

Master's Programme in Real Estate Economics

Open-end Real Estate Fund Performance

A German Fund Study

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Abstract

For the past sixty years German open-end real estate funds have been considered attractive assets in the world of investment. They have a reputation to achieve stable returns and potentially perform better than other real estate investment vehicles, such as REITs or direct property investment. Their complex structure and tumultuous past led to unique characteristics and created many possibilities to assess their general role in the industry of real estate investments.

A common term for successful investments is often referred to as performance, however its underlying assumptions, determination, calculation and interpretation can be considered vague and heterogenic across the literature and real estate economy. This may be reasoned in the lack of transparency and information inefficiency of real estate and its fund markets. The universality of a performance formula that complies with all types of assets is consequently reduced.

This thesis aims to discuss fund performance and performance influencing variables in regard to the fund's characteristics. The empirical research is based on the fund's annual reports, share price and secondary market share price development. The results suggest that the most commonly used parameter for fund performance determination in Germany, the BVI-return often differs from the performance of the portfolio, although it can be adjusted by the fund managers through various mechanisms, namely a sales strategy to adjust for changes in appreciation of the underlying assets. For the years 2016 to 2019 the secondary market share price development exhibited a positive correlation with the share price development for most of the funds and may partially be used as substitute for the performance measurement. In summary, fund performance measurement still requires transparent assumptions, clear and understandable models and detailed description of the data that is used to achieve a higher level of comparability between funds and allocate the performance driving components.

Keywords Open-end real estate funds, performance assessment, unlisted real estate, portfolio, performance measurement, Germany

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Abbreviations

AIFM	Alternative Investment Fund Manager
AUM	Assets under management
BaFin	Federal Financial Supervisory Authority <i>(Bundesamt für Finanzdienstleistungsaufsicht)</i>
BVI	Federal Association for Investment and Asset Management <i>(Bundesverband Investment und Asset Management e.V.)</i>
CAPM	Capital Asset Pricing Model
GOEREF	German open-end real estate fund
INREV	European Association for Investors in Non-Listed Real Estate Vehicles
InvG	Investment law code <i>(Investmentgesetz)</i>
INREV	European Association for Investors in Non-Listed Real Estate
KAGB	German investment code for investment management <i>(Kapitalanlagegesetzbuch)</i>
KVG	Capital managing company <i>(Kapitalverwaltungsgesellschaft)</i>
OEREF	Open-end real estate fund
NAV	Net asset value
REIT	Real estate investment trust
WertV	Valuation regulation in Germany <i>(Wertermittlungsverordnung)</i>

1 Introduction

Retail open-end real estate funds (OEREFs) have been considered an attractive indirect real estate investment vehicle in Germany since their establishment in 1969. As illustrated by figure 1, the capital invested into the open-end real estate fund market has for the most part been continuously growing, with approx. 1,8 billion euro invested capital in 2010 to almost 11 billion euro in 2019. The total capital invested has more than doubled from about 50 billion euro in 2002 to over 100 billion euro in 2019 (Streit, 2019). And with over 100 billion euro bound capital, the open-end real estate funds market in Germany is the most developed and largest OEREF market in the world.

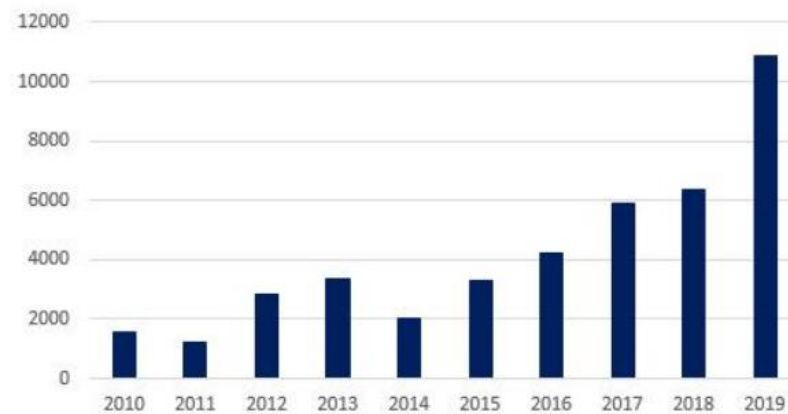


Figure 1: Development of capital invested into retail German open-end real estate funds (Source: <https://finanzenlounge.de/offene-immobilienfonds-alles-hat-seine-zeit>)

Over the years OEREFs have built up a reputation for themselves, as they feature characteristics which in combination make them unique from other investment vehicles. Firstly, most of the fund capital is invested into real estate. Real estate's most special features are its heterogeneity, durability, illiquidity and necessity for a large capital investment (Chambers, 2020). Heterogeneity implies that no two properties are alike due to different material, size, age and other criteria, but in particular since no two assets share the same location. As real estate are real assets, they are physical and built to last for up to many centuries, making them more durable than most other physical assets (Sirota, 2004). Additionally, due to the high transaction costs, the capital invested into real estate is most commonly bound for multiple years. This stands in contrast to listed assets which can often be traded on a daily basis. Since direct property investment implies the purchase of the property as a whole, it usually requires large capital to be invested. The "open-end" structure allows any investor to buy shares from the Kapitalverwaltungsgesellschaft (KVG) on a daily basis. Furthermore, the fund is aimed to be continuous with no prearranged termination date. Unlike the price development of indirect listed real estate investment classes such as REITs or real estate stocks, the price of fund shares is not determined through supply and demand on the market and does therefore not underly the sensitive price changes as a direct reaction to economical and real estate market changes (Benk et. al., 2009). In addition, the small amount of required capital necessary to invest into OEREFs results in a lower investment threshold compared to direct property investment, enhancing the interest of smaller private investors. These differences imply different characteristics that open-end real estate funds comprise, raising a necessity for them to be treated different from other investment classes

in regard to attractiveness or return and risk calculations. An exemplary risk can hereby be described as the liquidity transformation that results from the illiquidity of real estate and the potential daily issuing of shares.

When capital is available for investment, the investor needs to base the decision on assumptions in regard to the assets. For a better comparison between assets an important indicator is known as “performance”. Performance in regard to a company may hereby be described as a „business' ability to take operational resources, manage them, and produce profitable returns” (Kenton, 2018). For assets, it can be defined as “the relative change in the value of an investment, plus an income generated and adjusted for deposits and withdrawals during a given period of time. The result shows the excess of an investment considering risk.” (Behrisch, 2009) Another definition for asset performance is “the investment income of a portfolio or a new security, made up of price successes and dividends; i.e. the comparison of the investment success with another benchmark” (Lackes, 2018). Even more often in the literature, the word “performance” is used without further explanation as to which epistemology is taken on when measuring performance. The different underlying assumptions of how performance is measured reveal the challenges of a term with no universal procedure intending to provide and improve comparability, further suggesting that the evaluation of performance output figures can differ from analyst to analyst. Consequently, a closer look at the performance' determination and evaluation is necessary in order to provide a foundation for asset, and hence fund, comparability.

1.1 Research Aim and Scope

In the interest of the complexity of OEREFs this thesis aims to disclose and extensively evaluate OEREF performance, the different performance models that currently exist in the literature, as well as the determinants for fund performance. The focus is put on retail OEREFs available to private investors, which stand in contrary to special OEREFs available to institutional investors only. Given market information such as secondary market share price development, share price development, indices and annual reports will be used to determine different returns and discuss characteristics of OEREFs that may influence such returns.

The research focuses hereby on the German retail OEREF market, due to its maturity and level of development, offering high quality data by several data providers. Twelve OEREFs, which existed for at least four years, will be analysed in their fund structure and other performance influencing factors. A four-year observation time period was chosen due to the fact that several funds did not provide information further back in the past, which would have limited the fund sample size of the data. The data comprises information available on each fund manager's websites, secondary market share price development from finanzen.net as well as German fund market data and indices provided by IPD, BVI and INREV.

1.2 Research Question and Hypothesis

When taking a glance at the stock market, one can observe that the performance is mostly derived through stock returns. Generally, a return can be calculated by using solely the value of an asset at different points in time, and the pay outs within that time frame as the main parameters. The value of stocks can hereby be precisely taken from the price on the given stock market. In contrast, the value of any property within the OEREF can only be estimated by the valuator, unless a property is sold or purchased. Longer holding periods for the illiquid asset class “real estate” make sells and purchases a rarer occasion than is the case for stock-based funds. In addition to the heterogeneity of real estate, the usage for actual sale and purchase prices for the value estimation of other property is limited. This shows that return calculation for real estate are more complex and inaccurate compared to other asset classes, as real estate returns are partially based on vague assumptions. While returns for single properties can be questioned in their reliability already, the fund returns differ in performance from the cumulation of property returns due to factors such as diversification, manager performance, implementation of acquisition and sales into the yield, bank support, and level of leverage. It is possible that the fund manager can adjust the yield of the portfolio through several mechanics, and also the fund return published by the fund managing company and determination of the dividends could therefore be an inaccurate reflection of the performance of the underlying assets. The first research question hence deals with the difference between the return achieved by the property portfolio and the NAV per share price-based return.

Research question 1: Does the share price-based return reflect the performance achieved by the portfolio and other portfolio influencing parameters?

With the regulation change in 2013, most importantly adding a 12-month notice period before share redemption, the secondary market for OEREFs, e.g. in Hamburg, has further matured. While the secondary market should only account for the liquidity premium given to investors who could otherwise only liquidate their asset in up to 12 months, the secondary market for secondary market shares is more sensitive to the investor sentiment and tend to therefore be more volatile. As a result, the price development of OEREF shares on the secondary market may differ from the price development of the fund share prices and the significance for research of secondary market information as a substitute for the fund share price development may decrease.

Research question 2: Do the prices on the secondary market correlate with the fund share prices?

1.3 Contribution

The literature offers an extensive discussion about the use of OEREFS in a mixed-asset portfolio (Benk et. al., 2009), the difficulties it faces with the highly valuation-based share prices (Weistroffer and Sebastian, 2014), and the liquidity problem generated by its structure (Banner et al., 2007). At the same time, performance measure of mutual funds has been around since Harry Markowitz published his paper on “Portfolio Selection” in 1952, and has been further developed by several authors since (Sharpe, 1964; Jensen 1964; Fama and French 1972; Grinblatt and Titman, 1989). A close attempt to adjust the performance assessment to the characteristics of OEREFS was done by Fuerst and Matysiak (2013) who published the “INREV drivers of fund performance report” and extracted performance variables unique to OEREF through hedonic regression. Nonetheless, the research covered all unlisted funds and only considered a few potential return drivers. Furthermore, Piazzolo et al. (2013) made an attempt to assess the performance as part of the IPD “Performance Study – open-end real estate fund index”, however they only considered returns as the sole performance criteria. As to the knowledge of the author, this paper is the first attempt to comprehensively analyse performance influencing factors and the opportunities that arise from the assessment of German retail open-end real estate fund’s performance from different perspectives, by the use of annual reports, share price development and secondary market information.

1.4 Thesis structure

The thesis is divided into five parts. In chapter 2 the literature is reviewed and relevant information about OEREFS and performance assessment are discussed. Chapter 3 contains the data description and the methodology used in this research. In chapter 4 the results are presented and illustrated, and the results are discussed in regard to the previously presented findings from the literature. Finally, in chapter 5 the research is concluded and suggestions for further research are made.

2 Open-end Real Estate Funds

Open-end real estate funds (OEREFs) are a type of indirect, unlisted real estate investment vehicle where the majority of fund capital is invested into property. A fund, in general, is a “pool of money that is allocated for a specific purpose” (Kaga, 2019) are in most cases managed externally by one entity. In the case of German open-end real estate funds, the manager as a legal institution is called *Kapitalverwaltungsgesellschaft (KVG)*. In regard to the total real estate capital markets, the investor hereby invests into private equity. The “equity” investment stands in contrary to debt investment, when capital is lent to a separate entity. The role of open and closed end funds is illustrated in figure 2, as part of a four-quadrant model that visualized the different types in respect to equity, debt private and public investment.

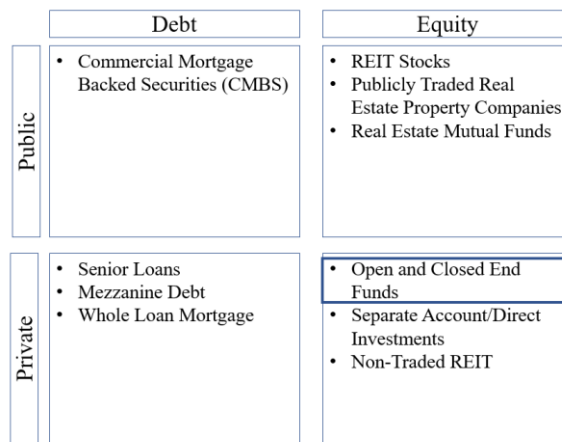


Figure 2: Four quadrants of real estate investment (Jain, 2014)

In case of a total failure of an investment, the return of debt capital is prioritized over the return of equity. Consequently, equity investments are riskier than debt investments. The “private” investment on the other hand stands in contrary to the investment in public investment vehicles that are traded on a secondary market, such as a stock exchange, and offer acquisition and sale by all legal entities.

The term “open-end” indicates that investors can openly invest and, to some extent, redeem shares, and that the fund is aimed to be continuous with no prearranged termination date. The capital received through a new share acquisition by an investor leads to an increase in liquidity, such as cash on bank accounts, which can be used by the fund managers for investments or operations. Analogically, a redemption decreases the available cash reserves and, after reaching a set threshold in respect to the liquidity ratio, may force the fund manager to sell assets. In consequence, the number of shares within a German fund is furthermore variable and able to change on a day to day basis (Benk et. al., 2009). While the shares used to be acquirable on a daily basis, a new regulation called KAGB, replacing the former InvG, added a clause that required a notice of 12 months in advance for any share redemption, effectively restricting the sale of fund shares. The overall decreased liquidity of fund shares resulted in an emerge of secondary market trading, where the fund shares are traded publicly on public exchange markets. As such, fund shares are traded simultaneously on a private

basis through the fund managing company, as well as publicly through a public exchange market. For a better distinction the public exchange fund share will be referred to as secondary market share.

The described characteristics in which OEREFs differ from other asset classes create a unique return-risk profile and increase the potential for diversification within a mixed-asset portfolio. Benk et. al. (2009) showed in his study that mixed-asset portfolio returns increase gradually by up to 25% with longer investment horizons and with an increasing ratio share of OEREFs. Returns considered equal, they also concluded that the risk of a mixed-asset portfolio can be lowered by up to 32% when about one fourth of assets are allocated into OEREFs. In the same manner, the lower, less correlated return-risk profile of property compared to bonds and stocks was also found by Bannier et al. (2007) when examining GOEREFs over the period of 1980-2002. Fuerst and Matysiak (2013) found that there is no strong relationship between unlisted funds and the stock market, supporting the low correlation and possible diversification effect it may have in a mixed-asset portfolio. Potentially driven by such diversification effects, the share of GOEREFs within the 980 billion euro mutual fund market in Germany reaches slightly over 10% (statistica.com, 2018).

Due to the relevance of GOEREFs in the fund market a great interest arises for analysts to evaluate the funds and forecast their future performance, aiming for accurate and detailed predictions, as to where each fund is positioned in the market at any given time. Nonetheless, the complexity of all variables in respect to OEREFs quickly reveal that a universal precise performance measure compatible with every fund does not exist.

OEREFs have been discussed extensively for their advantages and disadvantages from the point of view of an investor. Some authors consider them an attractive investment for their believed sustainable returns, underlying assets, a continuous development of the share value, active management of a diversified fund, tax-free shares of the dividends, fungibility and legally established control mechanisms which protect the fund and the investor (Kutscher, 1994). Fuerst et al. (2014) summarized several authors, (Hoelsi, Lekander, 2005; Brounen et al., 2007; Haran et al., 2008), supporting the mentioned benefits of OEREFs in their findings. At the same time OEREFs have been criticized to be untransparent in their structure and earnings towards the investor. Hereby they cannot easily be made accountable for mismanagement, e.g. when the performance or level of active management decreases (Bannier et. al, 2007). The anticipated diversification through international markets adds several risks, such as lack of market expertise or currency risk (Marc et al., 2011). The liquidity transformation of very illiquid assets to a daily redeemable share have seen the liquidity risk being affected by unsystematic risk, e.g. management failure, but also systematic risk, such as outflow behaviour of investors based on the performance of other funds. Another criticised aspect is the low level of optimization of asset holding periods within the fund. As potential buyers tend to have similar knowledge about the life cycle position of assets at any given time, they also tend to reject asset acquisition when they are in the lower part of a cycle and tend to buy in uprising market times. For the funds, the acquisition and disposal of assets can therefore only be optimized with difficulty (Rohmert, 2004).

In regard to the exemplary advantages and disadvantages, it appears that the attitude towards OEREFs in the literature is mixed. All in all, they are complex on a multidimensional level. and reveal a necessity to make several considerations when allocating capital. The characteristics of OEREFs are unique as a whole and may appeal to a specific group of investors who seek for an indirect real estate investment with long term stable returns.

2.1 Structure and Regulations

In Germany, OEREFs can for the most part be divided into retail funds (“Publikumsfonds”), available for all investors, and special/institutional funds (“Spezialfonds”) which are only available to institutional investors (Maurer et al., 2012). In addition to the retail fund and the special fund there are also co-op funds, which are available exclusively for clients of the banks who manage the funds (Stein, 2014).

Open-end real estate funds are most commonly compared to closed-end real estate funds. In contrary to closed-end funds, OEREFs have a perpetual life, regular liquidity in- and outflow, unit price generation based on the valuation-based NAV, while closed-end shares can only be traded on a secondary market once the fund is fully closed and the manager has started to invest capital. In respect to performance, the benchmark used as a performance indicator for open-end funds are indices, while for closed-end funds a fixed nominal target rate of return is tried to be achieved (Klug, 2008).

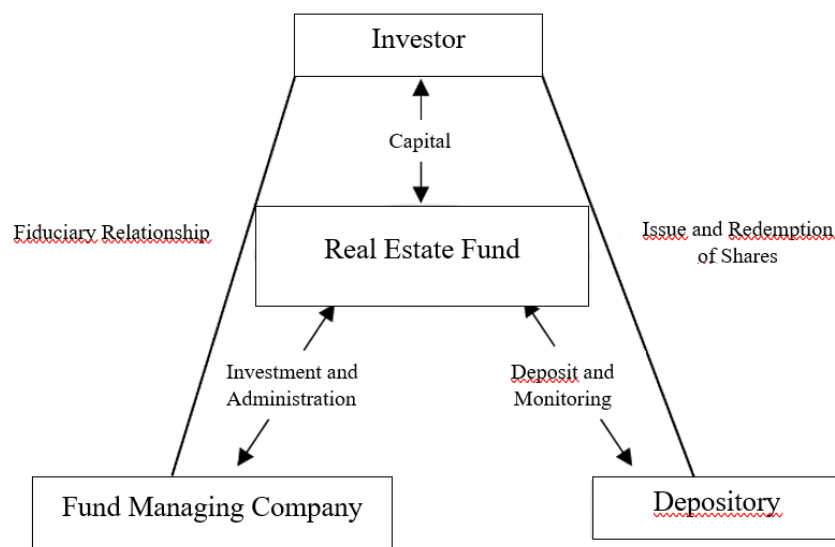


Figure 3: Structure of open-end real estate funds in Germany (Referring to Bentele, 2016)

The managing company of a GOEREF must by German law be an incorporated or limited company (Klug, 2008). As seen in figure 3, the investment fund structure in Germany consists of the investor, the KVG who manages the fund, and the deposit institution, often represented by a bank. While the depository bank takes control of share issuance and redemption, it furthermore monitors the in-and outflows of the real estate fund (Bentele, 2016). However, since the fund managing company is commonly owned by the bank, the quality and purpose of the monitoring purpose may be questioned. The fund managing

company stands in a fiduciary relationship to the investor, whereas the investor transfers responsibility and rights over the capital and assets to the fund managing company (Bentele, 2016). In addition to the three entities depicted in figure 3, a supervisory board (Aufsichtsrat) as well as an expert board (Sachverständigenausschuss) provided by the BaFin are set as controlling institutions over the fund and its management (Stiefel, 2010). The managing company (KVG) must be its own entity, separated from the bank (Banner et al., 2007).

GOEREFs are exempt from German corporate income tax, rental income tax as well as German trade tax. Only the achieved profit on an investor’s level is subject to taxes (Johansen, 2012). For an exemption from the German trade tax the assets need to be held by the fund for at least 24 months (Spieler, 1994). For investors the capital gain tax is subject to exemption as well, enhancing the appeal of GOEREFs investment.

The determination of the fund share price is based on several factors, most importantly the NAV of the fund portfolio. Most GOEREFs measure the NAV per share on a daily basis (Schnejdar et al., 2019). Nonetheless, the NAV per share cannot simply be determined by dividing the NAV by the number of shares. This is due to the fact that transaction costs (tax fees, broker fees, legal fees) need to be taken into account. New investors buying at NAV price would imply that only past investors bare for occurring costs. As a result, the offer price for a share is a combination of a rate of the cost to acquire the assets, based on the current portfolio value, and the NAV per share (Skinner and Bradford, 2006). From an investor’s perspective, the share price can be divided into two different values: the issuance price and the redemption price. Both are based on the ratio between the net asset value of the fund and the number of issued fund shares. In addition, there is a spread between the two values, called agio, which comprises an issue surcharge that is paid by the investor. This issue surcharge represents all costs that occur in respect to the transaction of property, since the transaction costs at acquisition and sale are not priced into the value of a property, but rather need to be reflected in the fund price.

As seen in figure 4, the surcharge can hereby be either discounted from the issuance or the redemption price. A discounted issuance price will result in a redemption price that reflects the ratio between NAV and number of shares, and a discounted redemption price reflects results in an issuance price that reflects the ration between NAV and number of shares. Both types of adding the agio can be found in practice.

Gross Asset Value (GAV)	-	Debt and Non-property related equity	=	Net Asset Value (NAV)	
Net Asset Value (NAV)	:	Number of Shares	=	Share Price	
Share Price	-	Issuance Agio	=	Lowered Issuance Price	→ Redemption Price = Share Price
OR					
Share Price	-	Redemption Agio	=	Lowered Redemption Price	→ Issuance Price = Share Price

Figure 4: Determination of Issuance and Redemption of the Share Price

When transaction costs change, it can be problematic for the fund to adjust the surcharge, as this may lead to an advantage or disadvantage for the investors, where too much addition

onto the issuance price punishes new investors and puts older investors into an advantage, and vice versa. This was found to effectively influence their allocation decision, where an anticipation of increasing transaction costs favours investors to enter into funds that discount the surcharge from the issuance price (Skinner and Bradford, 2006). Moreover, the different values for issuance and redemption price increase the difficulty in terms of comparability for benchmarks and funds, as they do not always depict which value they used for the benchmark construction.

The German valuation guidelines (WertV and WertR) regulate the valuation procedure for most German valuers. As per German definition, the land can be used indefinitely, while buildings constructed on the land deteriorate and have a finite lifespan. To distinguish the characteristic further, the WertV and WertR strictly separate the value of land from the value of the buildings. Land valuation is hereby determined by an official “board of expert evaluators” (Gutachterausschuss). Through deduction of a fictive annual return on land from the property return the value of the building can be derived (Weistroffer and Sebastian, 2014). More information about the valuation process of property can be found in chapter 3.1.4.

In accordance with the Investment Law (InvG) funds need to appoint at least three independent valuers as a committee with a rotation pattern of at least two years. The committee is assigned to audit each other’s valuations. The German supervisory authority (BaFin) serves as a control instance for the valuers to ensure professionalism and economic independence (Weistroffer and Sebastian, 2014). When a fund wants to dispose of a property, the transaction price is allowed to decrease only up to 5% below the value of a property (§82 InvG). With the general lagging of values when the market is in a downturn stage, the properties are at risk of being overvalued and funds may not be able to sell off the properties (Weistroffer and Sebastian, 2014). In order to avoid large abrupt changes in the redemption prices due to valuations, the properties of a fund are not appraised on the same date, but in bundles at different dates over the year (Maurer et al., 2012). The German law imposes several restrictions on the fund structure of GOEREFs to ensure a risk-diversified portfolio. According to §73 (1) InvG, each property’s value cannot exceed 15% of the total fund value. Additionally, the sum value of all properties which exceed 10% of the total fund value cannot exceed 50% of the total fund value (Bentele et al., 2016). In regard to the portfolio value, a maximum of 30% can be bound to a different currency, therefore decreasing the currency risk for the fund (Maurer et al., 2012).

One of the most influential regulation changes in the KAGB was decided in 2011, and became valid from July 2013, introducing several new rules for GOEREFs. Firstly, a minimum holding period of two years together with a one-year notice period for share redemption exceeding 30,000€ was introduced (Stein, 2014). Secondly, the suspension of redemption is mandatory when a liquidity shortage occurs. Thirdly, 50% of the revenues have to be paid out as dividends unless they are needed for the maintenance of property. This is done twice a year and is predetermined at the establishment of the fund. Fourthly, valuations need to occur every three months by two independent valuers (Sebastian and Strohsal, 2016).

Lastly, when a fund goes into liquidation, it faces new limitations on the prices it can dispose the assets for. Hereby, properties can be sold by up to 10% under the last value. This limitation is increased to 20% after two years (Johansen, 2012). As a result, the liquidation of a fund can take several years to complete. From the moment the liquidation is decided, the remaining portfolio is transferred to a depository bank, who then takes care of the asset disposal. Maurer et al. (2012) criticized the new regulations, where they suggest that the regulation favours the funds whose risk of falling into a liquidity crisis is reduced. Investors, on the other hand, have an increase opportunity cost due to the higher level of illiquidity, as they cannot redeem their shares whenever market conditions change in favour of other assets classes or investment opportunities. Maruer et al. (2012) state the following:

“[A] semi-closed structure prevents liquidity crisis, but will generate a different risk and return profile, especially with much higher permanent return volatility. It is at least questionable if this is in the interest of long-term investors. On the other hand, when maintaining the current open-end structure [in 2012], policymakers and investors have to accept the unavoidable risk of temporary fund freezes.”

Sebastian and Strohsal (2016) believe that the new regulations have stabilized and simultaneously increased, the illiquidity of the OEREF industry, being now closer to the underlying asset’s characteristics. Stein (2013) stated that suspended funds were not able to return as a result of the regulation changes, while normal performing funds “did not need the helping hand of the regulators, yielding the change of law sort of ineffective”. These statements indicate the impact such a regulation change had on the fund industry in Germany, and either way the new regulations have changed the return-risk profile, and hence the performance which funds are achieving.

All in all, GOEREFs offer some level of risk mitigation for investors through mandatory diversification or notice periods to prevent fund runs. Nevertheless, the broad range of regulations contribute to the management costs and fundamentally determine the risk-return profile of GOEREFs.

2.2 History of GOEREFs

The investment vehicle GOEREF started in 1969, when the Investmentgesetz (InvG) introduced regulations for the open-end real estate funds, mostly in concern of the liquidity risk that underlies the funds. It covered 5% minimum cash reserve, a limit to leverage and a possibility to suspend redemption if necessary. The latter was never used until the start of the first GOEREF crisis in 2005 (Banner et al., 2007). Ever since the establishment GOEREFs were a popular investment opportunity for German investors. After the German reunification in 1989, the popularity of funds strongly increased even further, particularly between 1992 -2001. In 2001, by the mean of the German investment firm act (*Finanzmarktförderungsgesetz*), funds were allowed to take on currency risk, increasing the allocation possibilities on a global level. In 2002, the BVI introduced a rating agency which helped investors decide on their investment decisions and monitored the funds, assessing the fund performance based on risk and return, as well as the management and allocation quality (Schulte et al., 2005).

In 2004 the volume invested into funds started to stagnate, while the returns simultaneously hit an all-time low, following a drop in commercial property prices, which resulted in large amount of withdrawals and liquidity shortage for funds owned by Deka, Hypo Vereinsbank and Commerzbank. All banks managed to support their funds and help them recover from the crisis (Fecht and Wedow, 2009). However, in December 2005 the closure of “Grundbesitz Invest” managed by Deutsche Bank’s DWS, was announced, as Deutsche Bank was not willing to provide credit for the fund, since they did not consider the loss in reputational capital larger than the loss in financial capital. This led to an outflow across the whole GOEREF market, putting many funds at liquidity risk (Bannier et al., 2007). Between December 2005 and March 2006, over 12 billion € covering 13% of the total AUM were withdrawn by investors, leading to three more funds suspending their share redemption (Weistroffer and Sebastian, 2014).

In 2006 only those funds which did not go into suspension during the crisis received positive inflows (Fecht and Wedow, 2009). In 2009 the global financial crisis triggered a second liquidity crisis for the GOEREF industry. Ten funds, with over 30% of all capital invested into GOEREFs, had to suspend the redemption on shares. The main result was found in the devaluation of many properties on a global level, leading to several property values within the funds being decreased as well. By this time, the image of GOEREFs giving stable returns with liquidity on a daily basis had decreased (Maurer et al., 2012). In answer to both crises a new regulation called Directive 2011/61/EU was adopted by the AIFM in April 2011 and came into effect on July 2013. Hereby, the possibility for redemption of shares with values under 30,000€ required a notice 12 month prior to the redemption (Bentele, 2016). Such changes for GOEREFs through the AIFM regulation were strongly criticized by Nack (2012), arguing that the changes make it more difficult for fund managers to comply with the law, as many regulations in the AIFM are already covered in the InvG, simply adding more work onto the funds. In comparison to listed real estate vehicles, such as REITs, GOEREFs were quite unresearched in their economical characteristics. Throughout the 21st century, with more guidelines being introduced by BaFin and the Investmentgesetz, the management transparency increased as well. Fuerst and Matysiak (2013) believe that the tendency went, and may still go, towards stronger regulation and higher transparency within the open-end real estate fund industry.

In conclusion, GOEREFs maintained their reputation for the most part of their existence, however recent years generated two crisis and revealed several difficulties of the investment vehicle. The believed reasons as to why these crises had happened include rating agency influence and its misuse and the valuation practices used for GOEREFs (see chapter 3.1.4). The history of the funds revealed even further that OEREFs are a complex investment vehicle with many factors influencing their stability, security, growth and performance.

3 Open-End Real Estate Fund Performance

In regard to the sheer amount of alternative investments, most investors have the interest to determine the “success” of such alternative investments in order to find the best possible investment in regard to one’s investment strategy. Just like the strategy and investment profile can differ on an individual level, it can differ strongly on portfolio level as well. One common indicator for success that is mentioned frequently in the literature is the term “performance”. It can be defined as “the relative change in the value of an investment, plus an income generated and adjusted for deposits and withdrawals during a given period of time. The result shows the excess of an investment considering risk.” (Behrisch, 2009) Another definition for asset performance is the “the investment income of a portfolio or a new security, made up of price successes and dividends; i.e. the comparison of the investment success with another benchmark” (Lackes, 2018). As described by the definitions, important parameters related to the performance of an asset are the change in value, the income generated, a given period of time and risk. Furthermore, asset performance aims to be comparable between different asset classes, e.g. through benchmarks, which is in the interest of investors who choose the best possible investment option.

In order to increase the level of comparability the performance measurement in regard to funds and property have been attempted to be standardized. On a global scale, standards like the Global Investment Performance Standards (GIPS) try to improve the level of comparability of investments. In Germany, the German Asset Management Standard Committee (GAMSC) aims to make German funds comparable to other funds, in respect to the already strict and settled regulations that exist for German funds. However, the implementation of standards set by the GAMSC is voluntarily, whereas approx. 60% of all German investment funds are participating (Raab, 2019). A similar lack of obligatory use is found for the GIPS. This fundamentally decreases the effectiveness of such a measure, as the comparability between the funds is still limited. All in all, performance calculation and measure and cannot fully be universal when even the assumptions taken for the standards may differ, enhancing the necessity to carefully observe all aspects of open-end real estate fund performance.

3.1 Stakeholders

Firstly, a view on the most important stakeholders of OEREFs will be undertaken. As depicted in figure 3, the fund manager, investor (or shareholder) and the depository bank are the main operators in the sphere of real estate funds (Bentele, 2016). In addition, the valuers have such a significant impact on the fund performance (Rohmert, 2004) that their role and task will be looked at in more detail as well. A discussion about the main actors in regard to the open-end real estate funds gives insights on their intentions, and the potential issues that arise with the establishment, measurement and assessment of fund performance.

3.1.1 Fund Managing Company

Fund managers play a particularly important role for the funds, as by nature they have a high degree of responsibility and power of decision. They dynamically manage the OEREF and may take on roles in the field of development, purchase and disposal, liquidity management, marketing, market research or asset management (Klug, 2008). A common feature of indirect investment vehicles is the high level of authority the manager receives to react quickly and guarantee the success and potential overperformance of a managed portfolio. However, the manager stands at a superior position in regard to information about the fund compared to the investors and is driven by the fee incentives as well as eventual interests that differ from the pool of investors' interests. This is known as the principal-agent problem (Kurzrock et al., 2009). The level of control a manager is given over the fund in order to adapt to changing market conditions is higher than for a closed-end structure, where investors and manager can mutually discuss and implement changes throughout the holding period. The lack of influence on the fund can be of some concern for some investors (Skinner and Bradford, 2006). In addition, manager performance fees are a significant aspect of the fund structure. While higher fees are of more interest for the manager, it may scare investors to invest into a fund, effectively decreasing the fund cash pool and hence opportunities to increase the fund size. On the other hand, the fees in the fund industry resemble the level of professionalism of a manager. With that knowledge for investors and managers alike, even worse performing managers may charge high fees to appear more professional and attract more investors (Schnejdar et al., 2019). Consequently, the level of fee can be a misleading indicator for the investor about a manager's skills and knowledge. In addition, the fee structure is crucial for the strategy pursued by the managers, as a fee simply based on a higher NAV may lead to the purchase of highly valued assets that do not perform in the interest of the investors.

The open-end structure used to be regarded as a great advantage for the investors to cope with bad performance, as they can, in theory, always redeem their shares in case of an emergency. The ability to monitor the development of redemption gives the investors a control mechanism (Kurzrock et al., 2009). Unlike the closed-end fund structure, where investors cannot simply withdraw from their investment if the manager performs badly, the investors in an open-end structure can redeem their shares if desired. As managers may be scared of a run from investors and the effect it may have on the liquidity-sensitive funds, they are incentivized to put in high effort in order to avoid such runs (Sebastian and Tyrell, 2006). A fund going into liquidation can consequently damage the manager's reputation (Bannier et al., 2007; Sebastian and Tyrell, 2006). However, the regulation change in 2013 led to a minimum notice period of 12 months in advance for any share redemption, reducing the effect of withdrawal as a control mechanism. As a result, managers can act more careless without seeing the consequences of their actions immediately reflected in capital outflows, as was described before the regulation change by Kurzrock et al. (2009).

Different aspects can drive the performance of managers. Friis and Smit (2004) have compared fund performance with manager characteristics and found that the qualification of the manager matters, where managers with a Chartered Financial Analyst qualification performed better than managers with a Master of Business Administration (MBA). In respect to the team size and skills Bär et al. (2005) concluded that a fund managed by a team performs slightly worse than funds managed by a single manager. than Skinner and Bradford (2006) stressed the communication between manager and investors, as well as the level of

transparency related to the fund and their work, to be impactful factors in regard to the fund performance. As understood by the author of this thesis, a better communication may increase the inflow and enable to invest into new objects, eventually profiting from economies of scale and a higher level of diversification.

For mutual fund manager performance in general, Baum and Farrelly (2009) mentioned the importance of dividing into the income return and the capital return in respect to return assessment, as these returns “reflect different features of management skill”. One feature that directly impacts performance can be described as the level of active management. Fama (1972) discussed the possibility of measuring such active management for mutual funds by using two components, namely selectivity and timing. The return on selectivity (also known as alpha) would hereby be reflected as the “difference between the return on the managed portfolio and the return on a naively selected portfolio with the same level of market risk” (Fama, 1972). The timing component can be described as the ability of managers to forecast major market changes and adjust the strategy to buy and sell assets at the right time, in regard to the current position within the real estate market cycle (Lee and Stevenson, 2003). Sebastian and Tyrell (2006) believe that the asset selection executed by the manager has a major impact on the OEREF’s performance. Even though high effort put into asset selection is connected to higher costs for the manager, it is in the interest of the manager to boost the funds’ performance and reputation. Ferson and Schadt (1996) criticised timing and selectivity to be the fundamental measures for mutual fund performance as they are too static and do not take the dynamic, complex and active trading behaviour of managers into account, and consequently do not fully display their actual performance. While OEREFs by nature are less active than other types of mutual funds, the dispersion between measurable performance and actual manager performance can be assumed for OEREFs as well. In further regard, the models that are chosen for the assessment of performance need to be decided with caution, as the results often react sensitive when different models are applied (Busse et al., 2010).

In regard to real estate fund managers, the possibilities to perform in terms of selectivity and timing are limited. Lee and Stevenson (2003) talk about a study conducted by Stevenson (1997), where Irish based real estate funds are observed, and the results show that the managers are not able to outperform in terms of selectivity but can outperform in terms of timing. Lee and Stevenson (2003) explain the absence of selectivity to be reasoned by the illiquid characteristic of properties, which cannot just be bought or sold immediately at any time. In another study Byrne and Lee (1997) show that real estate managers can indeed be measured by their selection and timing ability and found that they have moderate selection ability and very high timing ability. As discussed by Baum and Farrelly (2009), Lee and Stevenson (2003) have found that OEREF fund managers in the UK are able to outperform in terms of the selectivity, but not in regard to timing. As a result to these limitations, Geltner (2003) suggests a division of asset selection as a performance driver into several stages, namely the property selection, acquisition transaction execution, operational management and disposition transaction execution.

The impact of managers on the fund performance discussed in this chapter reveals their authority in the fund structure, and the need for transparency and constant communication with other stakeholders. It becomes obvious that overall funds perform better when the incentives in regard to management fee structure and external reputation are chosen to also

favour the manager performance. However, Baks (2003) concluded in his paper about fund and manager characteristics that the fund characteristics have a stronger impact on fund performance than manager characteristics.

3.1.2 Shareholder

The shareholders are the main source of capital for all open-end funds, whereas debt can only be raised with a sufficient amount of equity. Hence, an analysis of the shareholder's profile, interest and comprehension of performance comprise an important part of fund performance in general, as their behaviour fundamentally influences the capital structure and the opportunities of growth and success for any fund (Kurzrock et. al, 2009). For a better understanding of how shareholders define performance an examination of their profile and interests is advantageous.

Investors can be distinguished in two different categories: retail investors, which can comprise several different legal entities including private bodies, and institutional investors, such as insurance companies or pension funds. Institutional investors have better access to resources and tools for fund market observation while also quicker to down and upward changes in the market (Kurzrock et al., 2009). In regard to OEREFs this can lead to a possible run of institutional investors when bad news about a fund arise, which may even be enhanced when they know that most other investors are institutional as well (Kurzrock et. al., 2009). Fecht and Wedow (2009) found in their research that retail investors are less responsive to upcoming changes concerning the invested fund, and hence add a stabilizing effect on the fund's outflows before or during a crisis. This can be reasoned in retail investors using funds mostly as a long-term investment. Schmidt et al. (2013) found similar results for a reverse scenario, whereas a larger number of institutional investors increased the risk for a run.

Maurer et. al. (2012) found most open-end funds which are characterized by low volatility, high autocorrelation, stable returns and long holding periods for assets to attract risk-averse investors. Due to the way how share dividends are equally distributed over the years it may be questioned if OEREF shareholders seek for a higher position on the return-risk ladder. Furthermore, the investor pool got more international in the past decades, as investors crave for new markets and opportunities and the internet and globalization have enhanced the access to international investments (Suárez, 2005). Assumingly this may have increased further with the digital and technological advancements in the recent past. It can be interpreted as an advantage from the fund market's perspective, as international capital markets are to some degree independent from each other and can bring an inflow into a market that would otherwise experience a stagnation. On the other hand, potential language barriers and differences in culture, ethics and moral standards can decrease the communication and mutual understanding between managers and investors, effectively seeing the capital not being used optimally in respect to the investor's strategy.

Extensive knowledge about the characteristics and strategical preferences of the investors can help the fund to adjust the fund strategy accordingly and improve the investments and fund performance. An explanatory strategy that could be followed is a long-term, capital

growth-oriented strategy rather than an income-oriented strategy. This is due to the fact that fund shareholders have several tax benefits: they are exempt from corporate income taxes, while private investors pay income taxes on dividends and interest payments received as a result of their shareholding. Furthermore, the change in capital value is free of taxes for private investors (Maurer et al., 2004a). According to Rohmert (2004) the investment strategy from an investor's perspective may have a focus on property quality, location quality and stability, diversification, contracts, management fees and professionalism, cyclic diversification, initial rental income, value stability and transparency, as well as long-term total return. All those factors can be, whenever possible, in some way used as a directory for the total fund performance.

In conclusion, the profile of shareholders can be mixed, including retail and institutional, risk-averse and higher risk, as well as national and international shareholders. Analogically, their understanding of great performance can differ. An evaluation of the investors can reveal the general strategy and level of risk of a fund, and in conjunction with the portfolio return indicate the general investment profile of the investment clientele that are willing to invest into a specific fund.

3.1.3 Depository Bank

For open-end real estate funds, the depository bank often plays an important role as they are strongly connected to the ownership of the fund managing company. Hereby, the KVG, i.e. the company structure managing a GOEREF, as described in the German law (Investmentgesetz), is most commonly owned by the depository bank. The main activities of real estate funds and banks are considered to be similar in terms of the liquidity transformation, where banks provide long-term loans and need to hold cash reserves on a daily basis for clients in case of many and large withdrawals, while real estate funds hold illiquid assets and may experience changes in monetary availability on a daily basis as well (Fecht and Wedow, 2009). Banks may therefore offer an expertise beneficial for the handling of funds with such an open-end structure. In addition, the banks have the opportunity to recruit from their pool of own clients and quickly increase the capital size of the fund at initiation in order to acquire assets right away.

The structure of KVGs being owned by banks is the most popular structure for several more reasons. The investors interpret the liquidity risk to decrease when the KVG is owned by a bank, since banks who own the fund managing KVGs can temporarily buy fund shares to provide additional equity or grant loans and hence provide debt to prevent a liquidity crisis (Maurer et al., 2004a). However, since buying fund shares at book value usually means a loss in downturn markets, the banks will not do such actions limitless (Fecht and Wedow, 2009). Share purchases by banks can also be used to enhance the equity of the fund in order to buy new assets, if the available equity would otherwise not be sufficient. The banks themselves can store liquidity on a temporary basis by investing into the fund, or grant loans to the funds, effectively benefiting from the fund as well (Maurer et al., 2012). The bank's strong influence on the fund, however, can also show negative effects on the fund when the fund becomes less important for the bank, which was the case in the previously described Deutsche Bank case with Grundbesitz Invest in 2005.

Stein (2013) found hereby that retail open-end funds formed by banks have a higher survival rate and better performance than those funds where the KVG is not a subcompany of a bank, since better access to more liquidity is expected to positively influence the performance of a fund (see chapter 3.3.2). Stein (2013) underlined this assumption by the fact that none of the bank-managed funds has had to suspend their redemption since the last fund crisis in 2008. Sebastian and Tyrell (2006) concluded that funds managed by companies who are owned by banks exhibit increased performance as a result of better distribution expertise and higher fund professionalism, since many banks own more than one large fund and can support the KVG with asset purchases via financing. The strong influence of the banks is represented by a case described by Sebastian and Tyrell. (2006):

“When Commerzbank took over Dresdner Bank in January 2009, Dresdner Bank’s DEGI Europe fund had already been sold to Aberdeen International. Commerzbank successfully channeled former DEGI investors from Dresdner Bank into their own open-end funds. This sudden loss of many investors has put DEGI, and thus Aberdeen International, under pressure.”

Downs et al. (2016) analysed the effect funds from the same depository institution have on each other’s performance, since they may draw from the same pool of investors and effectively compete with each other. They found that there is indeed a “cannibalization” effect between the funds, where newly opened funds decrease inflows into other funds of the same family. They reasoned new openings to provide a higher level of economies of scale, however new fund openings are a “high-risk low-reward strategy for fund families”. Since KVG may have an interest in new fund openings only when outflows of the other funds are low, it can be assumed that families with many funds have experienced stable inflows compared to outflows in the past. This may also be reflected in the investor sentiment, as they might assess a larger fund family as successful. According to Downs et al. (2016), great performing funds additionally provide positive inflow for all funds from the family. Concerning performance analysis this may be used as an argument to support better assessment of funds from the same family. Furthermore, it may indicate that the performance from other funds in the same family affects all other funds from the family as well. Information about funds which are planned to open in the future could also be used as an additional variable in the measurement of fund performance from the same fund family.

In conclusion, the depository institution can actively influence success or failure of a fund on several levels. It indirectly manages the fund through a KVG, has the ability to offer loans and credit for the fund and potentially save or let the fund go into misery. Furthermore, the relationship between funds as part of a “fund family”, managed by the same depository institution, was found to influence the performance of each fund as well. In regard to the fund performance assessment, the larger picture in terms of the managing KVG and the depository institution needs to be evaluated and the effect and influence from the past, present and the future on the fund should be considered.

3.1.4 Valuation

The valuation of the properties executed by valuers in a fund's portfolio are crucial for the price calculation of the whole fund. This is due to the fact that the net asset value of a fund can be described as one of the most important parameters for the generation of the fund share price.

$$\text{Fund share price} = \text{NAV per share} = \frac{\text{Assets} - \text{Liabilities}}{\text{Total number of shares}} \quad (1)$$

Formula 1 depicts the general approach of determining fund share prices. Assets are hereby the cumulation of all asset values at a given point in time. A variance in the asset values therefore strongly impacts the share price as paid or received by the shareholder. The values for open-end real estate funds in Germany have been found to differ from their actual values, i.e. those which could be achieved in a transaction (Geltner, 1991). There are several reasons as to why the values may differ from realized property prices.

Firstly, the valuation practices give room for biases by the valuers. These biases can be of random nature, such as a point in time with extraordinary market situation, noise in the data or the statistical overreaction in respect to a higher measured variance (Yui et al., 2006)., On the other hand, the biases can also be systematic, which could potentially be avoided by the valuer, such as assumptions that differ from valuation standards. One important bias is hereby known as anchoring, where the value at a given point of time is influenced by the previous value. As it is more difficult for the valuer to justify large variations between the present and the past value than it is to justify equal values in the past and the present, the values of property become "hooked" to previous values of the same property (Murphy et al., 1995). Another impactful bias can be described as aggregation bias. It results in value changes following the patterns which they followed in the past, e.g. based on the valuer's same model and the assumption that past assumptions remain true in the present. Even when the market received a strong rise or decline, the values do not adjust accordingly, as a realistic change in the assumptions interferes with past ones.

Maurer et al. (2004a) found that over a period of 30 years the risk characteristics of the money market and the GOEREF market were about the same. Since the money market is, unlike the real estate market, naturally connected to less risk, it seemed unreasonable for that the real estate market has equal risk with higher return, effectively with a better return-risk profile. The real estate market must therefore comprise more risk which is not depicted statistically in terms of volatility in the data sample. They explained it in smoothed values of GOEREFs over a period of time, that are expressed in larger volatilities in transactions than was reached in valuations (Maurer et al., 2004a). Hoesli and Hamelink (1996) have discussed the role of smoothing for the investor and mentioned that the smoothed return of the fund, based on the share price, is the effective return received by the investors. If the fund performance tends to be better or worse than displayed by the NAV, the return for the investor does not change. Whereas in other markets, such as the stock market, the price for the share would immediately adjust. Weistroffer and Sebastian (2014) described the true fund value to possibly originate in the face value promised to the fund investors rather than the cumulation of the residual claims on the fund's assets, i.e. properties. Additionally, the

smoothed returns can withstand temporary asset price shocks and tend to have a positive effect, especially when the price shocks occur for a short amount of time (Bannier et al, 2007).

The smoothing effect of fund valuations could be lowered by increasing the frequency of property valuations. However, this would lead to a loss of the described price shock resistance and furthermore lead to higher costs for the fund, and as a result, also for the investors. (Bannier et al., 2007) Several authors have suggested ways to correct for the appraisal smoothing to uncover the real returns for a property or fund (Geltner, 1991; Byrne and Lee, 1995; Getmansky, Lo, and Makarov, 2004;). The unsmoothing process can be based on an unsmoothing factor, which can be determined in several different ways. One of them was described by Getmansky, Lo and Makarov (2004) who observed and compared the discrepancy between transaction-based and valuation-based value development of real estate. They hereby assumed that the true real estate returns have a higher standard deviation and are lagged, and correct for both by applying a weighting factor for each return in a time series and adjusting the standard deviation through an maximum likelihood estimation The result was an unsmoothing factor that could be used onto valuation-based indices (Hass, 2011).

As a result of a certain level of market inefficiency in the transaction-based data and the appraisal process, the possibility for unsmoothing bias or inaccuracy exists nevertheless (Maurer et al., 2004b). In relation to the important role of valuations, it is possible that managers will exploit the lagged and smoothed values of a fund to artificially improve the fund performance. This could occur e.g. by holding on to bad performing assets which are overvalued or those which raise the fee in the manager's favor according to the agreed-on management performance fee structure. However, due to the fund share trading on secondary markets, less smoothed and lagged return distribution of GOEREFS have been identified as a result of frequent transactions (Schweizer et al. (2013).

A second reason as to why property values differ from the actual prices can be found in the importance of the valuation timing. Market changes can appear at different times, leading to a lag in the real market values. Before the change of regulations in 2013, this led to exploitation of arbitrage possibilities by selling shares for a high price immediately before an expected devaluation and buying the shares back for profit after the price drop. As a result, some funds fell into liquidity problems (Bannier et. al., 2007). In accordance, Maurer et al. (2004) concluded in their paper that property appraisals lag movement in the property market. They argued that the reason may be found in values being based on a yield calculation instead of more market-based cash-flow calculation. Stein (2014) took up on the fact that valuations are based on expected long-term rent to be received (long-term sustainable rental income method). This results in very stable values which do not precisely reflect market changes as part of their values. This phenomena of more stable values can also partially be explained through the definition of a property value as described by the German law (BauGB, §194). Hereby, value is an average price attainable in normal business dealings where both parties act without compulsion and face each other on the same level. It reflects therefore an average value, rather than a best-use value. As market conditions constantly change, average property values adjust less than best-use-values, and consequently tend to be less volatile (Weistroffer and Sebastian, 2014).

Thirdly, despite the regulated independence of appraisers, opportunities for clients, appraisers or fund managers to influence the valuations do exist. (Kurzrock et al. (2009); Amidu and Aluko (2007); Levy and Schuck (2005)). In this respect, overvaluation of funds stands as the most discussed issue. Weistroffer and Sebastian (2014) found in their research that properties held by OEREFs were overvalued before the crisis in 2005/2006, leading to a justified run by the investors and giving reason to critique the current German valuation practices. Furthermore, they found that sold properties were rather conservatively valued properties, while the funds tend to hold on to their overvalued properties. Rohmert (2004) described a valuation technique used by German appraisers to embellish the performance of some funds. The appraisers hereby calculate a higher value than the purchase price and use the profit (“Einwertungsgewinn”) as a capital growth surplus, leading to a better tax benefit, as well as return and performance indication for the fund. According to Rohmert (2004), the appraisers justify the difference between the price and the value e.g. through indexed rent contracts and properties which contain rent contracts based on other agreements. Furthermore, appraisers can artificially raise the value of a fund by indicating vacant property to be vacant solely for the purpose of refurbishment, giving the way for justification of more optimistic figures in the value calculation (Rohmert, 2004).

The different use of valuation all over the world challenges the global standardisation of performance measuring. In the context of GOEREFs this may be noticed when the fund invests internationally, leading to property valuation according to the country’s regulation. As the total return is highly based on the capital value change, the outcome of the valuations strongly changes the possible returns, making it difficult to compare the results when valuation regulations differ strongly (Gläsner, 2019). Gläsner (2019) furthermore mentions that several international studies have found severe restrictions in the comparability of capital value change return figures, underlining this argument. Baum and Farrelly (2009) also mentioned in their conclusion that the fund complexity and the heterogeneity of property make it difficult to distinguish between different factors that contribute to the portfolio performance.

In conclusion, the valuation practices in Germany tend to be problematic and can be justifiably questioned in their significance for the performance assessment of open-end real estate funds. Some researchers believe that the lagged and smoothed values have at least partially caused the fund crisis’ in 2006 and 2009 (Crosby, 2007; Kurzrock et al., 2009) However, the valuation impact may also have advantages e.g. for long-term investors, as they may prefer the stable and smoothed returns caused by the valuations (Hoesli and Hamelink, 1996). In regard to performance assessment, the NAV, and values in general, have to be used with caution and could potentially be adjusted (e.g. de-smoothed) or compared to other variables such as the NOI or property indices.

3.2 Performance Measurement

The choice of applied measures to calculate performance is of high importance. The measures should be reliable, computed consistently and most importantly help shareholders, analysts and future investors understand and compare the performance of the asset or fund. Furthermore, they should accurately depict the performance of the vehicle in the context of its style, strategy, type and structure (INREV Performance Measurement Guidelines, 2020).

The measurement of fund performance can be done in several different ways. This is due to the fact that fund performance can be defined differently, depending on the consideration of risk, the importance of holding periods and reinvestment, as well as other performance parameters that these results are compared to such as benchmarks. Generally, measures can be distinguished between one-dimensional performance measures, which focus on the success or surplus in terms of returns, and how these exceed the expected or average comparable figures, as well as two-dimensional performance measures, which consider the returns in regard to the risk that underlies the asset or fund (Raab, 2019). Additionally, the assumptions used for the generation of a model and the following calculation should be precisely mentioned. and ideally standardized, to enhance the quality of a performance measure.

3.2.1 Real Estate Return

For a better comprehension of the fund performance, a description of the performance on asset level is essential, as the assets are fundamentally driving the overall fund performance. For this reason, the main asset held by GOEREFs, real estate, will first be evaluated.

As part of the performance of property the first aspect to be discussed is the real estate “return”. A closer look at the term in the literature reveals the broadness and different approaches of calculating return, which depend on many important assumptions, such as the point of view and criteria that is taken into account when calculation a return. One type of return that is commonly used to express the success of single properties is the total return, which consists of two separate components: income return and capital return. Income return is based on the net operating income of a property, while capital return is based on the difference in value between two points in time during a specified time period (Gläsner, 2019). Formula 2 depicts how the total property return is calculated:

$$TR_t = \frac{(CV_t - CV_{t-1} - CExp_t + CR_{pt} + NI_t)}{(CV_{t-1} + CExp_t)} * 100 \quad (2)$$

TR_t = total return in month t

CV_t = capital value at end of month t

$CExp_t$ = total capital expenditure in month t

CR_t = total capital receipts (including sales) in month t

NI_t = rent receivable during month t , net of irrecoverable expenditures

The total return can hereby also be driven by either the income return, the capital return or both. The income return is the net operating income of the asset in ratio to the value of the asset for the observed time period $t-1$ to t . The capital return describes the difference between the value in $t-1$ and the value in t , divided by the value in the initial point in time $t-1$. Furthermore, the expenditures for acquisition and sale are considered. The point in time t finds use in most components of the equation. The chosen time period for the calculation of the total return impacts the output figure TR_1 . This results from changing figures, whereas certain chosen points in time can exhibit extraordinary values which consequently distort the return result. This could e.g. be the case when the capital value in point $t-1$ experiences an extraordinary value. Maurer et al. (2004a) stressed in his discussion that the choice of

holding period returns has a major influence on the returns, where a 20 year holding period between 1973 and 2003 had approx. 50 percent points more return than a holding period of five years. It indicates the importance of the holding period as an assumption for any type of return research and should always be chosen and considered carefully.

In regard to the statistical use of property return data, one of the problems that arise in the literature is the assumption of returns being normally distributed. Several authors have found this to be inaccurate for property returns ((e.g. Myer and Webb, 1994; Young and Graff, 1995; Byrne and Lee, 1997; Young and Graff, 2008 and others), as well as for GOEREFs (Maurer et al., 2004; Kurzrock et al., 2009). Mattarocci and Siligardos (2015) stated that the two major components of total return, income return and capital return, do not tend to be normally distributed on an equal level, referring to Richter et al. (2011) who found that income return is more normally distributed than capital growth. Richter et al. (2011) furthermore mentions that the lower statistical significance of capital growth returns should be statistically compensated by adding the assumption that the return distribution lacks a mean.

Nevertheless, real estate returns are a common way to determine the success of single assets and in combination with indices, which are in particular well developed in the United States of America and the United Kingdom, have been a fundamental part of asset performance measurement.

3.2.2 Fund return

OEREF returns have been found to be naturally connected to property returns, since most of the assets held by the funds are real estate. Downs et al. (2015) mentioned that the property return indices can be a good short-term predictor for fund return development when the underlying assets possess similar characteristics to the properties used in the index. Despite the fact that open-end real estate funds solely invest into property, the return for funds differ from that of the underlying assets. This is because more factors need to be considered when deriving fund returns from property returns, since the level of leverage, fund size and diversification have been stated to influence the fund return (Fuerst and Matysiak, 2013). In the context of OEREFs, the total return is calculated on the basis of the NAV and the investor's pay out. While the result on real estate level states the total return, the result on fund level indicate its equity return (Gläsner, 2019).

To understand how the fund return may be connected to the return of the underlying assets, it may be useful to look into the annual reports of the open-end real estate funds into detail. Figure 4 depicts the income statement for the fund "Catella European Residnetial". It indirectly exhibits the link between the profit of an asset and the dividends that are distributed to the shareholders. The amount of payments between asset profit, described as profit from property and profit from real estate shares, and the fund's realized profit in the business year reveal the strong influence of the different profits, such as the realized profit and sales that finally go towards the distribution for the investor.

Table 1: Exemplary development of the profit and distribution throughout a business year (Annual Report Catella European Residential, 30.04.2019)

Interest income	-369.539 €
Other income	143.569 €
Income from real estate	28.605.998 €
Income from special purpose vehicles	18.167.258 €
Total income	46.547.286 €
Operating costs	-12.068.231 €
Ground rent	-236.132 €
Taxes	-886.749 €
Loan interest	-2.596.522 €
Management fee	-22.931.296 €
Depository fee	-293.952 €
Auditing and publication costs	-325.687 €
Other expenses	-944.387 €
Total expenditure	-40.282.956 €
Net investment income	6.264.330 €
Total realized profits	5.295.546 €
Total realized losses	-4.166.490 €
Results from sales transaction	1.129.056 €
Realized result business year	7.522.885 €
Unrealized profit	98.673.894 €
Unrealized losses	-5.787.660 €
Currency exchange	579.039 €
Sum unrealized profit business year	93.465.273 €
Total result business year	100.988.158 €
Realized profit business year	7.522.885 €
Saved for liquidity reserves	-402.967 €
Totally distributed dividends	7.462.922 €

Many of the profit influencing parameters are stable values with low fluctuation, such as the depository and audit fee. Resultingly, their values are rather predictable and do not contribute actively to a change in fund performance. In contrary, the table shows how the realized profit and sales have a fundamental impact on the realized profit of the business year. However, the realized profits from sales and losses are a major part of the realized profit in a business year and can fundamentally change the distribution outcome. There is furthermore reason to believe that the dividend distribution may not fully be explained by income or capital return alone of the underlying assets.

Table 2 exhibits the change in NAV during the business year 2018/2019, using the same example of the fund “Catella European Residential. It can be seen that an increase in inflow or outflow directly changes the net asset value of the fund. With a proportional increase in fund shares numbers the price per fund share does not change. Other financial positions such as transaction costs and the profits and losses from currency exchange do however influence the available cash reserves and hence the net asset value. In order to maintain a constant share price, the fund manager need to balance the expenses with the income generated by the assets.

Table 2: Exemplary development of the NAV throughout a business year (Annual report Catella European Residential, 30.04.2019)

NAV at the start of business year	882.969.824 €
Previous' year's distribution	-13.178.886 €
Interim distribution	0 €
Net cash in and outflow	68.101.651 €
Cash inflow from share sales	68.768.751 €
Cash outflow from share redemption	-667.101 €
Income adjustment/expense adjustment	129.499 €
Total Transaction costs	-3.023.264 €
Property transaction costs	-1.839.603 €
Indirect real estate investment transaction costs	-1.183.661 €
Business year results	103.881.923 €
Unrealized gains	98.673.894 €
Unrealized losses	-2.764.397 €
Currency exchange	579.039 €
NAV at the end of business year	1.038.884.164 €

The most influential position here can be interpreted to be the change in the non-realized profits and losses. These occur when the values of the portfolio change as a result of occurring valuations. The strong influence that valuations can have on the NAV directly affects the price of shares. For shareholders and investors this implies that the valuations fundamentally influence the capital return, since it is calculated on the basis of the fund share price in two points in time. The true fund performance can only truly be determined when the assets are sold on the market, as the capital return based on valuation may be inaccurate. As a result, the determination of the income return, based on the dividend distribution for investors, and the capital return, based on the change of NAV, have several steps in between, that could potentially be adjusted in dependence of how the manager desires to depict the financial situation of the fund. For unlisted real estate funds, INREV have published an equation for deriving the total return on fund level:

$$TR_t = \frac{(NAV_{(t)} - NAV_{(t-1)}) + Distributions_{(t)} - Equity Calls_{(t)} + Redemptions}{NAV_{(t-l)} - \sum_1^N W_l x Redemptions) + (\sum_1^N W_l x Equity Calls)} \quad (3)$$

t = point in time of total return calculation

Total return = TR

W = Weight

l = points in time

The advantages of a fund return calculation compared to property level total return is the consideration of the point in time when redemptions and equity calls have occurred. Furthermore, the income is adjusted to the real values that shareholders receive as a result of their fund share investment.

In order to raise the comparability between funds and their performance, the Bundesverband Investment und Asset Management e.V. (BVI) has established a return calculation method that is generally accepted in the German fund industry (Raab, 2019). The method follows a buy and hold strategy, where the pay-outs are automatically reinvested on the same day when a pay-out occurs. Its advantage lies in the dynamic approach over a chosen time horizon (Raab, 2019). Management fee and depository costs are considered in the model, with the redemption price used as a basis. Nevertheless, neither issue-surcharges nor taxes are considered in this calculation. During the business year, the amount of stored cash reserves for dividend distribution increases, leading to a higher net asset value. This effect, in return, constantly raises the share price until the dividends are distributed. As a side effect investors are prevented from buying shares shortly before the distribution, and redeem the share for the same amount right after the distribution, effectively profiting from the dividends. When the dividends are distributed, the net asset value is reduced by the amount of paid dividends and the share price decreases by the same value as the dividend payout. For the BVI return, Table 3 depicts an exemplary calculation as described by the BVI:

Table 3: BVI return calculation (Bundesamt Investment und Asset Management e.V., 2019)

Description	Date	Share price	Number of shares	Dividend distribution	Depot Value
Investment of 5.000 € in shares valued 100 € each	31.12.2020	100 €	50		5.000 €
Value of share hypothetically increases until day of distribution		105 €	50		5.250 €
Dividend distribution	23.10.2021			3 €	
Value of share hypothetically decreases after distribution	23.10.2021	102 €			
Dividends (3€x50) are reinvested into shares, with 150€ invested into shares valued 102€ = 1,471 shares	23.10.2021	102 €	51,471		5.250 €
Value of share hypothetically increases	31.12.2011	105 €	51,471		5.404 €
Total BVI Return for the time horizon of one year					(5.404,41€-5.000€)/5.000€= 8,09%

According to Gläsner (2019) the BVI return currently lack success attribution in respect to a comparable measure, where some successful transition methods to derive fund return from property return can be extended. The return on OEREFs is hereby influenced by factors like the leverage, liquidity ratio and fees (Gläsner, 2019). Nevertheless, it is the standardized fund return measure in Germany and is exhibited by all German open-end real estate funds in the respective annual reports.

In assumption of a dividend pay-out, the investor's return can be calculated in the following way:

$$TR = \frac{\text{Redemption price} - \text{Issuance price} + \text{Dividend Distributions}}{\text{Issuance price}} \quad (4)$$

As depicted in formula 4 the return comprises three variables. The investor can achieve an income return through dividends or a capital return through an increase of a share price. This leads to a potential profit found as the spread between the redemption price and the issuance price.

3.2.3 Asset and Fund Performance: Sharpe Model

In 1964 W.F. Sharpe generated a model partially based on the portfolio theory by Henry Markowitz (1952). His model was a significant contribution to the “capital asset pricing model”. The model observed the performance of assets, or funds, in respect to the overall market. The investment return as a proxy for performance of any asset was mostly influenced by two factors: alpha and beta. Alpha measures the excess return of an asset over a chosen benchmark return and reflects the actual manager outperformance. This outperformance can be achieved by either “structure”, indicating that the manager was able to allocate into outperforming sectors or markets, or by “stock” / “selection” outperformance, indicating that an asset within a sector performed above the sector’s average. As, in theory, higher returns are also underlined by higher risk, Sharpe stressed to care for a risk adjustment when measuring the performance of assets. This was done through the other variable “beta”. Beta can be based on the structure, e.g. related to an investment into more volatile markets, such as emerging markets or property development, or on the stock level by investment in assets with higher individual risk (e.g. higher vacancy rate). Some return influencing variables, such as leverage or performance fee, do also produce beta (Baum and Farrelly, 2009). Respectively, the Sharpe ratio illustrates the ratio between the excess return (alpha) per unit of risk (beta). Risk is hereby measured statistically as the standard deviation, i.e. volatility, of the excess returns.

$$S = \frac{E[R_a - R_b]}{\sigma_a} \quad (5)$$

R_a = asset return

R_b = risk – free return (e.g. German government bonds)

$E[R_a - R_b]$ = excess return

σ_a = standard deviation of the asset excess return

As a result, a higher Sharpe-value would only be achieved in comparison to assets with similar risk, while assets with higher or lower risks are naturally adjusted through their statistical standard deviation. Analogically, assets with lower risk that achieve similar returns to the benchmark produce more alpha.

Since the model was established under certain assumptions, it tends to differ among asset classes, and does so especially for the asset class real estate due to its unique characteristics. For properties, the outperformance regarding stock level differs from other assets, as active management in form of refurbishments, maintenance or tenant selection can influence the asset performance. Furthermore, the information inefficiency creates opportunities in terms of acquisition and disposal of assets. In addition to property life cycle optimization through the acquisition or disposal at the right timing, the managers can find properties that are

undervalued, or sell them over the value, effectively increasing the return by equal risk (Baum and Farrelly, 2009) Baum and Farrelly (2009) found that real estate does not tend to have alpha persistence and concluded that beta may be a better performance indicator for real estate. In practice, scores for structure and selection can be derived using portfolio return, portfolio weight of segments and the benchmark return (see also: Baum and Farrelly, 2009). Furthermore, and in contrary to stocks, it is challenging to mimic the market portfolio for property due to their heterogenic characteristics.

The Sharpe ratio is a two-dimensional performance measure that is commonly used for the measure of asset performance due to its simplicity and fast calculation. While it may give quick and comparable figures in regard to the risk-return-profile of an asset, it tends to be too static and simple and may include a large term of error (Grinblatt and Titman, 1994). Nevertheless, it contributed to an important foundation for other models that built up on it to improve the measure of asset and fund performance.

3.2.4 Capital Asset Pricing Model

The capital asset pricing model was further developed by Sharpe (1964) to explain the return and risk relationship between an asset and the market it is part of. The CAPM hereby follows several assumptions (Womack and Zhang, 2003; Pilbeam, Keith, 2018):

- Investors care only about expected returns and volatility. Therefore, as rational consumers, they will always maximize expected return for any given level of expected volatility
- All investors have homogeneous beliefs and information about the risk and reward tradeoffs in the market
- Systematic market risk which drives non-diversifiable volatility is universal to a broad-based market portfolio
- Investors are assumed to hold diversified portfolios, as the market does not reward investors for the bearing of diversifiable risk.

In order to quantified the risk of an asset in relation to the market, Sharpe (1964) introduced the previously mentioned coefficient β , which captured the systematic risk that is measured by the degree to which an asset's returns vary relative to those of the overall market (Womack and Zhang, 2003):

$$\beta_A = \frac{cov(r_A, r_M)}{\sigma^2_M} \quad (6)$$

r_A = Asset return

r_M = Market return

σ^2_M = variance of the market return

$cov(r_A, r_M)$ = variance between market and asset return

As the β coefficient could be computed simply through the development of the historical data given by the market (indices such as S&P 500) and the historical development of the asset, it became part of many financial models. With the knowledge of how risk is quantified in this model, the risk, return and a potential overperformance are put into relationship as part of the Capital Asset Pricing Model formula: (7)

$$E(r_A) = r_f + \beta_A(E(r_M) - r_f)$$

$E(r_A)$ = Expected excess return of market portfolio

r_f = risk – free rate

β_A = beta of portfolio

$(E(r_M) - r_f)$ = Expected excess return of market portfolio beyond risk – free rate

Capital Asset Pricing Model (Keith, 2018)

The resulting excess of a return that is risk adjusted by the beta-coefficient produces a factor called α , which expresses the overperformance of a portfolio in respect to the comparable market level of performance. This is depicted in figure 4. The y-axis expresses the return, while the x-axis expresses the level of beta, or risk.

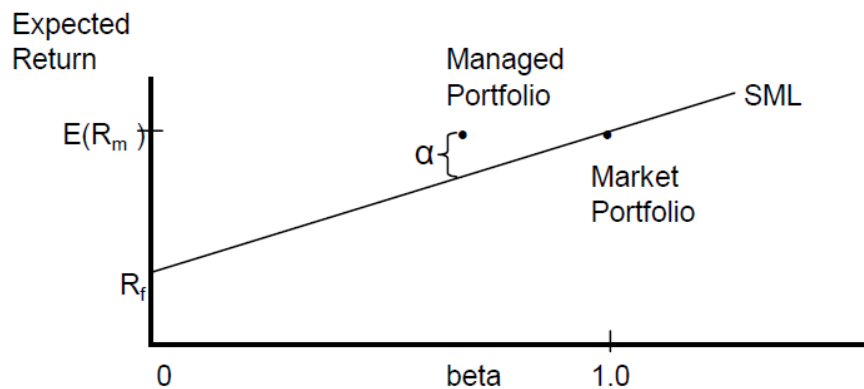


Figure 5: Overperformance of a managed portfolio above the security market line (Womack and Zhang, 2003)

The Security Market (SML) line depicts the pricing of efficient portfolios, combining the market portfolio and the risk-free security. If a portfolio performs over the security market line, it produces alpha, as it achieves more return with the same level of beta.

In regard to the utility of the capital asset market pricing the model set another foundation in the understanding of how performance could be achieved, calculated and evaluated. Nevertheless, the necessary assumptions reveal that this model is only a theoretical framework that requires realistic adaptation. Further models have attempted to tackle this challenge and improved the CAPM.

3.2.5 Jensen measure

The Jensen measure is a model based on the assumptions of Sharpe's performance research in 1964. Like the Capital Asset Pricing Model, the Jensen measure is a regression of time series of excess portfolio returns measured against excess benchmark returns. A positive intercept α hereby indicates a performance over the benchmark portfolio.

$$R_{i,t} - R_{f,t} = \alpha_i + \beta_{WRE,t} * R_{f,t} + \epsilon_{i,t} \quad (8)$$

$t = \text{month}$

$R_{i,t} = \text{return of fund } i$

$\alpha = \text{difference of actual return and single - index benchmark return}$

$\beta = \text{risk factor of the fund } i$

$\epsilon = \text{error term}$

Jensen measure (Jensen, 1969)

The summand beta multiplied by the benchmark return is a point on a security market line indicating the market (or benchmark) return for that specific level of risk. Any asset achieving higher returns generates alpha in stock, and any segment achieving higher returns than other segments enable higher alpha in selection (after adjusting for the error term). While the addition of a time series comparison enables a more dynamic approach than the Sharpe-ratio, the measure was criticized to be biased in market timing ability results (Grinblatt and Titman, 1989). A bias in market timing ability refers to the influence of the chosen time series on results, and the lack of robustness within the test, where e.g. a time series can fall into an upcycle, indicating a different α than would be the case with a different time series. Furthermore, the model was described to be skewed towards the impact of the chosen benchmark portfolio on the output of the model, where an inefficient benchmark portfolio would show extraordinary performance results of the tested portfolio (Lee et al., 2003).

3.2.6 Trynor-Mazuy-Model

The model is an extended version of the Jensen Measure, with the addition of a quadratic regression, resulting in two explanatory variables. The first explanatory variable is, similar to the Jensen-measure, aimed to display the performance quality of a portfolio manager, where excess return of the portfolio in regard to the benchmark portfolio indicate the selection ability through the intercept in the regression.

$$R_{i,t} = \alpha_i + \beta_i R_{mt} + \lambda_i R_{mt}^2 + \epsilon_{i,t} \quad (9)$$

$R_{mt} = \text{excess return (over risk - free return) of benchmark portfolio}$

$R_{it} = \text{excess return of benchmark portfolio}$

$\alpha_i = \text{overperformance of the evaluated fund}$

$\beta = \text{risk factor of the fund } i$

Trynor-Mazuy-Model (Grinblatt and Titman, 1994)

The second explanatory variable λ together with the variance of the benchmark return expresses the timing ability. It reflects the convexity achieved in the exposure to the market ability. A positive coefficient indicates that beta goes up when then market improves, showing that the manager has great market timing ability (Hübner, 2011). The Trynor-Mazuy-Model has been discussed by several authors (Grinblatt and Titman, 1994; Stevenson, 2001; Hübner, 2011) and has been found to be significant for the assessment of a manager's market timing ability.

The viability of the Jensen-model and the Trynor-Mazuy-Model for open-end real estate funds is limited in the ability to construct a reliable benchmark due to the scarcity of existing open-end real estate funds, in conjunction with the heterogeneity and difference of characteristics of each fund and the underlying asset (see chapter: 3.4). The scarcity leads to a smaller quantity of funds that are included in the benchmark, effectively decreasing the statistical significance. Furthermore, the assets of each fund are so heterogenic, that a comparison with the assumption of all funds being weighted equally may be inaccurate. This stands in contrary with stock mutual fund price development, where the prices reflect the behaviour of the assets more realistically than for open-end real estate funds (Chambers, 2016).

3.2.7 Positive Period Weighting Measure

In reaction to the biases in market timing ability found in the Jensen measure, Grinblatt and Titman (1989) adjusted the measure by using a vector of nonnegative weights, where all elements are each described as one point in a time series observation. The positive period weighting measure is a linear weighting of returns. The weight vector is chosen so that the sum of excess returns of the benchmark portfolio multiplied by the weights equals zero. Assets that can achieve excess returns in respective weights will result in higher alpha. The model enables the observation if outperformance was achieved through structure or through timing.

$$\alpha_i = \sum_{t=1}^T w_t r_{it} = \bar{r}_i - \beta \bar{r}_m \quad (10)$$

$$\sum_{t=1}^T w_t r_{mt} = 0$$

α_i = overperformance

w_t = weights corresponding to one time series observation

R_{mt} = Return of benchmark portfolio in time t

R_{it} = Return of evaluted portfolio in time t

T = number of observations

\bar{r}_i = mean return of the index fund

β = risk factor of the fund i

Positive Period Weighting Measure (Grinblatt and Titman, 1994)

Grinblatt and Titman found that the evaluated measures (Jensen Measure, Positive Period Weighting Measure, Treynor-Mazuy) yield similar results with same benchmark but vary with different benchmarks. This stresses the importance of using a reliable qualitative benchmark. In the context of OEREFs, the ability to weight each time enables to account for the low frequency of valuation and property transactions.

3.2.8 Multifactor Models

Multifactor models comprise another way to depict the excess return of a fund in respect to the risks associated with the portfolio. The fundamental logic behind those models lies in the idea that there are several different types of risk in terms of β , and each risk can account for a certain share of excess return. In order to analyse excess return for a single factor, the statistical characteristics need to match for both the selected portfolio as well as the market portfolio (Keith, 2018).

Fama and French (1992) have found in their research that two specific factors add additional explanatory power to the already existing market factor. The first factor, SMB (small minus big) measures additional return investors received historically by investing in stocks with small market capitalization. The second factor, HML (high minus low) measures the value premium provided to investors for investing in companies with high book-to-market values.

$$E[R_p - R_f] = \alpha + \beta_M E[R_M - R_f] + s_A SMB + h_A HML \quad (11)$$

$E[R_p - R_f]$ = Excess return of the portfolio

α = performance indicator

β_m = Market beta of the excess return

s_A = size beta

h_A = value beta

Fama-French Three Factor Model (Keith, 2018)

The model results in α , which expresses overperformance of a portfolio with a given excess return, or an expected return in respect to an expected overperformance, e.g. compared to previous overperformance.

The Fama-French model has been criticized by Verbeek and Huij (2007) to be based on hypothetical stock portfolios and lack transaction costs, trade impact, and trading restrictions. They suggest that mutual fund returns, rather than stock returns, provide more accurate data for the construction of a benchmark. In further regard to the usefulness of multifactor models for open-end real estate funds stands the fundamental difference between the asset classes real estate and stocks. The size of a mutual fund may reflect the success of such fund, where a raising demand results in a raise of price and a direct increase in the market capitalization, this is not equally the case for stocks. However, for open-end real estate funds, an increase in size could lead to the same capital return for the investor. This is due to the flexible number of shares circulating on the market, where the issuance of new

shares does not change the NAV per share price, but NAV and number of shares grow proportionally. The relationship between size and success is hence likely weaker and may decrease the significance of the Fama-French-model for open-end real estate funds.

Merton (1973) argued that the sources of risks for assets and investors can vary and should be accounted for in a model that observes the return behaviour of an asset in relation to the market. Merton's multifactor CAPM for a portfolio can be written as:

$$E(RP_p) = \beta_i E(RP_m) + \beta_{pF1} E(RP_{F1}) + \beta_{pF2} E(RP_{F2}) + \dots + \beta_{pFk} E(RP_{Fk}) \quad (12)$$

$E(RP_p)$ = risk premium on portfolio

k = number of factors F

β_{ik} = sensitivity of the portfolio to the k th factor

$E(RP_p)$ = risk premium associated with the k th factor

Merton's multifactor CAPM for a portfolio (Pilbeam, 2018)

Similar to the Fama-French three-factor model, Formula 7 depicts how the returns are split into several segments, in dependence to the chosen factors that are assumed to influence the excess return of a portfolio compared to a market portfolio. The result, $E(RP_k)$ indicates the expected return on the portfolio less the risk-free rate of interest.

3.2.9 OEREF Performance Measure Adjustment

A problem faced by all models shown in the previous chapter is the calculation of β , or risk coefficient used. The determination of beta is hereby the statistical volatility of the development of the share prices in comparison to a benchmark (Grinblatt and Titman, 1994). With the low frequency of value determination for open-end real estate fund assets a daily share price development may not fully reflect the development of performance and success of the fund as a whole. While the models can be used as comparable measures, the results are likely not significant when used as the only model. Rather, they should be compared to models that are adjusted to open-end real estate funds. After all, stock mutual funds are different in their characteristics from pure open-end real estate funds. Due to the higher level of liquidity and different risk-profile of their assets, the stock mutual funds are prone to problems related to other risks, such as company insolvency rather than the illiquidity and heterogeneity of real estate (Chambers, 2016).

The advantage of the multifactor models over other models is the flexibility to adjust the factors accordingly to the assets or funds. In this respect, multifactor models have been used recently in the measurement of open-end real estate fund performance. Fuerst (2013) used a multifactor model with factors related to the Gross Domestic Product growth as well as bond development. He found them to be good predictors of annual fund performance.

The best attempts to adjust performance measures to open-end real estate funds have been done by the INREV and IPD. In their performance study 2011 IPD introduced two important measures: a one-dimensional measurement using total returns, as well as a two-dimensional measure using risk-adjusted total returns. In addition, the Sharpe-Ratio of the analysed funds was calculated as well. Afterwards these figures were compared to the OFIX-Index which was computed by IPD and consists of 20 large open-end real estate funds in Germany.

In a more sophisticated approach, INREV published a guideline for how the managers are supposed to calculate several measures that indicate the performance of unlisted real estate funds. This was done as a consequence of increased demand in standardization adjusted to open-end real estate funds (INREV Guidelines Performance Management 2020). The guidelines aim to increase the level of consistency in the reporting of investor's performance and improve the relevance of indices such as the INREV Index. These standardisations include the following measures:

- Distributed Income Return
- Capital Return
- Total return on a Time weighted basis
- Annualisation

Despite the standardization e.g. by INREV, many options to adjust the calculations exists, such as the freedom of choice on how management fees can be implemented into the measures. Hereby INREV stated that manager performance fees can either be calculated net of both management and performance fees, net of management fees or gross of all management fees. Consequently, the values differ if the fees are considered in the calculation or not. It can be concluded that measures are still not standardized sufficiently in order to enable transparency and comparability in regard to fund performance. In regard to the discussed performance measures that are used by analysts it can be hypothesized that the open-end real estate fund industry has not developed similar statistical methods as standards, potentially as a result of lack of information access for all market players in general.

3.3 OEREF Performance Determinants

For a comprehensive analysis of real estate fund performance, it is necessary to discuss performance determinants and their influence on the overall fund performance. Methods that are used to distinguish the performance drivers vary, while a panel regression analysis appeared to be the most common approach, as used e.g. by Fuerst (2013) and Fecht and Wedow (2009). The literature review revealed and discussed hereby five important determinants: fund flow, liquidity, leverage, asset allocation, as well as the size of the fund.

3.3.1 Liquidity

In order to be able to monetarily compensate redeemed shares at any given time, the funds are obliged to hold a percentage of the fund's value as cash reserves. In Germany, the cash reserve is limited to a minimum of 5% of the fund's value. In addition, the funds can borrow short-term credit up to 50% of the fund's value. As previously mentioned, the banks are more likely to help the fund in case of an emergency in order to preserve the fund's reputation, since most GOEREFs are managed by subcompanies of banks (Maurer et al., 2012).

For open-end real estate funds, the liquidity can be divided into gross and net liquidity. The net liquidity is the gross liquidity minus the minimum 5% cash reserves for funds, pay-out reserves, asset maintenance costs, liabilities for the properties and developments, as well as debt liabilities (Bentele, 2016). In general, the liquidity rate of a fund may be increased through excess cashflow, incoming cash from newly distributed shares, borrowed capital or asset sales (Skinner and Bradford, 2006). As described in chapter 2.2, the funds have the potential liquidity risk triggered an investor's run. This could be caused e.g. in times of a market downturn caused by upcoming valuation that is expected to decrease the NAV. The funds consequently run out of cash reserves to meet all the redemption and have to suspend them. From the investor's point of view, the risk of suspension does not only exist in the described manner. One of the ways to accumulate more cash in the past was achieved by selling assets. If a fund is at risk, it may sell assets quickly at a discount of up to 15% below market value in order to avoid the suspension, effectively decreasing the capital return and hence the performance for the investor (Fecht and Wedow, 2009; Schweizer et al., 2011). Runs can also happen for well performing funds, when other funds experience difficulties and suspend their redemption. Investors can then irrationally expect a similar result for the well performing fund in the future as well (Schnejdar et al., 2019). This can be explained in a coordination failure between investors, where all of them know that a run by the others may reduce the payment oneself receives, eventually withdrawing and triggering the latter event (Fecht and Wedow, 2009). It is enhanced even more through the fact that funds distribute pro-rate among withdrawing investors, making investors eager to withdraw quickly in order to avoid a depreciation of their shares (Sebastian and Tyrell, 2006).

The resulting lower investor sentiment from the redemption suspension will also decrease the inflow of new commitments in the future, effectively harming the reputation of the fund. In addition to the often lower sale prices, as a result of the weakening market, it is not possible to sell shares at a lower rate in order to increase the liquidity and prevent suspension, since it would put investors remaining in the fund at a disadvantage (Skinner and Bradford, 2006).

Stein (2013) found the effect of the liquidity crisis to be reflected on the secondary market, where secondary market share prices traded up to 20% below the share price. A year later, Stein (2014) analysed the change in fund returns when funds fall into distress using the NAV as well as secondary prices and concluded that secondary market share prices for shares can fall up to 30% below the NAV. Stein (2013) suggested that the discount may be temporary as a result from exploitation. Hereby, speculators purchase discounted shares and sell them back at the bid price closer to the NAV as soon as the suspension of share redemption is

retreated. A similar effect may happen when liquidation is announced and the properties sell close to the NAV, resulting in a possible profit for speculators (Stein, 2014). Such speculations on the secondary market can enhance the liquidity risk for funds, since the opportunity to trade in secondary markets only enables such speculations. Funds that try to retreat the suspension are then put into distress, caused by the redemptions that are expected to occur immediately after share redemption is reopened. Ultimately, the funds run out of cash reserves and are forced to continue selling assets (Schöffel, 2012). Haß et al. (2011) documented in their study that investors who kept shares during times of distress had no negative effect on returns when funds managed to provide liquidity within a two-year period.

Schnejdar et al. (2018) studied the funds in distress and found a negative relationship between liquidity ratio, net capital inflows, as well as fund size, distribution network for fund shares and fund closure, and a positive relationship between industrywide spillovers from other fund's closures, share of institutional investors and fund closure. Consequently, in order to avoid suspension of redemption, the fund is interested in holding more liquid, diversified assets, i.e. core assets rather than opportunistic assets, to meet any eventually occurring redemption demand. (Skinner and Bradford, 2006). This may be seen as a large contributor to the reason by OEREFs mostly have a low risk-return profile, as they mostly hold low return core assets which could be sold faster than opportunistic assets in a state of emergency (Maurer et al., 2004a).

In conclusion, asset allocation plays an important role in the general liquidity situation of the fund. Holding assets that are more liquid decreases the actual liquidity ratio of the fund, effectively increasing returns and performance. Due to the mandatory cash reserves of GOEREFs it can be said that the fund is not fully a function of the property returns, but rather a mixed-asset portfolio of fixed-income assets and property (Maurer et al., 2004a). The liquidity rate is a relevant factor regarding the performance of the fund, where too much liquidity decreases the return of the fund, and too few liquidity puts the fund at more risk (Fecht and Wedow, 2009). Maurer et al. (2012) found in their study about GOEREFs that well performing funds have approx. 85% of the fund value invested into property and suggest that liquidity risk, i.e. potential temporary suspension, does not affect the optimal asset allocation. In contrary, they find that potential devaluation due to weakening markets does affect investment demand. Sebastian and Tyrell (2006) stated that the perfect liquidity ratio depends on the risk-appetite and information sensitivity of investors. The significance of the liquidity ratio for the fund performance is therefore a strong determinant for the risk that the funds are willing to take, and a lower level of cash reserves should be considered as a risk factor in the assessment of fund performance.

3.3.2 Fund Flow

In the field of open-end funds, the relationship of in- and outflows and performance can be quite influential, as e.g. more inflows and lower outflows can affect the fund performance positively. Fecht and Wedow (2009) find a sensitivity of flows to changes in performance similar to that found in US equity mutual funds, where 1 percentage point increase in performance increases a fund's net flow by 10 basis points. Furthermore, they state that performance behaviour of funds explains a large portion of fund flows. Fecht and Wedow (2009) supported their claim from the past and added that panic behaviour which leads to an

investor run can be irrational and more independent from a fund's performance. Using returns as the main performance indicator, Lee et al. (2000) found that fund flows and OEREF's asset returns do not have a strong causal link, and reasoned their results in the fact that investors not only consider the property asset class, but all asset classes when allocation their money. In their conclusion, relative rates of returns on securities were seen to be the best predictor of flows into funds. Downs et al. (2016) found an asymmetric (convex) relationship between flow and relative fund performance which varies over time. Accordingly, they described that in the scope of their research investors did not proportionally withdraw from the worst performing funds. One explanation may be found in the paper of Lynch and Musto (2003), where fund flows were less sensitive to bad performing funds when they indicate an upcoming strategy change. Chen et al. (2010) found in their analysis of mutual funds that flow related to less liquid stocks tends to be more sensitive than the flow into more liquid stocks. They furthermore raised the concern that any liquidity problem may reduce a fund's total returns. Schnejder et al. (2018) stressed the importance of OEREF net flows as an "additional proxy for fund run risk", and mentioned that the net flows can be either driven by fund related factors such as performance expectation, low liquidity ratios, high leverage ratios and management fees, or by irrational factors outside of the fund's economic behaviour. Later, Schnejder et al. (2019) stressed once more the importance of the investors net fund flows for the fund performance as well. With higher in- and out flows, the volatility of the flows is higher, requiring more cash reserves to be available, decreasing the property investment, related returns and ultimately the funds' performance.

In addition, the relationship of flows and fund performance was found to be connected to the percentage of cost that is added to the redemption costs (participation cost), as higher costs increase the threshold for investors to invest into such funds (Downs et al., 2015) As many factors related to funds are interconnected, it also becomes difficult to separate such factors from one another. Downs et al. (2015) hereby mentioned that the flow-performance relationship of OEREFs is strongly linked to the liquidity ratio that such funds offer. They concluded that investment behaviour, i.e. the level of inflows and outflows, is less sensitive to market changes for funds with low liquidity ratios and more sensitive to market changes for funds with a higher liquidity ratio. Consequently, it can have a positive effect on the fund's in- and outflows when the liquidity ratio is held low.

3.3.3 Leverage

Leverage in the realm of GOEREFs is used to cover potential short runs of cash reserves, to increase the fund return, to optimize tax benefits, as well as to provide a hedge against eventual currency risk for international investments (Bentele, 2016). Bentele (2016) described the fundamental problem with the maximum leverage set by the German law. In 2011 the maximum leverage for GOEREFs was reduced from 60% to 30%, while other investment vehicles remain an allowance of up to 60% leverage. Hereby, the reason for a lower maximum leverage can be found in the additional risk of an investor's run, leading to a potential shortfall of debt repayment. The option to acquire higher leverage might contradictorily help to overcome such situations. As an answer to this problem the German law gives the KVG the opportunity to take an addition 20 % short term loan for emergency situations (Bentele, 2016).

The level of leverage has furthermore been found to affect the share prices on the secondary market when the fund is in distress, where more leverage used leads to a larger price discount (Schnejdar et al., 2019). In this regard, Schejdar (2018) illustrated that the liquidity ratio is a crucial indicator for the fund closure probability, where a 20% liquidity ratio would give a 1% probability, and a 5% liquidity ratio an approx. 28% probability of fund closure. Mattarocci and Siligardos (2015) stressed the significance of the leverage on pay-outs, dividends, return and risk of the funds, where the “spread between cost of financing and the return from the real estate investment is enough to justify the financial risk”. The level of a fund’s leverage as part of the liquidity determines actively the fund return and risk, where higher leverage leads to a higher return-risk profile. The ability to maintain leverage, but also receive short-term loans, is crucial for an liquidity transforming investment vehicle like OEREFs. A closer look at the level of leverage and the capacity of further loans is essential in the assessment of fund performance, as these factors contribute highly to the return and risk of the fund.

3.3.4 Asset Allocation

The performance of funds depends on the allocation of the assets within the portfolio, due to the selection of either outperforming assets or asset choice in outperforming markets. In addition, diversification effects are achieved through great asset allocation. Fuerst and Matysiak (2013) stressed that “asset allocation to specific countries and property sectors is perceived to be a crucial factor for the overall performance of funds”. Mattarocci and Siligardos (2015) put an important focus on geographical diversification as a capital growth performance driver for funds. Suárez (2005) even stated that the performance of GOEREFs is a curve of the percentage of international investment, as the domestic real estate industry was weak at the time of his research. Mattarocci and Siligardos (2015), on the other hand, discussed the need for international diversification and argued, based on McGreal et al., (2006), that national diversification may be sufficient due to the heterogeneous characteristics of real estate. However, funds may want to invest internationally when they lack competitiveness on the domestic market or face an overvaluation of foreign property by German valuers (Kurzrock et al., 2009).

The effects an optimized allocation can have on the performance may be influenced by several different factors. For once, the selection of cross-border investment involves more costs, while managers also have less expertise in foreign markets (Kurzrock et al., 2009). In addition, the management of real estate requires local presence in order to exploit market inefficiencies, as well as knowledge about the state’s language and legal framework, making it difficult to manage properties in an outperforming manner on a global scale (Skinner and Bradford, 2006). Assets in countries with different currencies additionally underly a currency risk. In accordance, increased investment activity abroad is mentioned as a potential reason for the higher sensitivity of NAV changes in respect to market changes when compared to the 2000s and could be reasoned in the higher currency risk that is tackled (Stein, 2013). Young and Graff (1995) believed that models which measure asset diversification for real estate tend to be inaccurate, as the returns for real estate are not normally distributed.

On the other hand, the effects of actively diversifying the assets within the portfolio can lead to a decrease in volatility (Markowitz, 1952). It was suggested that such diversification could

be achieved by sector, geographical, asset size or tenant diversification (Mattarocci and Siligardos, 2015).

The development of international investments in the OEREF industry has increased in the past, leading to more experienced managers who can outperform on a pan-European level. This, in return, decreases the risk premium for international investments, resulting in more core funds investing internationally (Skinner and Bradford, 2006). It can be assumed that recent technological and digital development enhanced this effect even further. National or international allocation can differ for many reasons, such as different strategies. For the performance assessment of OEREFs allocation should be considered in order to account for performance influential factors such as diversification, currency risk, and portfolio market segments.

3.3.5 Fund Size

The size-performance relationship of a fund has been discussed in the literature as well. Fuerst and Matysiak (2013) observe the relationship between fund size and fund performance for non-listed real estate funds, finding that small funds perform worse than larger funds. They argue that this could be due to higher initial transaction costs for smaller funds and referred to Matallin-Suárez's (2011) who stated that outperformance of larger funds might be reasoned in their advanced maturity. Additionally, the professionalism of large fund managers, also related to the market cycle, gives them the opportunity to select well performing properties, as larger funds are mostly older funds as well (Fuerst and Matysiak, 2013).

3.4 Fund Performance Assessment: Use of Benchmarking

Raab (2019) divided the assessment of real estate fund performance into several steps. Firstly, the absolute and relative value share of each property are determined at a chosen point of time. This reveals the relative allocation share into different segments. In addition, other in- and outflows are considered. Secondly, the returns of each segment are calculated. Thirdly, the profit of each segment is determined and compared, showing how much each segment has relatively contributed to the total fund performance. Lastly, each segment is divided and analysed in detail to give an insight on a manager's ability of selection. It becomes obvious that Raab (2019) focused in his performance assessment on the performance within the portfolio. Performance assessment could be expanded by comparing returns of segments or the whole portfolio with alternatives. This could e.g. be done through the construction of a benchmark, which resembles the development of the market.

At the foundation of what is known as one-dimensional performance measurement in the literature, the returns of funds are compared to benchmarks to evaluate over-and underperformance of such funds. It creates a directory for the fund performance, sets a foundation for strategies and defines the expectation of investors (Raab, 2019). In a study analysing mutual funds, Lehman et al. (1987) defined "what constitutes as normal performance" and argues that constructed benchmarks and the results for the performance assessment can differ significantly (for more, see chapter 2.5) . Even though the study was

based on mutual funds in general, it is likely to assume that the significance can be applied for OEREFs in a similar manner.

The conception of benchmark construction has been widely discussed in the literature, as the assumptions used for the construction of a benchmark are far from uniform, mainly because the underlying assets, in form of real estate, are heterogeneous by nature. These include assumptions about the way dividends, market values, interest rates, rent figures, repayment and investment strategies can be added to the benchmark construction (Maurer and Sebastian, 1999). While the stock market is much closer to a complete market in terms of information transparency and efficiency as well as trading volume, the real estate market, and hence the OEREF market, face more difficulties in constructing reality depicting benchmarks (Geltner, 2013). One idea to cope with such difficulties was presented by Maurer and Sebastian (1999), where hedonic indices are constructed in order to extract value-influential factors from the properties in regard to timing, effectively homogenising property to increase the level of comparability. Geltner (2013) believes that the hedonic indices are a good tool to adjust the indices for asset quality differences. The capital change of property can also be compared to an index based on real estate stocks, with the underlying assumption that the development of real estate stock and property are highly correlated (Maurer and Sebastian, 1999).

In regard to major economic parameters, Fuerst and Matysiak (2013) concluded in their research that for all non-listed real estate funds the GDP growth, bond rates and stock market returns are significant predictors of annual fund performance. The relationship between the general economy appears reasonable, since an economy downturn may lead to higher vacancy or less tenant credibility, where newer contracts may achieve less income. This may give fund managers an even higher incentive to maintain a high NAV while they try to adjust to market development, since otherwise investors who are able to recognize the spread between real prices and value may panic and redeem their shares (Haß et al., 2011a)

Real estate indices can be constructed in several ways; most common are the value-based and transaction-based indices. Geltner (2013) described the problems that occur with the construction of benchmarks, where the smoothed and lagging values of real estate hinder the usage of value-based benchmarks. This occurs, for example, in regard to statistical variables such as volatility and covariance, in particular when comparing them to statistical results of other asset classes. The transaction-based indices are known to depict the reality better than value-based indices. However, as transaction costs for real estate are high and regular valuation for fund assets are mandatory, transactions are a lot less frequent than valuations. This leads to a decrease of the statistical significance of any data sample that is used for the construction of the benchmark, despite the fact that statistical modification can filter noise. In addition to that, the heterogeneity of assets complicates bundling assets into one index based on their characteristics, e.g. by geography or asset type. Finally, the inclusion of asset disposal timing into the indices can be difficult, as the timing of the transaction may occur in different parts of the economic cycle (Geltner, 2013). Geltner (2013) furthermore discusses the repeat-sales-indices, which give the opportunity to compare the changes of value in a time period and the quality differences of the assets, effectively resulting in more accurate indices. Nevertheless, this requires consecutive sales of the same property, decreasing the data sample size even more and hence the statistical significance. While

transaction-based benchmarks have the potential to comprise more realistic information of higher quality, their utility for OEREFs can be difficult due to the assumed valuation smoothness that may be included in the share price development of OEREFs.

Figure 6 exhibits Geltner's (2013) results, where it can clearly be seen that the appraisal-based index is smoothed and slightly lags behind the transaction-based index.

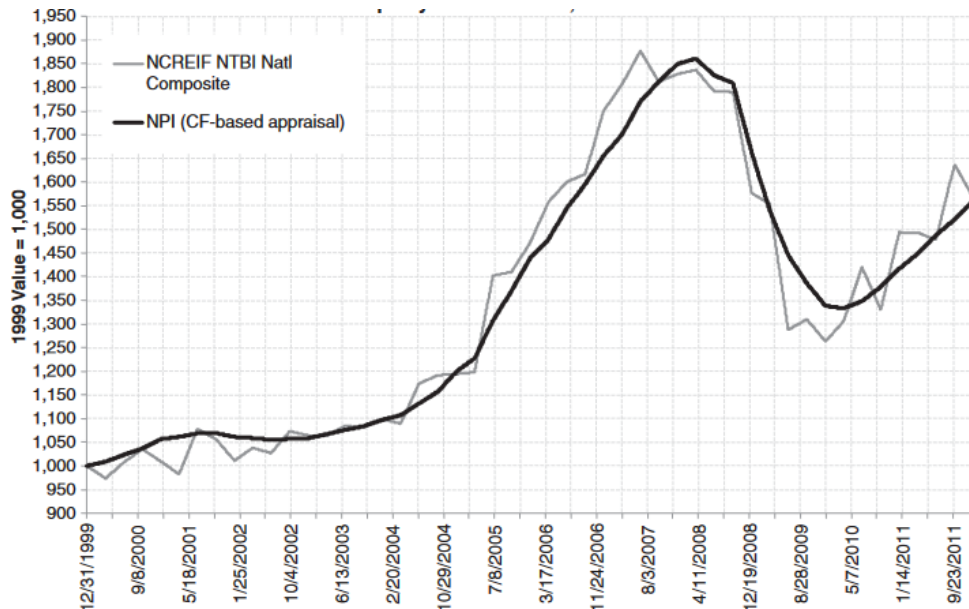


Figure 6: Appraisal-based & Transaction-based versions of NCREIF (Geltner, 2013)

Concludingly, Geltner (2013) suggests the use of all three indices as a comparison and performance measurement tool in order to achieve the most accurate performance assessment results. A more sophisticated way than indices based on property returns would be the construction of a fund return based index, though it would come with difficulties as open-end funds are not traded as a whole in the way property can be traded. The correction for autocorrelation, i.e. de-smoothing, is believed by Maurer and Sebastian (1999) to be the best way to make indices more realistic. However, it is argued if the desmoothing should be executed by the index constructor or the investors themselves, as the desmoothing process can include a bias or error (Maurer et al., 2004b). As a result, it may be a better solution to give investors the opportunity to desmooth an index themselves.

Gläsner (2019) has compared and modified real estate fund indices to show the significance of biases at any state of the index construction process related to the challenges with accounting for the whole life cycle of real estate. He found that several characteristics of assets used in indices, such as rent per sqm, underly strong biases in terms of composition and quality of the market. He argued that e.g. newer offices with better technology may distort the index results, since the higher costs that arise with the refurbishment and maintenance may not be transparently indicated. Consequently, the variables and assumptions used to construct a benchmark need to carefully be considered, and the benchmark should be used with caution. In addition, factors such as different valuation practices increase the difficulty of benchmark comparison on an international level. Gläsner

(2019) suggests benchmark construction to consider only those properties which have been part of the portfolio over the whole evaluation period, since the most recent calculation of a comparable benchmark.

As mentioned in chapter 3.2.1, the concept of the total return has been widely accepted in the literature and eases the comparability of different investment vehicles like stocks, bonds and real estate. Consequently, it is often used as the main variable in index construction in order to achieve comparable results. Gläsner supports the hypothesis that the total return is universal due to an existing global standardized definition (Gläsner, 2019). However, the valuation based total return can still differ in several ways, e.g. by considered either pre-tax based or after-tax based values.

Schweizer et al. (2011) explained a construction process in detail. First, they used a representative index provided by BVI and Datastream. The raw data was adjusted for share splits and deducted by the management fees to remove biases against funds with higher management fee. Each fund's total return was equally weighted, where each fund is considered equally in the index construction, independent from the fund size. Finally, the figures were corrected for autocorrelation using the Getmansky method. The large number of steps indicates how many options exist to adjust, change or even generate an index. As a result, the indices become more and more distinct in their characteristics and the usefulness of performance comparability with two different benchmarks, e.g. from two different countries, decreases.

For OEREFS, the problem faced by analysts evaluating their performance occurs as a result of the lack of a standardized reliable method of index construction. The quality of indices is lowered by the fact that they only represent fixed figures that do not account for future development of funds (Skinner and Bradford, 2006). It becomes clear that benchmark construction can be undertaken in many ways, where even small adjustments decrease the comparability of such indices. The benchmarks do not fit for every comparison in respect to OEREF performance, as e.g. fund managers may differ in their allocation and strategy from the benchmark when they possess other information or try to exploit an opportunity that leads to a better return-risk-ratio (Baum and Farrelly, 2009). Despite the essential role of benchmarks in the measurement of fund performance, it is not recommended to use them as the only source of measurement. The assumptions underlying the benchmark constructions should be evaluated, and if necessary, adjustments should be made in order to make the benchmarks comparable. This additionally reveals the necessity for a universal standardization in regard to benchmark construction, evaluation criteria and procedure to enhance the comparability and means to assess the performance of open-end real estate funds.

4 Methodology

The aim of the empirical work is to analyze the link between the components that contribute to the success of a fund in an annual report and the ultimately achieved investor returns. In this regard, it will be discussed how the links and components can include risk factors that may transfer the portfolio's performance and which mechanisms exist for fund managers to avoid the reflection of underperformance in the investor's return. An example for such a potential case could be a fund that may go through difficult times with decreasing values and underperforming property, but still achieve consistent BVI returns or an increasing net asset value.

In a second part of the empirical work the correlation between the share prices and the secondary market share prices will be observed. The secondary market share prices have been discussed to react more sensitive to market changes. This stands in contrary to the smoothed values of share prices, where the net asset value as the main parameter for the share prices do not adapt to market changes in the same degree the secondary market share prices do. However, the secondary market share prices can also be sensitive to irrational market participant behavior. The purpose is to observe if the secondary market share prices can be used as an indicator for upcoming changes in the fund's net asset values, or if they accurately reflect the fund's performance, despite the underlying differences in the development of share prices and secondary market share prices.

The following data analysis will comprise twelve German open-end real estate funds. To achieve significant results, the number of funds was tried to be maximized in regard to the scope of this thesis and the total amount of retail open-end real estate funds in Germany. The funds were chosen based on the following criteria:

1. The parent company as well as the fund managing company are both based in Germany. As this thesis focuses on the German open-end real estate fund market, it is obvious that the analyzed funds should be based in Germany and operate under the mentioned German regulation and law. While the fund managers are based in Germany, the chosen funds may consist of an international portfolio. As part of the obligatory diversification for German OEREFs most funds tend to invest internationally, resulting in property held in other countries and currencies as well.
2. The fund has been established more than four years ago. This ensures that a certain level of data is available and can be used to evaluate time series and development of parameters, prices and hence returns. The chosen time period for most types of analysis comprise the years from 2016 to 2019. 2016 was hereby the earliest date where all chosen funds provided reports for. With the beginning of the writing process in early 2020 the last available data was published in 2019.
3. The funds offered sufficient information for the observed time period about the share price development and provided annual reports. Such information is crucial since the share price, as well as figures taken from the annual reports, are important parameters for the performance evaluation of funds.

4. The funds are listed at the Hamburg stock exchange (HAM). This enables a comparison of the share price development with the price development at the exchange market and a subsequent analysis of their potential correlation.

Relevant data was gathered from each fund's annual report, the share price development provided by the fund managing company as well as websites exhibiting the development on the Hamburg stock exchange market. The share price development of all funds has been adjusted to fit in terms of valuation frequency. The standard for the adjustment was based on the fund that provided the least frequent values, where values were published every three to four days. Numbers taken from the annual report have been justifiably put into comparison to each other in order to observe a potential relationship between the BVI based investor returns and other components of portfolio or fund performance. During the discussion, the parameters used from annual reports will be described in detail.

Additionally, a valuation-based index for retail real estate funds, as well as an open-end fund index provided by INREV, were used to compare the fund returns with given benchmarks. Neither of the two indices fully fit to the characteristics of retail open-end real estate funds, as open-end funds include special funds as well, while the retail real estate funds additionally include closed-end real estate funds. Nevertheless, the indices are the closest possible index in regard to the characteristics of the selected funds that could be found, as other indices for property or other vehicles include significantly different assets or investment vehicles. For this reason, those two indices were chosen for the performance evaluation of the chosen fund.

4.1 Descriptive Data

Table 4 comprises an overview of the twelve observed German retail open-end real estate funds. Hereby the net asset value includes the value of all assets, i.e. property, cash on bank accounts and capital that is bound to securities. Since the net asset value varies with each sale or redemption of a share, the number given in the table is the rounded value from the respective annual report in 2019. The net asset values range from 384.894.000 € (29.947.000 € for the fund in liquidation*) to 15.491.200.000 € and reveal the large spread in fund size among German open-end real estate funds. The offer price ranges from 2 € to 97,83 € and depends on the number of shares that have been distributed in total. The range for the offer price is large because the fund managing companies can freely decide the number of shares issued. Consequently, a fund issuing ten times more shares will experience the share price to decrease ten times as well. The date of establishment ranges from 1966 to 2010, with five funds that have been established in the last decade. It shows the longevity of OEREFs in Germany and may give long-term investors a good sentiment for future investment, knowing that open-end real estate funds in Germany can last for more than 50 years.

Table 4: Overview over the twelve selected funds

Fund Name	Net Asset Value (2019)	Offer price**	Date of establishment	KVG owned by	Occupancy rate***	Investment focus
Catella European Residential	1.239.737.000 €	14,71 €	27.12.2007	Catella Group	94,30%	Residential
Catella Focus Nordic Cities*	29.947.000 €	19,60 €	03.09.2007	Catella Group	43,90%	Office
Catella MAX	384.895.000 €	2,00 €	24.02.2010	Catella Group	99,10%	Residential
Deka Immobilien Europa	15.491.200.000 €	50,09 €	20.01.1997	German Savings Bank Finance Group	96,10%	Office
Deka Immobilien Global	5.344.100.000 €	58,15 €	28.10.2002	German Savings Bank Finance Group	96,50%	Office
WestInvest Interselect	7.548.000.000 €	49,74 €	01.10.2000	Deutsche Bank AG	96,10%	Office
DWS grundbesitz europa	7.318.100.000 €	39,58 €	27.10.1970	Deutsche Bank AG	95,60%	Mixed
DWS grundbesitz global	3.133.100.000 €	52,74 €	25.07.2000	Deutsche Bank AG	96,80%	Office
CommerzReal HausInvest	12.117.000.000 €	44,55 €	07.04.1972	Commerzbank AG	94,30%	Mixed
Unilmmo Deutschland	10.324.900.000 €	97,83 €	01.07.1966	DZ Bank Group	97%	Mixed
Unilmmo Europa	12.646.600.000 €	56,91 €	01.04.1985	DZ Bank Group	96,30%	Office
Unilmmo Global	3.544.300.000 €	53,16 €	01.04.2004	DZ Bank Group	96,20%	Office

*in liquidation

** as per 27.12.2019

*** as per 30.09.2019

All funds are owned by banks as parent companies, with the exception of Catella Group, who operates as a capital managing company. Consequently, many funds are still owned, supported and indirectly managed by their respective banks. However, Catella Group proves that KVG's are not obligatorily owned by banks. The occupancy rate for the real estate portfolio ranges from 43,90% to 99,1%. With the exception of the fund in liquidation (Catella Focus Nordic Cities), all funds achieve an occupancy rate of at least 94,3%. These higher numbers indicate that the funds are mostly invested in fully occupied low risk property, known as core property. This results in a low-risk profile for almost all funds. The low occupancy rate for the Catella Focus Nordic Cities indicates that the vacant properties are more difficult to sell throughout the liquidation process. As the funds are prohibited to dispose of property below their appraisal results, they are likely trying to sell property while waiting for the limitation to lapse. The funds either focus on office, residential or mixed (office, retail and residential) property. While office is most represented in the overall portfolios of the funds, it is not the only asset type that the office-focused funds invest in. This can be reasoned as part of the obligatory level of diversification for German open-end real estate funds.

The fund "Catella Focus Nordic Cities" is has been in liquidation since December 2018 and may therefore exhibit outlying or extraordinary figures. In the regard of a potential survivorship bias the fund will still be considered and discussed as part of the data analysis. This assumption is based on Kahn and Rudd (1995) who discussed several authors that found a significant influence of the survivorship bias on results, where an estimated percentage of survivorship changed the results to not be statistically significant anymore. Despite the consideration of the fund in liquidation, it should still be mentioned that the analysis and results are based on those funds that have managed to establish themselves within the market of OEREFs.

4.2 Results

The first comparison will include the income rate of return, capital rate of return, total rate of return and the BVI-method return. As discussed earlier, the returns are a fundamental determinant for the open-end real estate fund performance and can sometimes even be considered the only parameter of a performance analysis. Table 5 exhibits the values for the fund “Catella European Residential”, which was exemplarily chosen to demonstrate the differences in return calculation.

Table 5: Comparison between the rate of returns and the BVI-return

Year	2016	2017	2018	2019	TOTAL
Income rate of return	3,1%	2,3%	1,5%	1,4%	8,3%
Capital rate of return	4,1%	4,7%	5,8%	8,9%	23,4%
Total rate of return	7,2%	6,9%	7,3%	10,3%	31,7%
BVI-method-return	7,8%	8,5%	8,1%	11,1%	35,5%
Difference	0,6%	1,6%	0,8%	0,8%	3,8%

The returns were based on the share price development of the fund, as provided by the fund manager on their website. For each day starting 01.01.2016 the daily income and capital returns were calculated and subsequently compounded per year to result in the annual income return and annual capital return. The total rate of return was then generated through the addition of the income and capital rate of return.

The table describes the comparison in the values for the total rate of return and the BVI-method. As both can be used as a parameter in comparing performance, it is important to evaluate a potential comparison when different results are given. This could be useful when comparing OEREFs to other asset classes such as REITs or direct property in terms of performance. However, the results for most years reveal that the values differ for the BVI-method and the total rate of return. For all four depicted years the difference between the total rate of return and BVI-method-return ranged from 0.6 basis points to 1,6 basis points, totaling 3,8 basis points in the observed four-year time period. This difference appears logical, as the instant reinvestment of distributed capital can significantly contribute to an increase in return value. However, the BVI-return restricts the performance comparison with asset classes other than funds. For such cases, it may be useful to refer to other measures such as the compounded annual returns. The BVI-method is the standard for open-end real estate funds in Germany and will be used as the base comparable return value for this thesis’ performance analysis.

In the realm of stock based mutual funds the Sharpe-ratio is a popular measure used for performance calculations. While for mutual funds it would lead to the conclusion that the given years are riskier, it may not fully serve its purpose for open-end real estate funds. This is due to the fact that the share prices are not supply and demand driven, but rather reflect the monetary situation of the fund at any given date. Consequently, constant changes in share prices may result from frequent cash in- and outflows, for instance from rent income or operational costs. This influences the value for the Sharpe-Ratio without adding any risk to the fund. Hence, the Sharpe-Ratio does hereby not provide accurate information about the fund performance and was chosen not to be utilized.

Table 6: Yearly BVI-method returns between 2016 to 2019 for the observed funds

Annual BVI-Method>Returns					
Year	2019	2018	2017	2016	Average
Catella European Residential	11,0%	8,1%	8,5%	5,9%	8,4%
Catella Focus Nordic Cities	-19,4%	-7,2%	-17,9%	-6,7%	-12,8%
Catella MAX	8,1%	20,3%	19,4%	12,1%	15,0%
Deka Immobilien Europa	3,8%	3,6%	3,1%	2,2%	3,2%
Deka Immobilien Global	2,0%	2,0%	2,0%	2,0%	2,0%
WestInvest Interselect	3,2%	2,5%	2,0%	2,0%	2,4%
DWS grundbesitz europa	3,7%	2,7%	3,1%	2,5%	3,0%
DWS grundbesitz global	2,6%	2,1%	1,7%	2,1%	2,1%
CommerzReal HausInvest	3,1%	2,1%	2,1%	2,5%	2,5%
Unilmmo Deutschland	2,8%	2,8%	3,0%	2,8%	2,9%
Unilmmo Europa	2,5%	2,6%	2,6%	2,6%	2,6%
Unilmmo Global	2,0%	2,1%	2,4%	2,8%	2,3%
Average	2,1%	3,6%	2,7%	2,7%	2,8%
Average (no Focus Nordic Cities)	4,1%	4,6%	4,5%	3,6%	4,2%

Table 6 exhibits the BVI-method returns for the observed funds as given in the annual report of each fund. On this basis, it can be seen that two funds, Catella European Residential and Catella MAX, have achieved extraordinary returns ranging from 5,9% to 11% and 8,1% to 20,3% respectively, while Catella Focus Nordic Cities has achieved extraordinary negative returns ranging from -6,7% to -19,4%. All other 9 funds have achieved values between 1,7% and 3,8%. This leads to the assumption that the fund manager held by Catella Group may aim for a higher risk approach in general, as this group is the only group to achieve such divergent returns in both directions. With a focus on the other 9 funds, the results reveal that fund returns can be quite stable, where most of those funds have less than 10 basis points difference between the values in the observed time period. Only the fund Deka Immobilien Europa had an outlier value of 2,2% in 2016. The sister fund Deka Immobilien Global, however, had a constant 2% return for all years.

The returns marked in yellow comprise BVI-returns for the funds DWS Grundbesitz global, Deka Immobilien global and partially UniImmo Global, which achieve the lowest returns apart from the fund in liquidation. This could potentially be reasoned in the fact that these funds are investing on a global scale, which adds further costs through either a larger percentage in indirect investments or higher operational costs due to the necessary resources that come with the investment in new markets.

The average returns of all funds is 140 basis points higher when the fund in liquidation, Catella Focus Nordic Cities, is excluded. While the sample size of 12 funds may not be large, it still indicates the strength of survivorship bias and how it can impact the results when only funds that “survived”, i.e. the winners, are considered. This is in particular important for the construction of benchmarks as the funds that are considered for a benchmark, e.g. if a fund is currently processing liquidation or not, can lead to a completely different index. For this reason, the fund in liquidation will find consideration, and differences in results will be mentioned in the following analysis.

Table 7 exhibits the results when the BVI-returns are compared to open-end real estate fund indices. This comparison can be described as the common one-dimensional performance measure of selected funds returns put against market returns. The indices used were provided by INREV and comprise two groups of funds. The first index consists of open-end real estate vehicles and the second index consists of retail real estate fund vehicles. While the funds used in this data analysis belong to both groups, each index includes other funds that have different characteristics and may therefore achieve other results. The open-end real estate index further includes special funds that are only open to institutional investors. Retail funds include closed-end funds that have a termination date and are only open to investors in the initiation phase. Due to the index inclusion of funds that are of a different type, the results from the index comparison should therefore be used with caution.

Table 7: Index comparison between the BVI returns and two real estate fund indices (indices provided by INREV)

YEAR	BVI return vs. INREV open-end vehicles index				
	2019	2018	2017	2016	Average
Catella European Residential	6,1%	3,9%	4,2%	3,2%	4,4%
Catella Focus Nordic Cities	-24,3%	-11,4%	-22,2%	-9,4%	-16,8%
Catella MAX	3,2%	16,1%	15,1%	9,4%	11,0%
Deka Immobilien Europa	-1,1%	-0,6%	-1,2%	-0,5%	-0,8%
Deka Immobilien Global	-2,9%	-2,2%	-2,3%	-0,7%	-2,0%
WestInvest Interselect	-1,7%	-1,7%	-2,3%	-0,7%	-1,6%
DWS grundbesitz europa	-1,2%	-1,5%	-1,2%	-0,2%	-1,0%
DWS grundbesitz global	-2,3%	-2,1%	-2,6%	-0,6%	-1,9%
CommerzReal HausInvest	-1,8%	-2,1%	-2,2%	-0,2%	-1,6%
Unilmmo Deutschland	-2,1%	-1,4%	-1,3%	0,1%	-1,2%
Unilmmo Europa	-2,4%	-1,6%	-1,7%	-0,1%	-1,4%
Unilmmo Global	-2,9%	-2,1%	-1,9%	0,1%	-1,7%
Average	-2,7%	-0,5%	-1,6%	0,0%	-1,2%
Average (no Focus Nordic Cities)	-0,8%	0,4%	0,2%	0,9%	0,2%

YEAR	BVI return vs. INREV public funds vehicles index				
	2019	2018	2017	2016	Average
Catella European Residential	8,1%	6,0%	5,7%	4,4%	6,0%
Catella Focus Nordic Cities	-22,3%	-9,3%	-20,7%	-8,2%	-15,1%
Catella MAX	5,2%	18,2%	16,6%	10,6%	12,6%
Deka Immobilien Europa	0,9%	1,5%	0,3%	0,7%	0,8%
Deka Immobilien Global	-0,9%	-0,1%	-0,8%	0,5%	-0,3%
WestInvest Interselect	0,3%	0,4%	-0,8%	0,5%	0,1%
DWS grundbesitz europa	0,8%	0,6%	0,3%	1,0%	0,7%
DWS grundbesitz global	-0,3%	0,0%	-1,1%	0,6%	-0,2%
CommerzReal HausInvest	0,2%	0,0%	-0,7%	1,0%	0,1%
Unilmmo Deutschland	-0,1%	0,7%	0,2%	1,3%	0,5%
Unilmmo Europa	-0,4%	0,4%	-0,2%	1,1%	0,2%
Unilmmo Global	-0,9%	0,0%	-0,4%	1,3%	0,0%
Average	-0,7%	1,5%	-0,2%	1,2%	0,5%
Average (no Focus Nordic Cities)	1,2%	2,5%	1,7%	2,1%	1,9%

The results of the index comparison exhibit the relative performance of the observed funds. The green indication of the returns illustrates that the funds have performed well in the field of retail funds, while all funds with the exception of the funds held by the Catella group have

underperformed in the field of open-end vehicles. This difference is in particular significant for some funds such as Deka Immobilien Global or UniImmo Global (up to negative 2,9% basis points). The Catella Group funds, who had exceptional returns within the observed group, are outperforming both indices as well. Catella Focus Nordic Cities has expectedly strongly underperformed both indices in every single year. Considering that other retail open-end real estate funds are also included in both indices, it can be assumed that special funds have a performance advantage over retail funds, and that open-end real estate funds perform better than closed-end real estate funds.

4.2.1 Return component analysis

In the following part of the data analysis, components of the annual report are analyzed in relation to the BVI-method return performance. As the BVI-method return is derived on the basis of the share price and the distribution of dividends, those components will play a significant role in the analysis as well. The goal is to determine how are linked to each other to the BVI-method return, as the components give an insight on the portfolio performance, whereas the BVI-return expresses the performance achieved by the investor. The parameters are taken from the respective annual report of each fund.

The analysis will observe the relationship between the income return achieved from direct and indirect property, capital return achieved through earning, capital return assumed as part of the valuation-based appreciation and the BVI-return realized for the investors. These values are observed to analyze which of the components contributes to the investor's total return. Naturally, a well performing fund with the main purpose of holding real estate is expected to have the underlying assets achieve outperforming income or capital return. Similarly, a fund with bad performing underlying assets should see such performance be reflected in the investor's return.

An outperformance of a fund's underlying asset can hereby be achieved through higher income return or capital return. In this manner if two funds have the same actual earnings within the same time period, the fund that holds assets valued lower achieves a higher actual property income return. If most assets of a fund outperform similar assets of other funds, an outperformance in terms of the investor's return would be expected.

The capital income is reflected as the sum of the realized earnings and appreciation. The realized earnings indicate the gain from a sale that achieved a higher transaction price than the original purchase. The appreciation indicates, on the other hand, the change in value that was achieved by values higher than the original purchase price. An outperformance in respect to the capital return of the underlying assets hereby indicates an increase in NAV, and hence an increase in the share price held by the shareholders. As a result, an increase in the shareholder's capital return would be expected as well.

The sum of these values results in the total return. Table 8 depicts the property income return, as well as the capital return from realized earnings and appreciation.

Table 8: Composition of the total return for each fund as depicted in the annual reports

Year	Property income return				Capital return from realized earnings and appreciation				Total return (Income + Capital return)			
	2019	2018	2017	2016	2019	2018	2017	2016	2019	2018	2017	2016
Catella European Residential	0,5%	1,7%	2,3%	2,4%	10,6%	6,4%	5,9%	3,2%	11,2%	8,0%	8,2%	5,7%
Catella Focus Nordic Cities	2,4%	0,0%	2,1%	0,8%	-13,8%	-4,6%	-7,2%	-4,9%	-11,4%	-4,6%	-5,1%	-4,2%
Catella MAX	1,4%	1,4%	1,8%	2,7%	6,8%	18,6%	17,6%	10,4%	8,2%	20,0%	19,4%	13,1%
Deka Immobilien Europa	1,6%	1,4%	2,0%	2,0%	2,5%	2,6%	2,3%	0,7%	4,1%	4,0%	4,3%	2,7%
Deka Immobilien Global	1,6%	2,4%	1,3%	2,4%	-0,1%	2,8%	0,5%	-1,2%	1,5%	5,2%	1,9%	1,1%
WestInvest Interselect	1,8%	1,7%	1,9%	2,7%	0,9%	1,0%	0,4%	-1,2%	2,6%	2,8%	2,3%	1,5%
DWS grundbesitz europa	1,7%	2,2%	2,4%	2,3%	1,3%	1,0%	0,9%	0,7%	3,1%	3,1%	3,3%	3,0%
DWS grundbesitz global	0,7%	2,1%	2,4%	0,6%	2,0%	0,1%	-0,8%	1,5%	2,7%	2,2%	1,6%	2,1%
CommerzReal HausInvest	0,9%	1,0%	2,2%	1,5%	1,4%	1,2%	0,9%	1,1%	2,2%	2,1%	2,6%	2,5%
Unilmmo Deutschland	3,0%	2,8%	2,8%	3,5%	0,5%	0,7%	1,0%	0,3%	3,5%	3,5%	3,7%	3,7%
Unilmmo Europa	2,4%	3,1%	2,0%	1,6%	0,3%	-0,3%	0,8%	1,3%	2,6%	2,8%	2,8%	2,8%
Unilmmo Global	1,7%	1,9%	1,6%	2,5%	0,4%	0,3%	1,1%	0,3%	2,1%	2,2%	2,7%	2,8%

The result of the total returns, described as the sum of the property income return and capital return from earnings and appreciation ranges from -11,4 % (Catella Focus Nordic Cities) to 20% (Catella MAX). For all funds that are owned by banks the total return fluctuates less than 1,4% (highest: 2,7% to 4,1%) between 2016 and 2019. In contrary, the income return and the capital return experience a much higher volatility. For the capital return from earnings and appreciation, most funds depict positive and negative values within the four-year time frame.

Table 9: Composition of the capital return for 2016 until 2019

Year	Capital return from realized earnings				Capital return from appreciation				Capital return from realized earnings and appreciation			
	2019	2018	2017	2016	2019	2018	2017	2016	2019	2018	2017	2016
Catella European Residential	0,1%	0,4%	0,0%	0,4%	10,5%	5,9%	5,9%	2,8%	10,6%	6,4%	5,9%	3,2%
Catella Focus Nordic Cities	-17,8%	-9,4%	2,8%	-1,1%	4,0%	4,8%	-10,1%	-3,8%	-13,8%	-4,6%	-7,2%	-4,9%
Catella MAX	0,0%	0,0%	0,0%	0,0%	6,8%	18,6%	17,6%	10,4%	6,8%	18,6%	17,6%	10,4%
Deka Immobilien Europa	0,8%	0,2%	0,7%	2,3%	1,8%	2,4%	1,7%	-1,6%	2,5%	2,6%	2,3%	0,7%
Deka Immobilien Global	-1,3%	3,5%	-0,9%	-1,2%	1,2%	-0,7%	1,4%	-0,1%	-0,1%	2,8%	0,5%	-1,2%
WestInvest Interselect	0,4%	0,4%	-1,2%	-0,6%	0,4%	0,6%	1,6%	-0,6%	0,9%	1,0%	0,4%	-1,2%
DWS grundbesitz europa	-0,2%	0,0%	-0,1%	-0,1%	1,6%	1,0%	0,8%	0,8%	1,3%	1,0%	0,9%	0,7%
DWS grundbesitz global	-0,3%	2,3%	0,7%	-1,5%	2,3%	-2,1%	-1,5%	3,0%	2,0%	0,1%	-0,8%	1,5%
CommerzReal HausInvest	-0,5%	1,3%	2,6%	2,7%	1,9%	-0,1%	-1,8%	-1,7%	1,4%	1,2%	0,9%	1,1%
Unilmmo Deutschland	0,1%	0,0%	0,2%	0,5%	0,4%	0,7%	0,7%	-0,2%	0,5%	0,7%	1,0%	0,3%
Unilmmo Europa	-1,3%	1,1%	-0,7%	-0,3%	1,6%	-1,4%	1,5%	1,6%	0,3%	-0,3%	0,8%	1,3%
Unilmmo Global	-1,1%	3,0%	-1,4%	-3,3%	1,5%	-2,7%	2,5%	3,7%	0,4%	0,3%	1,1%	0,3%

For the relationship between the capital return from earnings, appreciation and the total return, an observation was found in the values that are highlighted in yellow. Whenever a value for appreciation unrealized profit to NAV value is negative, the value for earning is positive and vice versa. This could be reasoned in sells of assets that the managers expected to create a realized profit in order to compensate the loss in unrealized profit and vice versa. In comparison to the change in value for the income as well as both capital return components, the stable values in the total return and BVI return could be explained by the attempt of the active management to realize specific values in order to achieve the expected or targeted BVI return. One example would be the fund “DWS grundbesitz global”, where the income return for the years 2019 (0,7%) and 2016 (0,6%) was lower than the values for 2017(2,4%) and 2018 (2,1%). The earnings for the fund were negative in 2019 (-0,3%) and 2016 (-1,5%) as well, while it was positive in 2017 (0,7%) and 2018 (2,3%). It appeared that for the two weaker years, the appreciation, as determined by valuation, was much higher in 2019 (2,3%) and 2016 (3%) and negative for 2017 (-2,1%) and 2018 (-1,5%), leading to final total returns that are closer to each other (2019: 2,7%; 2018:2,2%; 2017: 1,6%; 2016: 2,1%).

This observation is depicted in figure 7 for four exemplary funds:

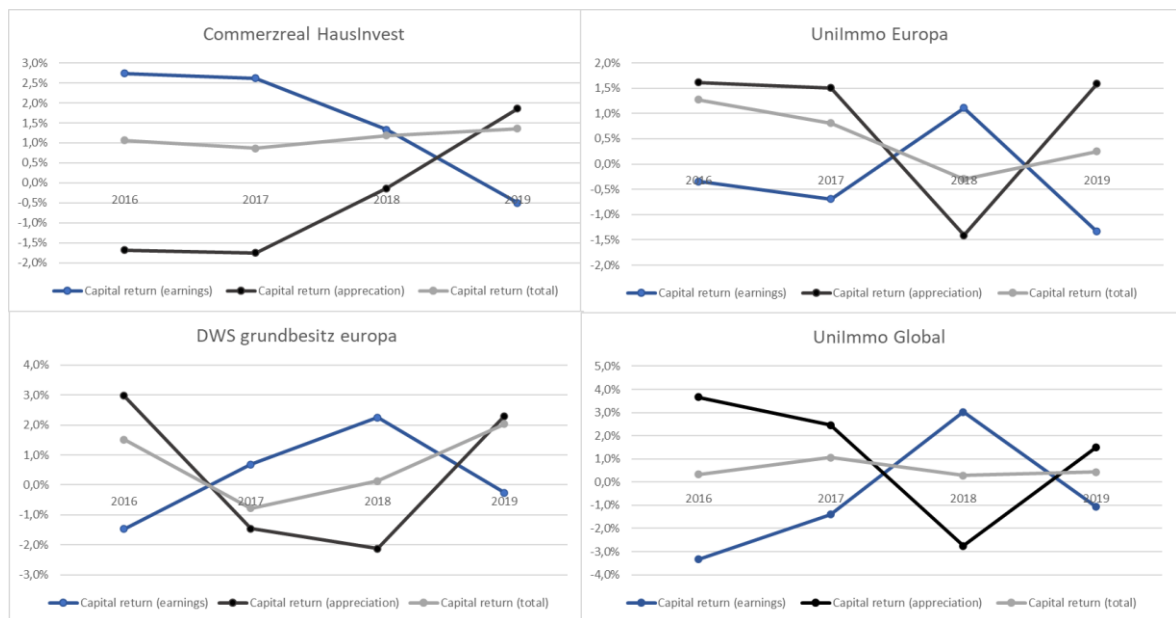


Figure 7: Capital return composition for the years 2016 to 2019 (four examples)

This relationship between the income, capital and total return appear for most funds, with the exception of the already strong performing Catella MAX and Catella European Residential and the bad performing fund in liquidation, Catella Focus Nordic Cities, where a weaker position in income and capital return is compensated by positive figures in the other position. The lower volatility of the total return could be an indication for the mechanisms which fund managers may use to ensure stable returns for the shareholders over a longer period of time. Hereby, the exceeding profit realized from an overperformance in one year may be transferred to a year with lower performance results. Excessive income return may be followed by sales of property that is overvalued, effectively leading to a loss in capital return compensated by the excessive income return. Therefore, while fund managers may not have direct influence on the valuations of the property, the results hypothetically suggest that they may have the portfolio situation appear lower or higher in dependence of the achieved income returns. Overall, a closer look into the relationship between the income return and capital return and BVI-return should be considered, using more extensive and detailed data as well as statistical analytical tools to approve or disprove such a hypothetical statement.

Table 10 exhibits the differences between the total return and the BVI return that was achieved from an investor's point of view. Despite the fact that the BVI return is a total return as well, the values are in most cases different due to the fundamentally different calculations. The dividend payout determination ultimately considers more parameters, as expressed in the annual reports of the funds. Furthermore, the difference between the total return achieved by the underlying assets of the fund and the BVI-return achieved by the investors can be explained through the additional cash flows that finally influence the BVI-return. These include manager performance fees or the variation in currency. Out of the 48 observed differences in return for the time period 37 have been found to differ 70 basis points

or less, where most of the difference may be explained through the underlying assumption of the BVI-return that the paid out dividends are reinvested into fund shares.

Table 10: Total return compared to the BVI-return

Year	Total return (Income + Capital return)				BVI return				Spread between total return and BVI-return			
	2019	2018	2017	2016	2019	2018	2017	2016	2019	2018	2017	2016
Catella European Residential	11,2%	8,0%	8,2%	5,7%	11,0%	8,1%	8,5%	5,9%	0,2%	-0,1%	-0,3%	-0,2%
Catella Focus Nordic Cities	-11,4%	-4,6%	-5,1%	-4,2%	-19,4%	-7,2%	-17,9%	-6,7%	8,0%	2,6%	12,8%	2,5%
Catella MAX	8,2%	20,0%	19,4%	13,1%	8,1%	20,3%	19,4%	12,1%	0,1%	-0,3%	0,0%	1,0%
Deka Immobilien Europa	4,1%	4,0%	4,3%	2,7%	3,8%	3,6%	3,1%	2,2%	0,3%	0,4%	1,2%	0,5%
Deka Immobilien Global	1,5%	5,2%	1,9%	1,1%	2,0%	2,0%	2,0%	2,0%	-0,5%	3,2%	-0,1%	-0,9%
WestInvest Interselect	2,6%	2,8%	2,3%	1,5%	3,2%	2,5%	2,0%	2,0%	-0,6%	0,3%	0,3%	-0,5%
DWS grundbesitz europa	3,1%	3,1%	3,3%	3,0%	3,7%	2,7%	3,1%	2,5%	-0,6%	0,4%	0,2%	0,5%
DWS grundbesitz global	2,7%	2,2%	1,6%	2,1%	2,6%	2,1%	1,7%	2,1%	0,1%	0,1%	-0,1%	0,0%
CommerzReal HausInvest	2,2%	2,1%	2,6%	2,5%	3,1%	2,1%	2,1%	2,5%	-0,9%	0,0%	0,5%	0,0%
Unilmmo Deutschland	3,5%	3,5%	3,7%	3,7%	2,8%	2,8%	3,0%	2,8%	0,7%	0,7%	0,7%	0,9%
Unilmmo Europa	2,6%	2,8%	2,8%	2,8%	2,5%	2,6%	2,6%	2,6%	0,1%	0,2%	0,2%	0,2%
Unilmmo Global	2,1%	2,2%	2,7%	2,8%	2,0%	2,1%	2,4%	2,8%	0,1%	0,1%	0,3%	0,0%

In this part of the thesis, the relationship between components of the total return and their relationship with the BVI-return was discussed. The analysis illustrated how the total return of the fund is constructed and revealed potential mechanisms that may impact the capital return, e.g. through buy and sell strategies executed by managers. In addition, the total return achieved by the underlying assets has been found to explain the BVI-return for the most part, where over 90% of the total return values differ less than 1% from the BVI-return values.

4.2.2 Correlation of share price and secondary market share price

In response to a past suspension of share redemption, secondary exchange markets have emerged in order to continue share trading. The Hamburg stock exchange started to trade GOEREF shares in August 2002, and during the times of the crisis in 2008/2009 the trading volume quadrupled for some GOEREFs that suspended redemption, while the price saw a up to 10% discount of the NAV per share price (Maurer et al., 2012). Haß et al. (2011a) talked about discounts of up to 20%. Stein (2014) even found trading prices to be 50% lower than the NAV. The discount can be reasoned in the lack of an option to redeem the shares, potential risk of lower pay-outs when properties are sold under value, risk of fund liquidation, as well as higher volatility on a trading-based price market (Schnejdar et al., 2019; Stein, 2014; Schweizer et al., 2011; Haß et al., 2011). In this respect, figure 6 illustrates the share price and secondary market share price development of nine funds from the 01.01.2016 until the 31.12.2019. The funds owned by Catella did not provide information on the secondary market share price development and are therefore excluded in this analysis. Hereby, two graphs share the same colour and depict the share price and exchange market price development for one fund. It can be seen that for all funds, the development of the secondary market share prices possesses a higher volatility and is constantly below the purchase prices provided by the fund manager. This expresses the premium that sellers on the market need to pay, e.g. compensating the liquidity restriction of the notice period for share redemption.

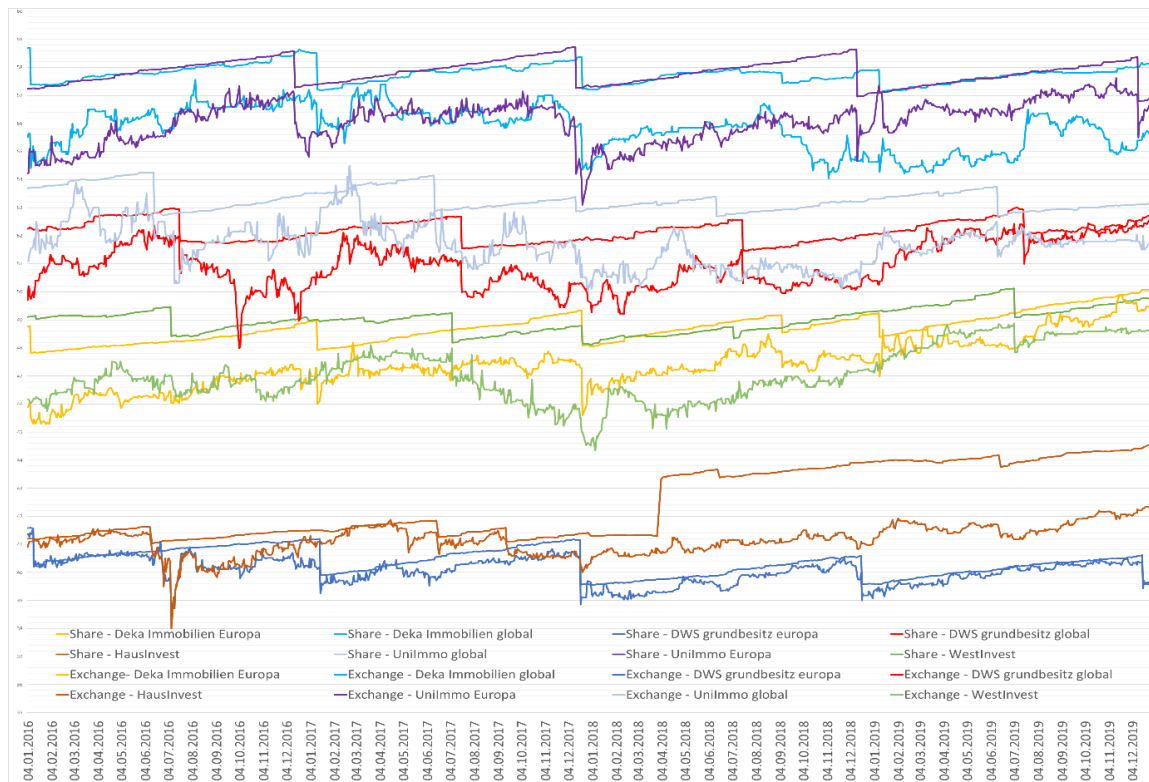


Figure 6: Development of share prices and Hamburg exchange market prices (2016-2019)

For all funds, there are occasional drops in the value, with a subsequent slow and steady value increase. Naturally, these value drops occur right after the distribution of the dividends.

For the analysis of the relationship between the fund share prices and the prices on the Hamburg stock exchange market, a correlation analysis was conducted. Hereby, data comprising the price development from 01.01.2016 to 31.12.2019 was used. As most funds release new price information in two- and three-day intervals, the secondary market share prices were adjusted to match the frequency of the fund share prices. Overall, 1000 values were observed over the given time period. To enable comparability on an annual basis each year's price correlation is exhibited individually. Additionally, the compounded four-year correlation is depicted. The results for the correlation between the share prices and secondary market share prices are depicted in table 11. In this regard, one apostrophe behind the value indicates a significance of at least 0,95, whereas two apostrophes behind each value indicate that a significance of over 0,99 (second confidence interval.). Values that are statistically less significant are highlighted in red.

For single years, the correlation results range from 0,064 (Grundbesitz Europa in 2016) to 0,919 (UniImmo Europa in 2016). Only one value is statistically insignificant (UniImmo Deutschland in 2016). The fund Hausinvest comprises values ranging from 0,586 to 0,849, indicating that the secondary market development has a significant correlation with the share price development. Similar results have been found for the Deka Immobilien Europa fund, where the single year values range from 0,539 to 0,841, and the fund UniImmo Europa with values ranging from 0,537 to 0,919. The weakest correlation results for single years were found for UniImmo Global (0,136- 0,549) and WestInvest (0,188-0,784). While UniImmo

Global indicates a weaker correlation between fund share prices and secondary market share prices, WestInvest still consists of three values (0,057; 0,648; 0,784) above 0,5. As a first observation, the single year values indicate that the share prices and secondary market share prices do correlate in for the observed funds.

Table 11: Correlation table between fund share price development and Hamburg exchange market price development of the observed funds

Fund	Raw values				
	2016	2017	2018	2019	2016-2019
Number of values	253	250	248	249	1000
Dekalmmo Europa	0,841**	,539**	,896**	,815**	,871**
Sig.	0,000	0,000	0,000	0,000	0,000
Dekalmmo Global	0,742**	,160*	,458**	,601**	,565**
Sig.	0,000	0,011	0,000	0,000	0,000
grundbesitz Europa	0,064	,873**	,924**	,960**	,815**
Sig.	0,311	0,000	0,000	0,000	0,000
grundbesitz Global	,709**	,734**	,428**	,536**	,687**
Sig.	0,000	0,000	0,000	0,000	0,000
HausInvest	,586**	,779**	,769**	,849**	,626**
Sig.	0,000	0,000	0,000	0,000	0,000
Unilmmo Deutschland	0,005	,807**	,432**	,410**	,198**
Sig.	0,934	0,000	0,000	0,000	0,000
Unilmmo Europa	,919**	,537**	,813**	,757**	,493**
Sig.	0,000	0,000	0,000	0,000	0,000
Unilmmo Global	,539**	,549**	,188**	,136*	,306**
Sig.	0,000	0,000	0,003	0,031	0,000
WestInvest	,188**	,648**	,784**	,557**	,803**
Sig.	0,003	0,000	0,000	0,000	0,000
Average correlation	0,510	0,625	0,632	0,625	0,596

For the four-year observation period the values range from 0,198 (UniImmo Deutschland) to 0,871 (Deka Immobilien Europa). Together with UniImmo Deutschland the fund UniImmo Global and UniImmo Europa exhibit a correlation lower than 0,5 (0,306). As all three funds are from the same fund family, the assumption holds that funds managed by UniImmo experience a secondary market price development which differs from the share price development. DekaImmo Global (0,565), grundbesitz Global (0,687) and HausInvest (0,626) exhibit a stronger correlation, WestInvest (0,803), grundbesitz Europa (0,815) and Deka Immobilien Europa (0,871) denote a significantly strong correlation between the share price and secondary market share price. Overall, for the observed funds, the correlation is always positive and tends to be more linear, indicating that the secondary market price development may depend and actively react to changes of the share price and NAV.

As the given data may include biases towards several events, the data was corrected and results were computed and discussed again. Firstly, the event of dividend distribution may lead to a distortion of the secondary market prices, as the distribution may lead to a consecutive exceptional decrease in the price on the secondary market. For this reason, all days with dividend distributions will be removed. In addition, the secondary market has been found to react quicker to market changes than the net asset value of a fund, as valuations do not occur on a daily basis. In order to corrected for a potential delay in, the secondary market prices will be shifted in three scenarios by two weeks, 1 month and 2 months respectively. The results of the four corrections are comprises in table 12.

Table 12: Correlation values with corrected data for 2016 to 2019

Fund	Corrected for distributions					Corrected for time delay: 2 weeks				
	2016	2017	2018	2019	2016-2019	2016	2017	2018	2019	2016-2019
Number of values	245	238	241	242	966	236	238	241	242	957
Dekalmmo Europa	,837**	,535**	,899**	,813**	,870**	,761**	,216**	,711**	,808**	,833**
Sig.	0,000	0,000	0,000	0,000	0,000	0,000	0,001	0,000	0,000	0,000
Dekalmmo Global	,740**	,144**	,471**	,599**	,567**	,605**	-0,098	,314**	,657**	,485**
Sig.	0,000	0,026	0,000	0,000	0,000	0,000	0,132	0,000	0,000	0,000
grundbesitz Europa	0,035	,878**	,926**	,959**	,822**	-0,223**	,573**	,705**	,775**	,689**
Sig.	0,585	0,000	0,000	0,000	0,000	0,001	0,000	0,000	0,000	0,000
grundbesitz Global	,707**	,735**	,426**	,530**	,686**	,762**	,574**	,490**	,429**	,657**
Sig.	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
HausInvest	,604**	,795**	,774**	,842**	,632**	,524**	,668**	,810**	,844**	,639**
Sig.	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
Unilmmo Deutschland	-0,013	,816**	,417**	,394**	,190**	-0,110	,639**	,368**	,351**	,134**
Sig.	0,835	0,000	0,000	0,000	0,000	0,092	0,000	0,000	0,000	0,000
Unilmmo Europa	,927**	,501**	,822**	,761**	,492**	,865**	,131**	,760**	,611**	,369**
Sig.	0,000	0,000	0,000	0,000	0,000	0,000	0,044	0,000	0,000	0,000
Unilmmo Global	,539**	,553**	,169**	0,11648	,307**	,627**	,484**	,140**	0,002	,312**
Sig.	0,000	0,000	0,009	0,070	0,000	0,000	0,000	0,030	0,979	0,000
WestInvest	,203**	,653**	,781**	,547**	,806**	0,085	,620**	,632**	,394**	,775**
Sig.	0,001	0,000	0,000	0,000	0,000	0,193	0,000	0,000	0,000	0,000
Average correlation	0,509	0,623	0,632	0,618	0,597	0,433	0,423	0,548	0,541	0,544

Fund	Corrected for time delay: 1 months					Corrected for time delay: 2 months				
	2016	2017	2018	2019	2016-2019	2016	2017	2018	2019	2016-2019
Number of values	224	238	241	242	945	203	238	241	242	924
Dekalmmo Europa	,730**	0,057	,327**	,803**	,787**	,723**	0,124	-0,033	,789**	,736**
Sig.	0,000	0,384	0,000	0,000	0,000	0,000	0,055	0,606	0,000	0,000
Dekalmmo Global	,564**	-0,366**	,136**	,642**	,378**	,396**	-0,224**	-0,079	,446**	,269**
Sig.	0,000	0,000	0,035	0,000	0,000	0,000	0,001	0,222	0,000	0,000
grundbesitz Europa	-0,217**	,356**	,399**	,504**	,548**	-0,247**	-0,037	-0,067	,158	,283**
Sig.	0,001	0,000	0,000	0,000	0,000	0,000	0,570	0,298	0,014	0,000
grundbesitz Global	,790**	,339**	,512**	,412**	,601**	,663**	,180**	,306**	,397**	,479**
Sig.	0,000	0,000	0,000	0,000	0,000	0,000	0,005	0,000	0,000	0,000
HausInvest	,790**	,529**	,747**	,734**	,628**	-0,046	,275**	,816**	,559**	,641**
Sig.	0,000	0,000	0,000	0,000	0,000	0,514	0,000	0,000	0,000	0,000
Unilmmo Deutschland	-0,108	,510**	,195**	,201**	,104**	-0,375**	,331**	-0,304**	-0,040	-0,017
Sig.	0,106	0,000	0,002	0,002	0,001	0,000	0,000	0,000	0,537	0,605
Unilmmo Europa	,846**	-0,0639	,568**	,470**	,272**	,806**	-0,427**	0,033	-0,091	-0,024
Sig.	0,000	0,326	0,000	0,000	0,000	0,000	0,000	0,608	0,158	0,472
Unilmmo Global	,414**	,355**	-0,01	,204**	,245**	-0,01	-0,07	-0,051	,334**	,078
Sig.	0,000	0,000	0,904	0,001	0,000	0,918	0,280	0,428	0,000	0,017
WestInvest	,414**	,677**	,441**	,289**	,761**	-0,035	,681**	,547**	,362**	,763**
Sig.	0,000	0,000	0,000	0,000	0,000	0,623	0,000	0,000	0,000	0,000
Average correlation	0,469	0,266	0,368	0,473	0,480	0,208	0,093	0,130	0,324	0,356

The statistically significant correlation values after a correction for distribution days range from 0,144 (Deka Immobilien Global in 2017) to 0,927 (UniImmo Europa). The correction led to a general decrease in the correlation values for the single years and a slight increase in correlation values for the 4-year time period. However, the results of a general existing correlation for most funds still holds true. With the exception of the three funds managed by UniImmo all funds depict a positive, linear correlation, with the same two funds Deka Immobilien Europa (0,87) and WestInvest (0,806) exhibiting a strong linear relationship between the share price and secondary market price development.

A correction for a potential reactive time delay revealed that the number of insignificant values increases, while simultaneously the correlation decreases for both the single years (average correlation from 0,093 to 0,548) and the four year time period from 2016 to 2019 (average correlation from 0,356 to 0,544). This leads to the conclusion that a potential time delay between the price changes on the secondary market as a reaction to market changes and the share price changes is unlikely.

5 Conclusion

This thesis dealt with German retail open-end real estate funds, as well as their characteristics and discussed the different actors, difficulties, measures and drivers in respect to fund performance. OEREF performance measurement is challenged by the heterogeneity of the underlying assets in terms of property, leading to a lack of data and benchmarks that are less developed than comparable benchmarks for other asset classes, such as stocks or REITs. This is reasoned in the small amount of open-end real estate funds in Germany whose information could be used for comparison. As a result to the low compatibility of available benchmarks, a qualitative analysis using the annual reports of selected funds was done in order to observe the relationship between underlying assets and the fund shares acquired by investors.

The results suggest that the total portfolio return achieved by the underlying assets has been found to explain the investor's BVI-return for the most part, where over 90% of the total return values differ less than 1 % from the BVI-return values. While for most funds the total return did not differ strongly from the BVI-return, a reciprocal relationship between the realized earnings from sales and appreciation was found. Hereby, a negative capital return through realized earnings was found to be compensated by a positive capital return from appreciation, and vice versa. This indicates a potential mechanism used by the fund managers to compensate for actualized loss or unusual changes in appreciation through specific asset sales, to finally achieve the BVI-return expected for the business year. However, further research is necessary to fully prove this observation. The first research question can therefore be answered in the way that fund returns, as calculated based on the BVI return, do only partially reflect the return of the underlying assets due to complex structure of fund and the valuation process. While the BVI-return has standardized the performance measures of funds in the German industry by making funds more comparable, it has only established this on a national level, and may decrease the comparability to foreign funds.

Since the rise of the secondary market with the purpose to enhance the liquidity of funds, after a minimum holding period was introduced in 2013, the daily trading provides more frequent and accurate price changes of funds. The higher frequency and potentially more immediate reaction to market changes may be a useful supportive data for the performance measurement of funds, e.g. for the construction of an OEREF benchmark. The results in this thesis suggest that the secondary market prices do correlate for most funds, with two funds exhibiting a significant correlation. The more frequent development may be useful as a proxy for further analysis; however, the dependence of supply and demand should be carefully put into consideration. Consequently, research question 2 leads to a result where a correlation between fund share price development and secondary market price development does exist.

The risks of such a complex investment vehicle are still not fully uncovered. Despite mutual fund performance measures such as the Jensen measure (1962) are well developed models, models for performance of open-end real estate funds can only copy such models with difficulty. These models require data with frequent observations points which can merely be met by real estate funds.

For further research a more detailed analysis over a longer time horizon is suggested to reliably identify the relationship between portfolio performance, fund performance for investors and the underlying risk. The goal could be a sophisticated, standardized performance model with specific requirements for the funds resulting in an additional supportive key performance indicator used for OEREF comparability next to the BVI-return. Furthermore, the returns and risks could be divided into components, where each comprises a distinguishable, relative contribution to the overall fund performance. After all, it should be a long-term goal to achieve a high level of transparency and clarity in respect to fund performance, the measures used and the evaluation process to ensure improved future analysis' executed by managers, investors, analysts and other associated parties.

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Appendix

Appendix 1: Construction of the BVI-return and other return components
(Source: respective annual reports)

Return development	Catella European Residential				Catella Nordic Cities			
	2019	2018	2017	2016	2019	2018	2017	2016
Gross income return	5,4%	5,9%	6,4%	6,2%	8,20%	5,60%	5,60%	6,20%
Operational costs	-1,8%	-1,6%	-1,6%	-1,8%	-10,20%	-4,00%	-2,30%	-1,60%
Net income return	3,6%	4,3%	4,8%	4,5%	2,00%	1,50%	3,30%	4,60%
Capital return	10,2%	5,6%	5,4%	2,7%	14,90%	-6,30%	-16,20%	-7,90%
Income taxes	-0,3%	-0,3%	-0,1%	0,0%	0,30%	0,20%	-0,20%	-0,30%
Latent taxes	-2,5%	-0,7%	-0,6%	0,1%	0,30%	-1,20%	-1,40%	0,10%
Result before financing	11,2%	9,0%	9,6%	7,3%	-16,30%	-6,10%	-14,50%	-3,40%
Total result (in €)	21,0%	10,6%	11,2%	8,6%	-21,30%	-9,20%	-19,00%	-6,10%
Currency exchange	-0,2%	0,0%	0,0%	0,2%	0,20%	0,10%	-0,10%	0,20%
BVI-return	11,0%	8,1%	8,5%	5,9%	-19,40%	-7,20%	-17,90%	-6,70%

Return development	Catella MAX				Deka Immobilien Europa			
	2019	2018	2017	2016	2019	2018	2017	2016
Gross income	3,6%	4,4%	4,5%	5,0%	5,2 %	5,2 %	5,2 %	5,3 %
Operational costs	-0,8%	-1,6%	-1,0%	-0,8%	-1,1 %	-1,2 %	-1,1 %	-1,1 %
Net income return	2,8%	2,9%	3,5%	4,3%	4,1 %	4,0 %	4,0 %	4,2 %
Capital return	7,0%	15,1%	15,5%	8,5%	2,2 %	2,0 %	0,8 %	-0,6 %
Income taxes	-0,1%	-0,1%	0,0%	0,0%	-0,5 %	-0,4 %	-0,3 %	-1,0 %
Latent taxes	-1,5%	-0,7%	0,0%	0,0%	-0,5 %	-0,4 %	0,0 %	0,9 %
Result before financing	7,9%	17,1%	19,1%	12,7%	5,4 %	5,3 %	4,5 %	3,5 %
Total result (in €)	9,5%	21,2%	24,6%	16,8%	6,1 %	5,9 %	5,0 %	3,7 %
Currency exchange	0,2%	0,1%	0,2%	0,2%	-0,2 %	-0,2 %	0,1 %	0,2 %
BVI-return	8,1%	20,3%	19,4%	12,1%	3,8 %	3,6 %	3,1 %	2,2 %

Return development	Deka Immobilien Global				WestInvest InterSelect			
	2019	2018	2017	2016	2019	2018	2017	2016
Gross income	5,0%	5,0%	6,0%	6,0%	5,0 %	5,1 %	5,4 %	5,8 %
Operational costs	-1,0%	-1,0%	-2,0%	-1,0%	-1,5 %	-1,4 %	-1,7 %	-1,2 %
Net income return	3,0%	4,0%	4,0%	4,0%	3,5 %	3,6 %	3,8 %	4,6 %
Capital return	1,0%	0,0%	0,0%	0,0%	1,6 %	0,3 %	-1,0 %	-1,2 %
Income taxes	0,0%	-1,0%	0,0%	0,0%	-0,3 %	-0,2 %	-0,8 %	-0,4 %
Latent taxes	0,0%	0,0%	0,0%	0,0%	-0,5 %	-0,2 %	0,7 %	-0,1 %
Result before financing	4,0%	3,0%	4,0%	4,0%	4,3 %	3,5 %	2,7 %	2,9 %
Total result (in €)	4,0%	3,0%	3,0%	4,0%	5,0 %	4,0 %	3,1 %	3,2 %
Currency exchange	0,0%	0,0%	0,0%	0,0%	-0,2 %	-0,1 %	0,0 %	0,1 %
BVI-return	2,0%	2,0%	2,0%	2,0%	3,2 %	2,5 %	2,0 %	2,0 %

Return development	DWS grundbesitz europa				DWS grundbesitz global			
	2019	2018	2017	2016	2019	2018	2017	2016
Gross income	5,3%	5,3%	5,4%	5,4%	5,80%	6,10%	5,80%	5,50%
Operational costs	-1,6%	-0,4%	-1,0%	-0,6%	-3,60%	-1,80%	-1,00%	-1,40%
Net income return	3,7%	4,8%	4,4%	4,8%	2,20%	4,30%	4,80%	4,00%
Capital return	1,3%	0,8%	1,3%	0,6%	4,30%	0,40%	0,30%	1,30%
Income taxes	-0,7%	-0,5%	-0,4%	-0,6%	-0,20%	-0,80%	-0,80%	-1,40%
Latent taxes	-0,4%	-0,5%	-0,3%	-0,3%	-1,40%	0,90%	-0,10%	0,50%
Result before financing	5,1%	5,3%	5,4%	5,3%	5,60%	5,70%	5,70%	6,90%
Total result (in €)	4,2%	4,9%	5,2%	4,7%	4,40%	3,80%	4,10%	4,00%
Currency exchange	2,8%	0,5%	1,0%	1,8%	0,70%	1,40%	0,30%	0,80%
BVI-return	3,7%	2,7%	3,1%	2,5%	2,60%	2,10%	1,70%	2,10%

Return development	CommertReal HausInvest				Unilmmo Deutschland			
	2019	2018	2017	2016	2019	2018	2017	2016
Gross income	5,6%	5,7%	5,9%	6,3%	5,40%	5,30%	4,80%	5,70%
Operational costs	-1,9%	-1,9%	-1,9%	-0,2%	-1,30%	-1,00%	-0,70%	-1,30%
Net income return	3,6%	3,7%	4,0%	4,4%	4,10%	4,30%	4,20%	4,40%
Capital return	2,0%	1,2%	1,1%	0,0%	1,50%	1,30%	1,60%	0,90%
Income taxes	-0,5%	-0,5%	-0,4%	-0,8%	0,00%	-0,10%	-0,10%	-0,10%
Latent taxes	-0,4%	0,0%	-0,3%	0,6%	-0,50%	-0,60%	-0,50%	0,20%
Result before financing	4,7%	4,6%	4,4%	4,2%	5,00%	4,80%	5,20%	5,40%
Total result (in €)	4,2%	4,2%	4,2%	4,1%	4,90%	4,80%	5,20%	5,00%
Currency exchange	-0,2%	-0,1%	0,1%	0,3%	0,00%	0,10%	0,00%	0,40%
BVI-return	3,1%	2,1%	2,1%	2,5%	2,80%	2,80%	3,00%	2,80%

Return development	Unilmmo Europa				Unilmmo Global			
	2019	2018	2017	2016	2019	2018	2017	2016
Gross income	6,1%	6,0%	5,7%	5,2%	6,10%	6,80%	6,70%	6,80%
Operational costs	-1,2%	-1,6%	-1,6%	-1,4%	-1,90%	-2,20%	-1,60%	-1,70%
Net income return	4,9%	4,4%	4,4%	3,8%	4,20%	4,60%	5,20%	5,10%
Capital return	1,0%	0,8%	0,8%	0,6%	1,30%	0,00%	0,10%	0,90%
Income taxes	-0,4%	-0,2%	-0,2%	-0,8%	-0,10%	0,00%	-0,30%	-0,30%
Latent taxes	-0,7%	-0,2%	-0,2%	0,5%	-0,60%	-0,10%	-0,20%	-0,70%
Result before financing	4,8%	4,8%	4,5%	4,1%	4,80%	4,60%	4,70%	5,00%
Total result (in €)	4,2%	4,6%	4,4%	4,2%	3,90%	4,00%	4,40%	5,00%
Currency exchange	0,6%	-0,3%	-0,1%	0,9%	0,00%	0,00%	0,30%	0,40%
BVI-return	2,5%	2,6%	2,6%	2,6%	2,00%	2,10%	2,40%	2,80%