profile of a portfolio improve by diversifying real estate assets globally?***

Given the above presented results, it is justified to conclude that the risk-return profiles of the global diversified portfolios have improved, with respect to a portfolio that contains only Dutch investments. In order to obtain an efficient portfolio, the total value of the properties in a particular country should equal the relative weights which have been determined by the model.

Conclusions of the empirical study:

1. As a result of global diversification a Dutch private investor is able to reduce the portfolio risks while earning the same level of return.
2. The effect of diversifying a portfolio that contains all-property investments (i.e. investments in a portfolio that contains offices, retail, residential and industrial/logistics assets) is most favourable. The favourable effects of diversifying a pure office portfolio are small.
3. The effect of hedging foreign currency risks turns out to be relatively negligible. By investing in a pure retail portfolio the effect of currency hedging is most beneficial.

Chapter V Summary and conclusions

Since the tremendous increase of international real estate investments in the last decades, the effects of global diversification are a widely studied area. However, most of these studies are aimed at effects for institutional investors, as these investors rely on studies and analyses in making investment decisions. This is a serious hurdle to private investors in trying to professionalize their investment strategies. For that reason this thesis provides information to Dutch private investors about effects of global property diversification. This chapter will present an overview, conclusions and recommendations on further research.

5.1 Overview

Investment strategies of private investors differ to those of institutional investors

Chapter II started with insight into the investment characteristics of Dutch private investors. As a consequence of different investment criteria the investment behavior of private investors differs from that of institutional investors. This is among other things reflected in portfolio sizes, portfolio values and investment strategies.

There are several alternatives for investing in real estate

A private investor may consider investing in direct (physical) or indirect (securitized) real estate. Further, investments in indirect real estate can either be made in listed or unlisted real estate. The essential difference between a direct and an indirect investment (listed and unlisted) is the level of control/authority an investor has over his investment. The choice of investing in direct or indirect real estate assets depends mainly on the nature of the investor, the investment objectives and the value of available funds.

Theoretically: global diversification improves a portfolios' risk-return profile

The main motive for investing in foreign real estate markets is that diversification improves a portfolios' risk-return profile. Diversification results in a reduction of the unsystematic risk when the additional assets do not co-vary perfectly with other assets in the portfolio. A tool to allocate assets for a diversification purpose is found in the Modern Portfolio Theory. A rational investor wants to determine the portfolio weights so as to get a portfolio that earns maximum return at a lowest level of risk (mean efficient portfolio).

Several IPD indices are modified and used as a proxy for returns to private investors in an empirical study to diversification effects

The returns of the total return IPD indices in the Netherlands, the United Kingdom, Canada, Ireland, Australia and the total return NCREIF index in the United States are used as a proxy for returns on direct real estate assets in these countries. The returns of these indices are adjusted for the additional unsystematic risk that a private investors' portfolio is exposed to and for effects of using leverage.

The risk-return profiles of global diversified portfolios have improved, with respect to portfolios that contain only Dutch real estate

Three different data sets are examined in two different scenarios. The returns series of all-property portfolios (i.e. investments in a portfolio that contains offices, retail, residential and industrial/logistics assets), office portfolios and retail portfolios are studied in scenarios that consider that currency risks are either hedged or unhedged. Conclusions:

1. As a result of global diversification a Dutch private investor is able to reduce the portfolio risks while earning the same level of return.
2. The effect of diversifying a portfolio that contains all-property investments is most favourable. The favourable effects of diversifying a pure office portfolio are small.
3. The effect of hedging foreign currency risks turns out to be relatively negligible. When investing in a pure retail portfolio the effect of currency hedging is most beneficial.

5.2 Main conclusions

The following central research question was formulated in the introduction and will be answered in this paragraph.

- ***Is it favourable to Dutch private real estate investors to diversify their property portfolios globally?***

The empirical study concludes that the risk-return profiles of global diversified property portfolios have improved, with respect to portfolios that contain only Dutch real estate. Hence, the conclusion has been drawn that global diversification of property portfolios is favourable to Dutch private real estate investors.

One remark needs to be made; Dutch private investors can not be distinguished by the same typical features. Private investors owning large funds and private investors with limited investment alternatives are at the extreme ends of this spectrum. This study does not consider

that there is a minimum amount of funds needed in order to benefit from global diversification effects. However, it is advised to invest in at least five properties in a specific country. By investing in at least five properties the unsystematic risk is reduced by 55 percent with respect to investing in only a single property in a specific country. The total value of a global real estate portfolio depends on the preferences concerning the value of the individual properties a private investor chooses to invest in. In order to obtain an efficient portfolio, the total value of the properties in a particular country should equal the relative weights in that country which have been determined by the mean-variance model.

Further, is assumed that Dutch private investors take own responsibility for the asset management and outsource the property management to local real estate agents. Hence, besides investing in properties a private investor should also consider taking costs in account for managing the properties. Private investors preferring not to be troubled with property management aspects may consider investing in indirect real estate. The diversification effects of investing in indirect real estate are however not covered in this study.

5.3 Recommendations on further research

The conclusion of this thesis implies that more research is needed in the area of global diversification effects. A question that would need to be addressed includes: what are effects of global diversification of indirect real estate assets? Based on this thesis, no conclusions can be drawn on these effects as the covariances of indirect real estate assets might be completely different.

Further, as a consequence of limitations on long-term return series, the diversification effects are only investigated in the Netherlands, the UK, Canada, Ireland, Australia and the US. It would be interesting to extend this research by studying diversification effects in more countries on the European Continent. Investing in foreign properties in the surroundings of the Netherlands is far more easily to manage for a private investor, than properties situated at four different continents. The conclusions of such a study would be of great interest, especially to small fund owning Dutch private investors. However, at this moment the property indices in these countries are not sufficient long enough to include in a study to these effects.

In a couple of years when more long-term return series are available, it would also be interesting to extend this research to global diversification effects in emerging real estate markets. Chances are that as a consequence of low mutually integrations, the covariances

between emerging and developed markets are at a very low or negative level. This could result in large benefits of diversifying real estate assets in these markets.

Summarizing: when present limitations on the availability of long-term return series are overcome in the future, much more conclusions about global diversification effects can be drawn.

Glossary

Capital Asset Pricing Model	Theory of the relationship between the expected return and risk of an asset.
Capital Market Line	The CML represents portfolios that combine all investments in risky and risk-free assets optimally.
Correlation	Measures the degree in which securities tend to move together.
Cost of financial distress	Costs arising from bankruptcy or distorted business decisions before bankruptcy.
Debt capital	Contracts containing a promise to pay a future stream of cash to the investors who hold the contract. Instruments: bank loans, commercial papers or bonds.
Diversification	Strategy to reduce risk by spreading the portfolio across many mixed-asset investments.
Efficient frontier	Combinations along this line represent portfolios for which there is lowest risk for a given level of return.
Institutional investor	An institutional investor is an entity, company, mutual fund, insurance corporation, brokerage, or other such group that has a large amount of money or assets to invest.
Interest tax shield	Tax savings resulting from deductibility of interest payments.
Market Portfolio	The Market Portfolio is a portfolio where the weight on each asset is the market value of that asset divided by the market value of all risky assets.
Modern Portfolio Theory	This theory proposes how rational investors will use diversification in order to optimize their portfolios.
Net present value	Present value of cash flows minus initial investment.
Pareto Optimal situation	It is impossible to consistently sell assets above the equilibrium price without harming another investor.
Private investor	A private investor acts for his own account and is not employed by a company, is not partner, or does not belong to any other entity related to his financial investments.
Risk-free asset	An (hypothetical) assets which pays a risk-free rate of return.
Security market line	Relationship between expected return and beta as a measure of risk.

Semi-strong efficient market	It is assumed that market prices reflect all the public available information.
Standard deviation	Square root of variance.
Strong form efficient market	It is assumed that all the information is absorbed in the capital market and no one can consistently earn excess returns.
Square Root of N Rule	By adding N assets in a portfolio, the random error decreases by factor √N.
Variance	Average value of squared deviations from mean. Variance is a measure of volatility.
Weak form efficient market	It is assumed that prices adapt to information from historical market prices.

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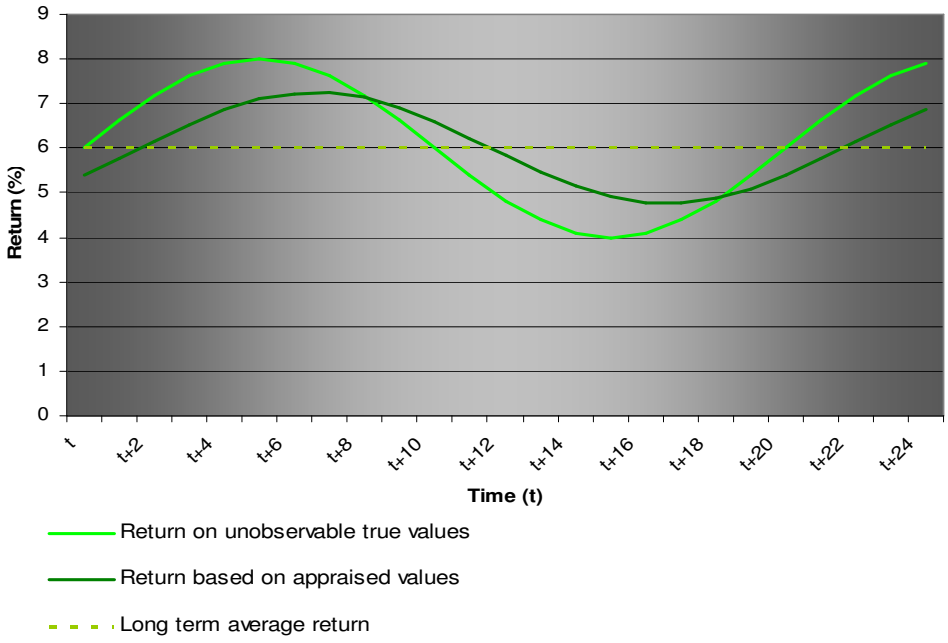
Appendix A Smoothing, lagging and unsmoothing techniques

In Figure 2.6., the hypothetical returns of a portfolio valued by unobservable true values and appraised values are plotted. As can be seen, the lag and smooth effect does not change the expected value of the periodic return in the long run (dotted green line). When looking in a short period of time, temporally lagged returns will be conditionally biased. The figure provides insight in how the lag effect and smoothing can be distinguished. The dark green line (appraised values) shows the peaks and troughs later than the light green line (true values); this is the lag effect. The dark green line shows smaller deviations from the trend; this is caused by the smoothing effect.

Figure 2.6. Temporal lag effect and smoothing



When ignoring these problems, real estate assets seem more attractive in comparison with financial assets due to apparent lower risk. Furthermore, the real estate assets seem to have lower correlation with financial assets, thereby overrated weights on real estate assets are taken (Geltner and Miller, 2001). What can be done about temporal lag and smoothing bias in periodic return series in an appraisal-based portfolio or a benchmark index?

A publicly available appraisal-based index is adjustable for serious temporal lag bias. The out-dated appraisal problem can be viewed as a missing valuation observation problem. It is laborious to reappraise the complete set of observations for all properties in the index every

period. Furthermore, there are some properties for which one cannot observe an updated appraisal (missing valuation observations). The attempt to approach 'true' returns by correction of appraisal-based returns is referred to as unsmoothing. In contrast with early unsmoothing techniques, Geltner developed in 1993 the Reverse Engineering technique, which is applicable even when markets are not assumed fully efficient.

Reverse Engineering of appraiser behavior.

The basic idea is to define a model of microlevel appraiser behavior, in which true returns can be estimated from observable appraisal-based returns. The underlying assumption is that missing valuation observations can be generated by using a technique that makes it possible to estimate true values by computing the weighted average of previous appraisal values and actual values. It is theoretically possible to approximately 'reverse-engineer' the appraisal-based returns to recover the transaction-price-based return on which the appraisals were based. A simple one-factor model can be used for a depiction of the relationship between transaction prices and appraised values:

$$V_t = \alpha V_t^* + (1-\alpha)V_{t-1} \tag{22}$$

Where:

V_t = The appraised values in period *t*

V_t^* = The actual average transaction price in period *t* (the 'true' value)

α = Confidence factor

The difficult part of the technique is quantifying a proper value to use for the α parameter. The higher α, the more weight an appraiser gives to the value of new information. Often a value for the α parameter based on the estimated lag:

$$\alpha = \frac{1}{1 + lag\ in\ periods} \tag{23}$$

For example, a lag of 1 year: $\alpha = 0.5$ on annual figures or: $\alpha = 0.2$ on quarterly figures.

Summarizing: Appraisal-based returns are not useless, but use the Reverse Engineering technique for unsmoothing returns when:

- Allocating a portfolio including real estate assets and financial assets;
- Comparison of a real estate risk-return profile with non real estate assets;
- When market timings differ.

Appendix B Methodology of the NCREIF and the IPD indices

Coverage of the Indices at December 2006

Index	No. of properties	Capital value (€ billion)
Australia IPD	718	44,8
Canada IPD	2.050	48,0
Ireland IPD	331	5,8
Netherlands IPD	5.369	45,2
UK IPD	12.137	284,6
US NCREIF	12.455	284,7

Rates of return of the NCREIF Index

- **Total Return:** includes appreciation (or depreciation), realized capital gain (or loss) and income. It is computed by adding the Income and Capital Appreciation return on a quarterly basis.

Income Return: Measures the portion of total return attributable to each property's net operating income (NOI). It is computed by dividing the NOI by the average quarterly investment. Income Return Formula:

$$R_i = \frac{NOI}{Beginning\ MV + 1/2\ Capital\ improvements - 1/2\ parials\ Sales - 1/3 NOI}$$

Capital Appreciation Return: measures the change in market value adjusted for any capital improvements/expenditures and partial sales divided by the average quarterly investment. Capital Appreciation Returns Formula:

$$R_{cap\ app} = \frac{(Ending\ MV - Beginning\ MV) + Partial\ Sales - Capital\ improvements}{Beginning\ MV + 1/2\ Capital\ improvements - 1/2\ Partial\ Sales - 1/3\ NOI}$$

Rates of return of the IPD Index

- **Total return:** It is computed by adding the Income and Capital Appreciation return on a yearly basis.

Income return:

$$R_i = \frac{NOI}{Capital\ Value\ of\ last\ year + total\ Capital\ Expenditure}$$

Capital Appreciation Return:

$$R_{cap\ app} = \frac{CV\ of\ this\ year - CV\ of\ last\ year - total\ Cap\ Expenditure + total\ capital\ receipts}{CV\ of\ last\ year + total\ capital\ receipts}$$

Appendix C Historical interest rate levels

This exhibit represents the three months variable interest rates in the US, Canada, Australia, UK, Ireland and the Netherlands.

	US	Canada	Australia	UK	Ireland	Netherlands
1985	8.33%	9.60%	15.98%	12.24%	11.93%	6.34%
1986	6.76%	9.19%	16.45%	10.94%	12.52%	5.68%
1987	7.12%	8.41%	13.75%	9.70%	10.83%	5.36%
1988	7.90%	9.61%	12.80%	10.33%	8.05%	4.82%
1989	9.25%	12.18%	17.61%	13.88%	10.04%	7.39%
1990	8.25%	13.01%	14.54%	14.77%	11.31%	8.68%
1991	5.95%	9.03%	10.23%	11.52%	10.43%	9.28%
1992	3.77%	6.67%	6.47%	9.62%	14.32%	9.35%
1993	3.24%	5.04%	5.15%	5.94%	9.12%	6.85%
1994	4.68%	5.55%	5.66%	5.50%	5.93%	5.18%
1995	5.97%	7.13%	7.73%	6.68%	6.25%	4.37%
1996	5.44%	4.45%	7.15%	6.02%	5.42%	3.00%
1997	5.66%	3.56%	5.40%	6.83%	6.09%	3.33%
1998	5.50%	5.06%	5.00%	7.34%	5.43%	3.46%
1999	5.36%	4.92%	5.01%	5.45%	2.97%	2.97%
2000	6.48%	5.70%	6.18%	6.11%	4.39%	4.39%
2001	3.73%	4.00%	4.90%	4.97%	4.26%	4.26%
2002	1.76%	2.62%	4.75%	3.99%	3.32%	3.32%
2003	1.17%	2.97%	4.90%	3.67%	2.34%	2.34%
2004	1.58%	2.31%	5.48%	4.57%	2.11%	2.11%
2005	3.53%	2.81%	5.64%	4.70%	2.19%	2.19%
2006	5.16%	4.17%	6.02%	4.76%	3.05%	3.05%

Appendix D Portfolio weights at other target levels of return

This graph provides insight into the portfolio composition at different risk levels for investment opportunities in all-property portfolios. The level of risk depends on the preference of an individual investor and his preference for a target level of return. As can be seen, an investor who is extremely risk avers could be exposed to only 1.1 percent of risk by investing in a lot of Dutch Cash and small amounts of real estate assets situated in the Netherlands, the UK, Australia and the US. An extremely risk loving investor would chose to invest his entire portfolio in Ireland at a risk level that exceeds the 30,9 percent.