WHAT DRIVES REIT RETURNS?

By Simone van Ee

Final version January 18, 2019

Abstract REITs are a hybrid security with some features of stocks, bonds, and real estate. On the one hand they are traded on common stock exchanges, but on the other hand, the relatively stable cash flow has a more similar appearance to the cash flow from bonds. Lastly, the underlying asset is real estate. Hence, the hybrid nature of REITs, questions their role as a diversifier in a mixed-asset portfolio. The debate regarding how REITs should be priced is still continuing. This paper addresses those issues by determining what drives REIT stock returns. Recently, Fama and French published a new asset pricing model for pricing common stocks. This five factor model uses a market, size, value, profitability and investment factor to explain stock returns. The aim of this study is to examine whether this five-factor model of Fama-French, in combination with a real estate factor, explains REIT stock returns as well. In order to accomplish that the monthly returns of all US equity REITs are analyzed over the period of 1997-2017. The value-weighted portfolio of equity REIT returns is specified as a linear function of the Fama-French five factors with a direct real estate factor. The regression results indicate that REIT returns are related to the market, size, value, and profitability factor of the common stock market factors. However, there proves to be no relationship with the investment factor and the direct real estate factor. Therefore, this study concludes that REITs are a unique asset class. It provides evidence that REITs cannot be priced entirely similar as common stocks, not to mention the fact that the role of direct real estate is completely negligible. This study provides implications for portfolio management. It may support portfolio allocation decisions, for instance tilt the portfolio towards the highest yielding factors.

Keywords – Hybrid security; REIT pricing; Fama-French five-factor model; real estate factor

University of Groningen
Faculty of Spatial Sciences
MSc Real Estate Studies
Master thesis

Colophon

Document: Master thesis Real Estate Studies

Title: What drives REIT returns?

Author: Simone van Ee

Student number: S3026922

Mail address: s.van.ee.1@student.rug.nl

First supervisor: Dr. F. (Frans) Sijtsma

Second supervisor: Dr. X. (Xiaolong) Liu

Date: January 18, 2019

Word count: 13661

The University of Groningen, Faculty of spatial sciences, MSc Real Estate Studies

Content

Colophon 2
1. Introduction 4
2. Literature review 6
2.1 Introduction Fama-French asset pricing model for REIT pricing 6
2.2 CAPM and three-factor model for REIT pricing 7
2.3 Stocks, bonds, and real estate index in REIT pricing 8
2.4 Relationship REIT returns and direct real estate returns 9
2.5 The five-factor model 10
3. Methodology 10
4. Data and summary statistics 12
4.1 Independent variables 12
4.2 Dependent variables 14
4.3 Portfolio construction 15
4.4 Performance per property sector 16
5. Results 18
5.1 Main results 18
5.2 Regression models over a small-cap, mid-cap, and large-cap REIT portfolios 22
5.3 Robustness check 23
6. Discussion 25
6.1 Answer research question 25
6.2 Results in the light of earlier studies 25
7. Conclusion 27
7.1 Summarising and concluding 27
7.2 Limitations of the current study and recommendations for future research 28
References 30
Appendix 33
Appendix A. Correlation matrix on a quarterly level 33
Appendix B. Factor sensitivities from regression on quarterly level 33
Appendix C. Regression models over small, mid and large-cap portfolio 34

1. Introduction

Over the past decade, the market for real estate investment trusts (REITs) has grown tremendously. The total market capitalization of the U.S. REITs broke the 1 trillion dollars mark in 2016 (The New York Times, 2016), while in 1986 the total capitalization was still below 10 billion dollars (Nareit, 2018). Figure 1 illustrates the recent explosive growth by the total amount of dividends paid to investors. The enormous growth indicates that REITs have become a popular investment vehicle. However, the role of REITs in a mixed-asset portfolio is still debated (Anderson, et al., 2005; Clayton and Mackinnon, 2003). REITs are a hybrid security with some features of stocks, bonds, and real estate. Predominantly REITs are viewed as stocks, because the stocks are traded on the stock exchanges: NYSE, ASE, and NASDAQ (Peterson and Hsieh, 1997). In spite of that, previous research showed that REITs behave differently than common stocks (Wang, Erickson and Chang, 1995). In several studies, REITs are even excluded, which might be attributable to their special requirements and features (Fama and French, 1993). Furthermore, the cash flow of REITs has a more similar appearance to the cash flow from bonds rather than those from stocks. Because of the high dividend payout ratio and the of the long-term fixed lease, the cash flow is relatively stable (Chan, Erickson and Wang, 2002). Last, REITs are classified as real estate, on the grounds that 75% of its income must be received from real estate related activities. All things considered, the hybrid nature of REITs questions how REITs should be priced and what is their role in a mixed-asset portfolio.

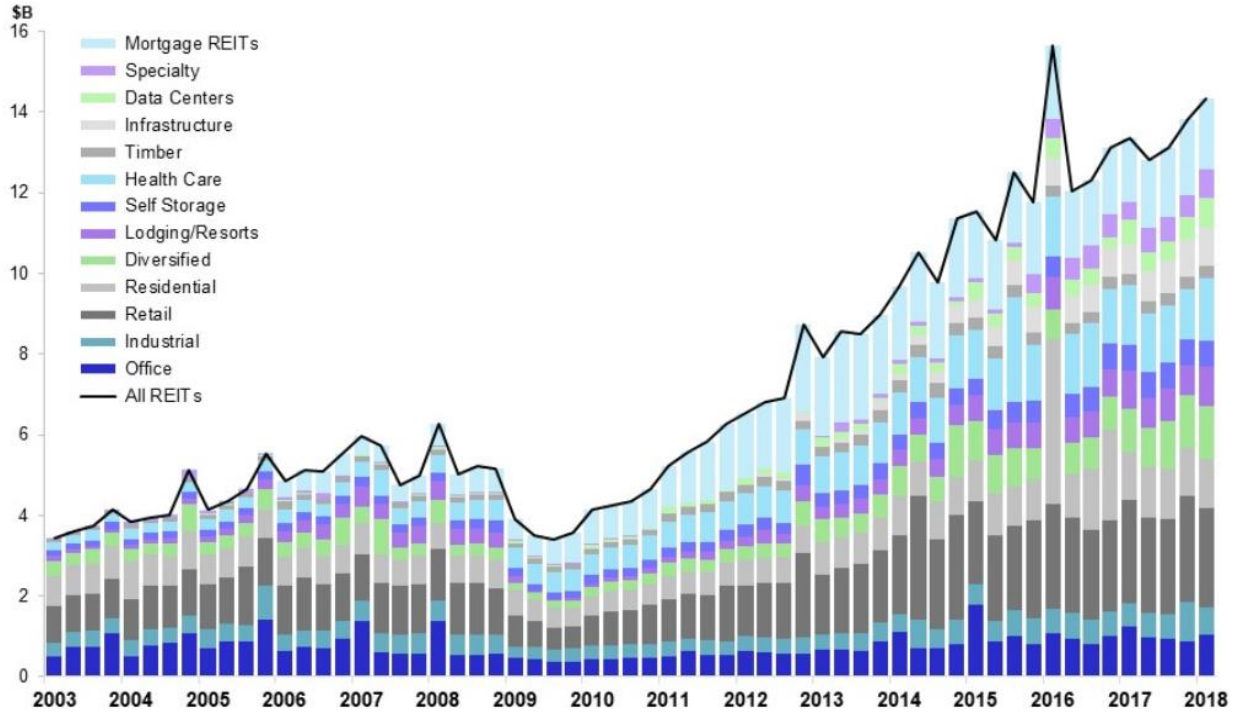

Figure 1 Dividends paid by all listed US REITs, source NAREIT (2018)

The pricing of this special asset class is, therefore, a frequently discussed topic. An extensive body of literature reveals that common stock factors drive REIT returns. Peterson and Hsieh (1997) demonstrate that the Fama and French three risk factors for common stocks; market, size, and value-factor can drive US REIT stock returns. Serrano and Hoesli (2007) reported also a significant contribution of all three common stock market factors in US EREIT returns. Coskun, Selkuc-Kestel, and Yilmaz (2017) confirm this relationship as well for the Turkish REIT stocks. Another avenue reported that common bond factor can explain REIT returns. Peterson and Hsieh (1997) observe that mortgage REIT returns, unlike equity REIT returns, are significantly related to common bond factor. Later, Clayton and Mackinnon (2003) identify that bonds only contribute to a minor part in explaining REIT returns. However, Anderson et al. (2005) discover that the part of a bond factor in explaining REIT returns is neglectable. The last stream of research focusses on the fundamental link among private unsecuritized income producing property and REITs returns. Liu and Mei (1992) conclude a strong relationship with direct real estate. Corgel, McIntosch, and Ott (1995) discovered that there is only a minor connection between private unsecuritized real estate and REITs. By contrast, Seiler, Webb, and Meyer (2001) showed that unsecuritized and securitized real estate have different properties and therefore states no connection. On the other hand, Clayton and Mackinnon (2001) conclude that since 1990 REITs exhibit a strong link to direct real estate. The strength of the link is cyclic, stronger in the downturns. Two years later, Clayton and Mackinnon (2003) state the same although they illustrate that the importance of direct real estate in explaining REIT returns drops considerably in 1998. Subsequently, Anderson et. al. (2005) state that on a monthly level direct real estate is only a minor contributor for REIT pricing. Serrano and Hoesli (2007) show that in 1990 REITs became more linked with direct real estate, however they state that this is not generalized tendency but rather a result of the real estate cycle. Pavlov and Wachter (2011) discover a statistically significant relationship of direct real estate with REIT returns only for the office sector. Oikarinen, Hoesli, and Serrano (2011), and Boudry et al. (2011) present evidence of the cointegration of REIT returns with direct real estate, especially over the long run. Coupled with that, Hoesli and Oikarinen (2012) prove in their study that the long run REIT stock performance is far more closely related to direct real estate than to the common stock market. In short, the previously reviewed papers show without doubt that equity REIT returns have a strong relationship with the three common stock market factors, but that bond market factors are negligible in REIT pricing. However, there appears to be no consensus concerning the relationship of REIT returns with direct real estate.

Altogether, the debate regarding how REITs should be priced and their role in a multi-asset portfolio is still continuing. Recently, Fama and French published a new asset pricing model to price common stock returns, the five-factor model. This model builds upon the traditional capital asset pricing model (CAPM) and their own well-known three-factor model by adding a profitability and investment factor. Although numerous studies examined the applicability of the Fama-French three-factor model for the REIT sector, none of these studies analyzed the applicability of the recently published five-factor model

on REIT returns. Therefore, the objective of this study is to contribute to this gap in the literature to be the first research which gives insight into the performance of the Fama-French five-factor model in REIT pricing. The five-factor model might be a decent candidate for explaining the REIT stock returns because REIT stocks are traded on the stock exchange. This indicates that it is likely that the same factors will influence both general and REIT stocks to a greater or lesser extent (Peterson and Hsieh, 1997). In addition to that, the literature concerning direct real estate as a driver of REIT returns is inconclusive. Considering that the underlying asset of REITs predominantly consists of real estate, it is reasonable that REIT returns follow direct real estate returns. Therefore the other objective of this study is examining whether direct real estate returns drives REIT stock returns as well. This research attempts to determine the appropriateness of the Fama French five-factor model with a real estate factor in explaining past REIT returns. Moreover, the performance of the REITs per property sector is examined as well. It is of great importance for investors to understand the investment characteristics of REITs, especially in light of the recently increased popularity of REIT investing. The findings could help investors to manage the risk exposure better. With the findings, the approach of factor investing may be utilized. Factor investing allows the investor to tilt the portfolio towards the highest yielding factors. Further, the outcomes of this study attempt to support the debate with regard to REIT pricing and the role of this unique asset in a mixed-asset portfolio. Does the hybrid REIT provide exposure to direct real estate, bonds or simply stocks? How can REITs be used as a diversifier and what can it substitute in a portfolio? These are important questions for investors who wish to enter the REIT investment market.
To support a beginning of answering all these important questions, the main research question answered in this current study is: does the Fama-French five-factor model with a real estate factor explain REIT returns better than the Fama-French three Factor model?

The remainder of this paper is organized as follows: the next section reviews existing literature regarding REIT pricing. Section 3 describes the methodology and section 4 the data and summary statistics. Section 5 presents the empirical results. Section 6 discusses the results in the light of existing literature. Finally, section 7 concludes.

2. Literature review

2.1 Introduction Fama-French asset pricing model for REIT pricing

The rise in popularity of REITs as an investment opportunity ensured that it became a widely investigated topic. Numerous studies explored the features and components of REIT returns. REITs are publicity traded, have long-term fixed lease contracts and the underlying asset of real estate, by virtue they are viewed as a hybrid asset with features of stocks, bonds, and real estate. Although REIT stocks are publicity traded on common stock exchanges, Fama-French excluded REITs in their studies. Beyond

that, several studies even showed that REIT stocks behave differently than common stocks. Nevertheless, on the grounds that REITs are still stocks, it is not bizarre for one to reason that the same factors that influence common stocks will affect REIT stocks as well.

To offer an illustration of the function of the Fama-French asset pricing model in the light of REIT pricing, we will started with a short description of this model. The basis of the Fama-French model is the traditional capital asset pricing model (CAPM). CAPM was the first asset pricing model that relates the return of an asset to the return of the market as a whole (market factor). The model describes the relationship among the systematic risk and expected return of stocks. CAPM is based on the idea that investors need compensation for the time value of money and the risk. The Fama-French three-factor asset pricing model built upon CAPM, by adding a size and value factor (Randl, 2017). They show that small-cap firms tend to be riskier because they do not have the possessions as larger firms which makes them more vulnerable in bad times. The third factor is the value factor. Chiu, Titman, and Wei (2003) show that the value factor, measured by the book-to-market ratio, differs between companies because of their differences in growth opportunities, management quality, intangible assets or it has to do with over and undervaluation due to investors bias. The differences in growth opportunities or intangible assets are not contributing to REITs performance. Hence it is likely that inconsistency in book-to-market has to do with the management quality or over and undervaluation.

2.2 CAPM and three-factor model for REIT pricing

Existing literature already supports the idea of superiority of the three-factor model over CAPM in REIT pricing (Chiang, Lee, and Wisen, 2004; Chiang, Lee and Wisen, 2005; and Coskun, Selcuk-Kestel and Yilmaz, 2017). First, Chiang, Lee and Wisen (2004) state that the omission of the capitalization factor and the book-to-price factor could mislead investors if they estimate REITs risks and returns. In a later study Chiang, Lee and Wisen (2005) show that when the size and value factor are not included, the market beta for REITs will be incorrectly measured. Therewith they provide evidence against studies that show a decline in the market beta over time, they show the beta remains unchanged over the period of 1972-2002. Last, Coskun, Selcuk-Kestel and Yilmaz (2017) state the superior performance of the three-factor model on capturing the variation of Turkish REIT returns as well.

Several earlier studies also explored the drivers of REIT returns, typically with the use of the three-factor asset pricing model in combination with additional factors (Dempsey et al., 2012; and Peterson and Hsieh, 1997). First, Dempsey et al. (2012) investigated the pricing implementations of firm disclosure opacity measured by the readability of annual reports. The REITs excess return is regressed against the Fama-French factors and a residual for annual report opacity. They found that financial opacity is negatively related to the company's performance and report opacity has incremental explanatory power for REIT returns beyond the Fama- French factors. Second, Peterson and Hsieh

(1997) examine the pricing and the performance of REITs using the Fama-French three-factor model and two common bond market factors. For the bond market factors, they use proxies for unexpected changes in interest rates and shifts in the probability of default. They signal that mortgage REITs, in contrast to equity REITs, are significantly related to all those factors. Equity REITs are only significantly related to the common stock market factors. Additionally, they indicate that when the single factor model is estimated, the overperformance of equity REITs turns out to be 0,41% per month and the underperformance of mortgage REITs turns out to be 0,15% per month. They apply another five-factor model. When their five-factor model is estimated they find an overperformance of 0,13 % per month for equity REITs and underperformance of 0,57% per month for mortgage REITs.

2.3 Stocks, bonds, and real estate index in REIT pricing

Further numerous prior studies address the topic of the hybrid nature of REITs. They examine the role of stocks, bonds and direct real state in REIT pricing (Anderson et. al, 2005; Clayton and Mackinnon, 2001; Clayton and Mackinnon, 2003; Hoesli and Oikarinen, 2012; Liu and Mei, 1992; and Serrano and Hoesli, 2007). Instead of decomposing the stocks into the Fama-French risk factors those studies concentrate on the total stock index. First, Anderson et. al. (2005) conduct a study where they attempt to explore the investment characteristics of equity REITs. They evaluate the linkages of REIT returns with small-cap value stocks, small-cap growth stocks and private real estate. They use a variance decomposition of REIT returns and a two-stage regression method. The study is unique in that they incorporate a real estate factor on a monthly basis. They construct their own real estate factor by the monthly share price premium to the net asset value. The results of the study of Anderson et al. (2005) reveal that on a monthly level private real estate returns proves to be neglectable in REIT pricing. Furthermore, they state that REITs became less like general stocks when the market has matured. Although accompanied by that, they emphasize that REITs became more like specific segments of the stock market, such as small-cap and value stocks. In addition, they state an increase of the unique sector-specific component in REITs over time.

Clayton and Mackinnon (2001) also examined the link of equity REIT returns to returns on other asset classes as unsecuritized real estate and financial assets. They used a multi-factor return generating approach. Their results reveal that since 1990 REITs do provide portfolios with some exposure to unsecuritized real estate, but the strength of the link is cyclical. The link with large-cap stocks has declined over time, and with small-cap increased. In a downturn, the link with small-cap stocks proves to be the strongest. In a later study, Clayton and Mackinnon (2003) focussed again on those linkages, yet they implement a variance decomposition for the REIT returns and they use a rolling two-stage regression method. Their results indicate again structural fluctuations over time. REIT stocks went from being driven by the same factors that drive large-cap stocks towards more driven by small-cap stocks and direct real estate since the “new” REIT era in 1990. Likewise, they show that especially small-cap

REITs are more like real estate. However, along with the structural changes there is also evidence of cyclical changes depending on the stage of the market. Additionally, they reveal that from 1998 the link of REIT returns with direct real estate incredibly dropped. Furthermore, they emphasize, in line with Anderson et al. (2005), that the proportion unexplained by those variables increases also over time. This singled out that REITs became more widespread. More recently, Hoesli and Oikarinen (2012) focus on long-term dynamics, using vector error-correction models to test whether REIT returns reflect direct real estate or common stock market factors. They prove that over the long run REIT stocks performance is far more closely related to direct real estate than to the common stock market. Then, Liu and Mei (1992) also concentrate on what determines the movements in expected excess returns for equity REITs. They reveal that REITs exhibit a strong relationship with small-cap stocks and private real estate.

Last, Serrano and Hoesli (2007) analyze the role of stocks, bonds, direct real estate, and the Fama-French factors in explaining and forecasting equity REIT returns. They compare four regression models and three forecast techniques. Overall the paper highlights the importance of the inclusion of the Fama-French factors. Nevertheless, the influences are remarkably volatile, before 1990 stock are dominant, while thereafter book-to-market and size factors prove to be dominant in REIT pricing. Broadly in line with Clayton and Mackinnon (2003), they present that in 1990 REITs became more linked with the direct real estate, however, they state that this is not a generalized tendency but rather a result of the real estate cycle. The influence of the real estate factors appears to be cyclic.

In other words, and to recap, the reviewed papers before all agree that since 1990 REIT returns exhibit a strong link with direct real estate returns on a quarterly level, while on a monthly level the relationship appears to be neglectable. Moreover, the relationship depends on the stage of the market. Further, there is consensus on that REIT returns went from being driven by large-cap stock factors, towards small-cap stocks factors. Bond factors prove to play only a role in mortgage REITs pricing.

2.4 Relationship REIT returns and direct real estate returns

By the reason that most of their income must be generated from the underlying assets of real estate, considerable attention has also been devoted to the relationship among REITs and direct real estate returns (Boudry et al., 2011; Oikarinen, Hoesli and Serrano, 2011; Pavlov and Wachter, 2011; and Seiler, Webb and Myer, 2001). First, Boudry et al. (2011) use the data of the NCREIF transaction based index. With a cointegration framework, they discover robust evidence of a relation between REITs and direct real estate. Oikarinen, Hoesli, and Serrano (2011) claim to be the first that uses the transaction based NCREIF index instead of the appraisal based index. Their results reveal also a cointegration. Pavlov and Wachter (2011) evaluated the strength of the relation between REITs and private real estate. They compute the direct real estate return using shadow portfolios. Unlike the other studies, they prove only in the case of the office sector that REITs provides exposure to direct real estate. Seiler, Webb, and

Myer (2001) explored whether private real estate portfolios can be rebalanced or diversified using equity REITs. The outcomes can be seen as quite striking. The authors state that if institutional investors wish to hold equity REIT stocks they should do that for other reasons than rebalancing or diversifying purposes. When they compared both asset classes, they found that private and public real estate have dissimilar properties. To summarize, existing literature indicates that ideas, regarding the relationship of direct real estate returns and REIT returns, are diverging. Of interest to the current study, therefore, is to verify whether direct real estate returns explain REITs returns, especially in combination with the common stock market factors.

2.5 The five-factor model

Recently, Fama and French (2015) added two additional factors to their widely recognized three-factor model for the pricing of common stocks; the profitability factor and investment factor. The inclusion of those factors originates from the valuation theory which states that expected returns are related to book-to-market ratio, expected profitability and expected investment. In an earlier study Fama and French (2005) indicate that with the manipulation of the dividend discount model interesting predictions can be made: First, a high book-to-market ratio implies a high return. Second, high expected earnings relative to current book equity imply a high return. Third, high expected growth in book equity due to reinvestment of earnings implies a lower expected return. In their paper, they show that the predictions are confirmed for ordinary common equity stocks from CRSP. Although REIT stocks are no ordinary common stocks, it is still likely that those predictions of the valuation theory will also apply to them. None of the studies reviewed before investigated the role of the profitability and investment factor in REIT pricing. Hence, the objective of the current study is to explore the suitability of the Fama-French five-factor model in combination with a real estate factor in REIT pricing.

3. Methodology

On the ground that REIT stocks trade on the stock exchange, it is plausible that common stock market factors affect REIT stocks as well. In order to test whether common stock market factors do determine REIT stock returns the Fama-French method is applied (Fama and French, 2015). The equity REIT portfolio excess return, R_{REIT}, is specified as a linear function of the Fama-French five factors (FF5FM):

$$R_{REIT} = \alpha + \beta_1 r_{MRKT} + \beta_2 r_{SMB} + \beta_3 r_{HML} + \beta_4 r_{RMW} + \beta_5 r_{CMA} + \varepsilon \quad (1)$$

where r_{MRKT} is the excess return on the market, $r_{SMB\ is}$ the return small minus big market capitalization, r_{HML} is the return high minus low price-to-book ratio, r_{RMW} is the return robust minus weak profitability, r_{CMA} is the return conservative minus aggressive investment strategy. Prior studies already supported the

superiority of the three-factor model over CAPM in REIT pricing. Nevertheless, for comparison purposes, the Capital Asset Pricing model of Sharpe in 1964 (formula 2 below) and The Fama-French three-factor model from 1997 (formula 3) are also estimated:

$$R_{REIT} = \alpha + \beta_1 r_{MRKT} + \varepsilon \quad (2)$$

$$R_{REIT} = \alpha + \beta_1 r_{MRKT} + \beta_2 r_{SMB} + \beta_3 r_{HML} + \varepsilon \quad (3)$$

REITs are companies that derive most of their income from real estate assets. Hence, it is reasonable that REIT stock returns move with the underlying real estate assets (Anderson et al., 2005). In order to test whether REITs returns follow direct real estate returns, R_{REIT} is also specified as a linear function of the Fama-French five factors including a real estate factor:

$$R_{REIT} = \alpha + \beta_1 r_{MRKT} + \beta_2 r_{SMB} + \beta_3 r_{HML} + \beta_4 r_{RMW} + \beta_5 r_{CMA} + \beta_6 r_{RE} + \varepsilon \quad (4)$$

where r_{RE} is the direct real estate factor. This study only focusses on stocks and direct real estate, it excludes bonds. The past behavior of the factors is studied through the betas. The same approach is utilized as in the paper from Peterson and Hsieh (1997), namely that the betas in all models are estimated using an ordinary least squares (OLS) regression. In the regression, the dependent and independent variables are all risk premiums. A further explanation of the independent variables is showed in table 1.

Table 1. Description of the factors (Fama and French, 2018)

Symbol	Variable	Description
MRKT	Market factor	Excess return on the market, calculated by the value-weighted return on all stocks minus the one-month Treasury bill rate
SMB	Size factor	Companies size measured by the market capitalization, calculated as the average of the return of three small stock portfolios minus the average of the return on three big stock portfolios
HML	Value factor	Is the average return of two portfolios with value stocks (high book-to-market ratio) minus the average return of two portfolios with growth stocks (low book-to-market ratio).
RMW	Profitability factor	Is the average return on two robust operating profitability portfolios minus the average return on two weak operating profitability portfolios
CMA	Investment factor	Is the average return on two conservative investment portfolios minus average return on two aggressive investment portfolios
RE	Real Estate factor	Direct real estate benchmark, the de-lagged excess NCREIF return

The regressions are run for the period of 1997 to 2017. To identify the "best" model from the four alternative models, the R-squared is a useful measure (Wilson, Keating, & Hodges, 2012). The R-squared denotes the variation in the dependent variable that is explained by the independent variables together in the model. However, the R-squared will always increase when new independent variables are added to the model, regardless of whether the independent variables are relevant (Wilson, Keating, & Hodges, 2012). Therefore, similar as in the study of Peterson and Hsieh (1997), this study will focus on the adjusted R-squared. The adjusted R-squared takes into account the number of independent variables in the regression model (Wilson, Keating, & Hodges, 2012). The adjusted R-square only increases if the new variable enhances the model above what would have been expected by chance and it can also decrease when poor quality variables are added (Venhorst, 2016). In addition to that, it is typically the intention to have the simplest regression model which includes only relevant independent variables. Which variables are characterized as relevant for the model is depending on the statistical contribution to the model and the theoretical relevance (Venhorst, 2016). After this, the robustness of the results is determined by a robustness test. For the robustness test, the entire research period is divided into sub-periods. These sub-periods have been examined to see if the results remain the same.

4. Data and summary statistics

4.1 Independent variables

The independent variables in the regressions are the Fama-French factors. These factors are downloaded from the Kenneth R. French Data Library. Fama-French constructed their factors on the basis of value-weighted portfolios of a range of characteristics, including all CRSP firms incorporated in the US and listed on the NYSE, AMEX or NASDAQ. They include only ordinary common equity stocks (as classified by CRSP), they exclude ADRs, REITs, and units of beneficial interest. The factors are downloaded on a monthly basis for the period of 1997 to 2017. Also, the risk-free rate, the one-month Treasury bill rate, is downloaded from the Kenneth French Data Library. Table 2 displays the correlation matrix of the independent variables. The correlation coefficients are relatively low, between -0,49 and 0,64. For the quarterly data with the real estate factor, the correlation coefficient is between -0,29 and 0,71 (Appendix A). This indicates that there exists no multicollinearity among the independent variables. Therefore the regressions are executed without transformation of the variables.

Table 2. Correlation matrix

	MRKT	SMB	HML	RMW	CMA
MRKT	1				
SMB	0,22	1,00			
HML	-0,14	-0,08	1,00		
RMW	-0,49	-0,49	0,44	1,00	
CMA	-0,34	0,00	0,64	0,31	1,00

Table 3 contains the summary statistics of the independent and dependent variables. The average risk premiums of the Fama-French factors over the entire period vary between 0,20% and 0,60% per month. The first factor is the market factor, it defines the average excess return on the market. The market factor is the highest factor, in particular in the second sub-period.

The second factor is the size factor, it specifies the outperformance of small-size companies. Especially in the first sub-period, the outperformance is substantial. In the second period, the size factor is small. This might be a consequence of the financial crisis. In periods of economic distress smaller companies might have to cope with liquidity issues earlier than the larger ones. Therefore they are forced to sell at low prices, which might result in lower returns.

The third factor is the value factor, it specifies the outperformance of value stocks. Value stocks are regularly traded below what they are actually worth. A reason for the outperformance of value stocks is, therefore, that because they are traded below what they actually worth, they are expected to provide superior returns in the future (Randl, 2017). Alternatively, Fama and French state that the outperformance of value stocks can be assigned to the presence of risk factors such as default risk (Randl, 2017). Fama and French (1993) reveal that low book-to-market is a feature of growth stocks and high book-to-market is a feature of value stocks. They state "the low-E/P stocks have the low average returns typical of (low-BE/ME) growth stocks, while high-E/P stocks have the high average returns associated with distress (high-BE/ME) (Fama and French, 1993, p. 50). In a later study, they state "that the value premium is compensation for risk missed by the capital asset pricing model (CAPM)" (Fama and French, 1997, p.1). Consistent with Fama-French, Chen and Zang (1998) suggest that value stocks are inexpensive for a reason, the past earnings are depressed and the earnings in the future are uncertain. Table 3 demonstrates that the average of the value factor over the entire period of 0,20 per month. The negative sign of the value factor implies the outperformance of growth stocks during that period. Yamani and Swansonc (2014) show that during a crisis investors tend to rush to quality and liquidity. Consequently, they removed, according to Fama-French, the high risk (value stocks) and replaced them with lower risk (growth stocks). Growth stocks are more favorable during periods of economic uncertainty, thus generating higher returns which is confirmed by the negative sign (table 3).

The fourth factor is the profitability factor, it specifies the outperformance of high profitabilite firms. Table 3 shows that the profitability factor remains roughly the same over both sub-periods.

The fifth factor is the investment factor, it specifies the outperformance of companies with a conservative investment strategy (Fama and French, 2018). The investment factor is high in the first period and extremely small in the second period. This indicates that in the second period there is almost no outperformance of the companies with a conservative investment strategy opposed to the ones with an aggressive strategy.

Table 3. Summary statistics for the factors and the portfolios, on a monthly basis

	Full Sample		Sub-periods			
	1997-2017		1997-2006		2007-2017	
	Mean	SD	Mean	SD	Mean	SD
Mean and standard deviation of the explanatory variables						
MRKT	0,60	4,46	0,46	4,61	0,73	4,34
SMB	0,23	3,23	0,39	3,96	0,09	2,40
HML	0,20	3,19	0,59	3,62	-0,16	2,71
RMW	0,32	2,92	0,33	3,88	0,32	1,63
CMA	0,25	2,19	0,51	2,79	0,01	1,44
RE *	2,06	4,84	2,58	4,32	1,60	5,23
Mean and standard deviation of the dependent variables						
Total portfolio	1,01	3,55	1,04	3,03	0,98	3,98
Small-cap	0,88	3,14	1,00	2,98	0,78	3,29
Mid-cap	1,24	5,61	1,17	3,85	1,30	6,84
Large-cap	0,73	5,42	0,73	6,95	0,74	3,53

* Real estate factor is on a quarterly basis

Beyond the Fama-French factors, another independent variable is a real estate factor. As proposed by most of the reviewed studies before, the NCREIF property index is used for the direct real estate factor. The NCREIF property index is a quarterly index. The index is a composite which includes apartments, hotel, industrial, office, and retail properties. A serious limitation of the index is that it lags "true" market returns because appraisals do not happen continuously (Boudry et. al., 2011; Clayton and Mackinnon, 2001; Clayton and Mackinnon, 2003; and Oikarinen, Hoesli, and Serrano, 2011). This greatly affects the precision of the returns and the usefulness. Therefore, equivalent as in their studies, this paper uses the de-lagged or unsmoothed version of the NCREIF, the transaction based index (TBI). The NCREIF TBI index is downloaded from the Thomson Reuters DataStream database. Table 3 provides the mean and standard deviation of the NCREIF excess return over time. Throughout the entire period, the NCREIF has an average quarterly return of 2,06% with a standard deviation of 4,82. The average excess return of the NCREIF index is in the first period substantial higher than in the more recent period.

4.2 Dependent variables

The dependent variable in the regression is the risk premium of the portfolio with all US equity REITs. As proposed by most of the reviewed papers before, the focus is solely on equity REITs. It is worthwhile to concentrate only on equity REITs considering that mortgage REITs earn their income from interest on mortgages, in contrast to equity REITs earning their income from rents. This might result in the fact that the returns might also be driven by other factors. Hybrid REITs consist of both equity and mortgage REITs and are for that reason also excluded from the portfolio. This is broadly in line with Peterson and Hsieh (1997) who prove that mortgage REIT returns, on the contrary to equity REIT returns, are driven

by bond factors. The REIT data is collected from the Thomson Reuter DataStream database. From the Thomson Reuters dataset the end of the month closing prices, monthly market values, the names, and a brief description of their portfolio of the several REITs are downloaded for all US REITs. The data is collected for the period of 1997 to 2017. The monthly data is in the currency of US Dollars.

4.3 Portfolio construction

From the downloaded data, all REITs that had no values for the end of the month prices, dividend of the market capitalization over the entire time period, are excluded. Then the data was filtered on only equity REITs based on the description of the REITs: mortgage and hybrid REITs are excluded. To overcome survivorship bias all REITs are included in the portfolio, even when they emerged later than 1997 or became a dead REITs before 2017. Without the inclusion of REITs that became "dead", the results might be biased due to overestimation of the return in the portfolio. As a consequence, the number of included REITs in the portfolio fluctuate over time (table 4). Table 4 shows that in 1997 the portfolio contained in total 323 REITs, while in 2017 the portfolio contained 1071 REITs.

Table 4. Number of REITs included in the portfolio each year

Year	Observations	Year	Observations	Year	Observations
1997	323	2004	591	2011	738
1998	380	2005	616	2012	809
1999	420	2006	629	2013	914
2000	424	2007	645	2014	956
2001	440	2008	680	2015	983
2002	475	2009	689	2016	1014
2003	538	2010	709	2017	1071

To construct the portfolio the returns are calculated from the end of the month prices. Dividends are included to calculate the total returns. REITs with a total return above thousand percent are excluded from the dataset, those returns are viewed as outliers. The value-weighted portfolio is constructed by multiplying each monthly total return with the monthly market value of that specific REIT, divided by the total sum of market values of all REITs that month. After this, the risk-free rate is subtracted to receive the portfolio with excess returns. Table 3 shows that the average excess return of the portfolio over the entire period is 1,01% per month. Figure 2 illustrates the development of the portfolio over time. In this graph, the pattern of the business cycle is clearly visible.

The REITs are also distinguished by the market capitalization for heterogeneity purposes. Three sub-portfolios are created; small-cap, mid-cap, and large-cap REITs by the classification of REITnotes. REITnotes state small-cap REITs have market capitalization values between three hundred million Dollar and two billion Dollar, mid-cap REITs have market capitalization values between two billion

Dollar and ten billion Dollar and large-cap REITs have a market capitalization value of more than ten billion Dollar (REITnotes, 2018). In order to establish the classification, all REITs are ranked on the average yearly market value and then assigned to one of the groups. For each group, the value-weighted portfolio is constructed in the same way as before.

Table 3 displays that the mid-cap portfolio has the highest excess return per month (the average over the entire research period), as well as the highest standard deviation. The large-cap portfolio has the lowest average excess return per month over the total period. Although if all years are considered separately, the portfolio with the highest average monthly excess return continuously changes over the different portfolios. The results of the small-cap, mid-cap, and large-cap portfolio in table 3 are roughly in agreement with the results of McIntosh, Liang and Tompkins (1991) and the results of Mueller (1998). McIntosh, Liang, and Tompkins (1991) did research into the small-firm effect within the REIT industry in the period of 1974 through 1988. They showed that in general investors could have earned greater returns by acquiring securities of smaller REITs compared to the larger ones, although they illustrate that this is not the case for all sub-periods separately. McIntosh, Liand and Tomkins (1991) also demonstrate that the highest average total excess return can be found the mid-cap portfolio, but then on a daily basis. Mueller (1998) did research into the size spectrum of REITs, and examined whether bigger is better. Mueller also concludes that investors might be better of buying smaller REITs compared to the giant ones. However, the smaller REITs must develop and acquire sufficient (100 to 200 million Dollars) new properties annually.

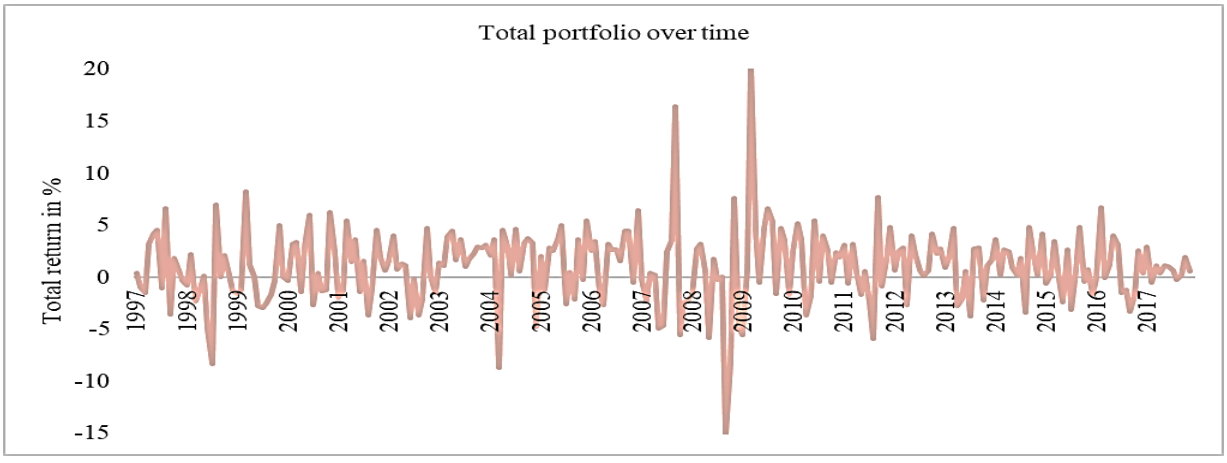

Figure 2 The development of the total value-weighted portfolio over time

4.4 Performance per property sector

Furthermore, the performance of each REIT by their specialization is also investigated. All REITs are classified into one of the twelve categories according to the classification of the National Association of Real Estate Investment Trusts (NAREIT). NAREIT presents the following categories: office, industrial, retail, lodging, residential, timberland, healthcare, self-storage, infrastructure, data centers, diversified

and specialty. Most categories are self-explaining. We add a few words to those who may be unclear. Timberland REITs are, despite that they concentrate on harvesting and selling timber respected as REITs. Infrastructure REITs include fiber cables, wireless infrastructure, telecommunications towers, and energy pipelines. Data centers REITs are products and services to help retain servers and data safe, including providing uninterruptible power supplies, air-cooled chillers, and physical security. Last, specialty REITs are for instance movie theatres, casinos, farmland, and outdoor advertising sites (Nareit, 2018). For each category again the value-weighted portfolio is constructed.

The performance of the REITs per property sector is displayed in table 5. The first column presents the number of REITs that are assigned to that specific category. Due to a lack of information, not all REITs could be classified. Table 5 demonstrates that most US REITs are focussing on residential property, retail property or have a diversified portfolio. Solely a few US REITs concentrate on infrastructure or timberland. Overall, the table displays that there are meaningful disparities across the sectors. The portfolios with REITs classified as data and infrastructure appear to have to highest average excess price return over the total period. Data and infrastructure are the most recently created REITs and might have the highest growth due to all technological developments. The sector lodging has a rather negative average price return, while all other sectors view moderate but positive price returns. The smallest volatility arises in office REITs. This seems to be against the general belief but it is caused by the fact that the demand for office space is correlated to the number of jobs and that the relatively long lease contracts might reduce the volatility. Furthermore, table 5 shows that the price return of most sectors was higher in the first period, most likely because in the later period, as a consequence of the financial crisis, returns fell. In sum, based on past performance of the returns investors can generate the highest returns by investing in data centers and infrastructure REITs. Although this is accompanied by the highest volatile. Therefore investors who are risk averse should invest in the office sector REITs. The findings of the performance of REITs per property sector are promising for investors for determining their investment opportunities, although it is widely recognized that historical performance does not provide any guarantees for future performance. Therefor a more refined approach using the Fama-French five-factor model in combination with a real estate factor, as sketched above, may prove to be of better or added guidance for investors in managing their portfolio. For which we now turn to the results.

Table 5. Excess price returns mean and standard deviation of the REITs per property sectors

		Full sample		Sub-periods			
		1997-2017		1997-2006		2007-2017	
Property sector	Ob	Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.
Data	20	1,32	8,97	1,03	9,36	1,57	8,65
Diversified	223	0,16	4,21	0,35	4,32	-0,01	4,11
Healthcare	75	0,14	5,29	0,09	4,06	0,19	6,21
Industrial	81	0,29	6,09	0,24	2,29	0,33	8,14
Infrastructure	11	1,67	12,57	2,50	17,32	0,91	5,38
Lodging	95	-0,08	5,86	-0,11	5,73	-0,06	6,00
Office	89	0,12	2,92	0,33	3,94	-0,07	1,45
Residential	188	0,06	3,45	0,24	3,09	-0,11	3,76
Retail	174	0,23	4,43	0,58	3,51	-0,09	5,12
Specialty	22	0,22	4,66	0,39	4,84	0,07	4,50
Storage	56	0,38	4,13	0,23	3,54	0,51	4,61
Timberland	10	0,32	6,57	0,44	6,61	0,22	6,56

5. Results

5.1 Main results

Table 6 reports the results of estimating the factor sensitivities in equations 1 to 4 over the period of 1997 to 2017. The regression results reported in the first three columns are on a monthly level and the regression results reported in column four are, because of a lack of real estate data on a monthly basis, on a quarterly level. Therefore, an important side note of table 6 is that the results of the first three columns are not fully comparable with the results of the fourth column, except for whether the coefficients are significant or not. Overall, table 6 shows a relatively high adjusted R-squared for all regression models, which indicates that a substantial part of the variation in the REIT returns is explained by the Fama-French factors.

Table 6 illustrates that the market factor already explains a significant portion of the total variance in the REIT portfolio, namely 39%. By adding the size and value factor the explanatory power rises considerably to 45%. The incremental explanatory power is attributable to the contribution of both the size and value factor to REIT pricing. This result ties well with previous studies of (Chiang, Lee, and Wisen, 2004; Chiang, Lee, and Wisen, 2005; Coskun, Selcuk-Kestel and Yilmaz, 2017; Peterson and Hsieh, 1997; and Serrano and Hoesli, 2007), who all state that the Fama-French three-factor model performs superior over the traditional capital asset pricing model in pricing of REIT stocks. When the profitability and investment factor are added, the explanatory power of the regression only slightly improves with approximately 1%. Those findings are in contrast to the findings from Fama-French (2015), who emphasize that adding the profitability and the investment factor result in a substantial improvement of the explaining power in the model for common stock returns. Altogether, based on only

the adjusted R-squared, the best model for pricing REIT stock returns on a monthly level would be the Fama-French five-factor model. Together the five factors explain approximately 46% of the variation in REIT returns.

Table 6. Factor sensitivities from regressions of total portfolio of equity REIT returns on CAPM, Fama-French three-factor and five-factor model (monthly) and five-factor model with a real estate factor (quarterly) over the period from 1997 to 2017

	Regression models			
	CAPM	FF3FM	FF5FM	FF5FM + RE
MRKT	0,50	0,49	0,54	0,46
	(12,55)***	(12,81)***	(11,79)***	(7,07)***
SMB		0,18	0,24	0,37
		(3,36)***	(3,93)***	(3,72)***
HML		0,26	0,18	0,21
		(4,86)***	(2,43)**	(2,91)**
RMW			0,18	0,12
			(2,15)**	(1,06)
CMA			0,04	-0,01
			(0,37)	(-0,10)
RE				-0,11
				(-1,22)
Intercept	0,71	0,62	0,53	1,99
	(4,01)***	(3,70)***	(3,04)***	(3,98)***
R2	0,39	0,46	0,47	0,61
Adj. R2	0,38	0,45	0,46	0,58
No. Obs.	251	251	251	84

*** p<0,01, ** p<0,05, * p<0,1

In the Appendix, the regression outcomes of all four models on the portfolio of equity REIT returns on a quarterly level can be found (Appendix B). Appendix B illustrates that the adjusted R-squared is 57,7% and 57,6% for the three-factor and five-factor model with a real estate factor, respectively. Accordingly, based on only the adjusted R-squared, the best model for pricing REIT stocks on a quarterly level would be the Fama-French three-factor model. Although the differences among all adjusted R-squared percentages are particularly small. Furthermore, it is generally important that the model only include relevant variables. Independent variables are considered relevant when they are essential in the model for theoretical reasons or they are supposed to statistically contribute to explaining the dependent variable. Hereafter the contribution of the factors to REIT pricing is described.

The first factor is the market factor. The market factor denotes the systematic or non-diversifiable risk. The coefficient of the market factor displays the sensitivity of the portfolio of REIT returns to the movements of the market as a whole. Table 6 shows that the coefficient is highly significant at a 1%

level. The significance of this coefficient indicates that the market factor contributes to explaining the variation in REIT returns. Additionally, the coefficient is the highest of all coefficients, ranging from 0,49 to 0,54. The second factor is the size factor, which represents the outperformance of small-cap stocks compared to the larger ones. The coefficient demonstrates the exposure to stocks that behave like small-cap stocks in the portfolio of REIT returns (Randl, 2017). In the various regression models, the slope on the size factor is also highly significant at a 1% level. The coefficient varies between 0,18 and 0,24, which indicates that the small-size effect is pronounced in the portfolio of equity REIT returns. The third factor is the value factor, which represents the outperformance of value firms (high book-to-market ratio) compared to the growth firms (low book-to-market ratio). The coefficient implies the sensitivity towards value stocks in the REIT portfolio. The slope on the value factor is also highly significant at a 1% level in the three-factor model and becomes slightly less significant for the five-factor model. The coefficient declines as well from 0,26 to 0,18. Although the positive and significant coefficient still indicates that the value factor contributes to REIT pricing. Altogether, consistent with earlier studies this study finds support for CAPM and the role of the size and value factor in REIT pricing.

The fourth factor is the profitability factor, it represents the outperformance of robust profitable firms. The coefficient indicates the exposure to robust profitable stocks in the portfolio of equity REIT returns. The slope on the profitability factor has a magnitude of 0,18 and it appears to be significant at a 5% level. This outcome extends existing REIT pricing literature by demonstrating that the profitability factor for common stock returns is also an important factor for REIT pricing. Since in the five-factor model the coefficient of the value factor declined and the significance reduced compared to the three-factor model, it suggest that the profitability effect was initially included in the value effect. This slightly corroborates with the results of Fama-French for the common stock returns, who state that the value factor becomes redundant in the five-factor model (Fama and French, 2015). The other recently added factor, the fifth factor, is the investment factor. The investment factor represents the outperformance of companies with a conservative investment strategy versus an aggressive one. The coefficient indicates the sensitivity towards stocks from firms with a conservative investment strategy in the portfolio of equity REIT returns. A striking observation is that the slope on the investment factor remains insignificant. Contrary to the results of Fama-French (2015) for the common stock returns, in the current study the investment factor of common stock returns appears to play no role in explaining the fluctuations of REIT returns.

In sum, on a monthly level, the positive and significant coefficients indicate that REIT returns have a positive relationship with the relative return to the market, the relative return to small capital stocks, the relative return to value stocks and the relative return to robust profitable stocks. The only exception is the investment factor, the insignificant coefficient entails that the investment factor does not contribute to explaining the variation in REIT returns.

The findings in the current study are not perfectly in line with the results of Fama-French (2015). The most remarkable difference between the current study and the study of Fama-French is the insignificant effect of the investment factor. It might be argued that this difference is attributable to the requirement of REITs, that they have to distribute 90% of their taxable income as dividends to their shareholders. This indicates that REITs, unlike other companies, need to rely on external capital such as debt or they have to issue new shares if they wish to invest. The investment strategies could, therefore, be completely different. The other discrepancy between the current study and the study of Fama-French is the considerable higher adjusted R-squared for the five-factor model in the study of Fama and French. This could be, among other things, assigned to the investment factor. Beyond that, it suggests that common stock returns and REIT stock returns behave differently. The fact that still a substantial part of the variation in REIT returns remained unexplained in the five-factor model compared to the regression of Fama-French on common stock returns, supports the conclusion that REITs cannot be priced or even classified fully as common stocks.

The last column of table 6 contains the results of the regression with a real estate factor on a quarterly basis. For the real estate factor, the excess return on the NCREIF transaction based index is used. A remarkable observation is that the coefficient of the real estate factor appears to be insignificant. This indicates that REIT returns do not reflect the performance of the direct real estate benchmark. In other words, the direct real estate factor is not a driver of REIT returns. Even though the coefficient is insignificant, a surprising observation is that the coefficient is even negative. When the real estate factor is included the sign and the significance of the other coefficients essentially remain the same, except for the coefficient of the profitability factor which becomes insignificant and the coefficient of the investment factor remain insignificant, but becomes negative.

The finding that direct real estate is not a driver of REIT returns is contrary to the findings of Seranno and Hoesli (2007), who showed that since 1990 REITs became more linked with direct real estate. However, they state that this is not a generalized tendency but rather a result of the real estate cycle. Seranno and Hoesli (2007) analyzed the past behavior of the betas of direct real estate and the Fama-French size and value factor by five-year rolling regressions over the period of 1978 to 2006. Therefore, the discrepancy in the findings might be a result of differences in the method and research period. Other studies also examined the role of a real estate factor in REIT returns but did that in combination with stock and bond indexes instead of the Fama-French factors. They used different data and a completely different method and therefore it is not surprising that the outcomes differ. The studies of (Lui and Mei, 1992; Clayton and Mackinnon, 2001; Boudry et al., 2011; Oikarinen, Hoesli, and Serrano, 2011) all found a relationship of direct real estate returns with REIT returns. Although the studies of (Anderson et., al, 2005; Clayton and Mackinnon, 2003; Corgel, McIntosh, and Ott, 1995; Pavlov and Wachter,

2011; and Seiler, Webb, and Myer, 2001) all suggest an only minor to no connection of direct real estate with REIT returns. To sum up, the outcomes of earlier studies concerning direct real estate returns as a driver of REIT returns are inconclusive.

To conclude, the highest adjusted R-squared on a monthly level is found for the five-factor model and on a quarterly level for the three-factor model. Normally the model with the highest adjusted R-squared will be a preferred model. Although, in this case, the differences among the percentages of variation explained are particularly small. Furthermore, a simple model that contains only statistically significant factors is preferred. The last added factors, the investment and real estate factor, appear to be insignificant in the REIT return model. Thus, up to this point, the most favorable model to price REIT stocks.

5.2 Regression models over a small-cap, mid-cap, and large-cap REIT portfolios

For heterogeneity purposes, the portfolio is also distinguished into a small-cap, mid-cap and large-cap portfolio based on the market values of all REITs. The results of the four regression models over the three different portfolios of REIT returns are showed in Appendix C. The table illustrates that the coefficient of the market factor remains highly significant over all three portfolios. The magnitude of the market factor coefficient is smallest in the small-cap portfolio and highest in the large cap-portfolio. This suggests that large-cap REIT returns are more sensitive to the movements of the market as a whole. Another observation is that the coefficient of the size factor becomes less significant in the mid-cap portfolio and even insignificant for the large-cap portfolio. This reveals that the small-size effect is more pronounced in smaller capitalization REITs and the small-size effect is even not present in large-cap REITs. The magnitude of the coefficient becomes also smaller and even negative for the large-cap portfolio. This is not surprising since the negative sign in the large-cap portfolio indicates that the portfolio consists predominantly of large-cap stocks (Randl, 2017). Then the coefficient of the value factor remains broadly the same over all three size portfolios in the three-factor model. For the other models, the coefficient becomes more significant in the small-cap portfolio and even insignificant for the mid-cap and large-cap portfolios. This suggests that the value effect is generally more pronounced in the small-cap REITs.

The coefficient of the profitability factor becomes, compared to the total portfolio, less significant for the small-cap and mid-cap portfolio and more significant for the large-cap portfolio. This suggests that the profitability effect is more dominating in larger capitalization REITs. The investment and direct real estate factor remain insignificant over all portfolios. The adjusted R-squared becomes, compared to the regression over the total portfolio of equity REIT returns, higher in the regression over small-cap REIT portfolio and lower in the regression over the mid-cap and large-cap portfolios. This suggests that the

part of the variation in the REIT returns explained by the Fama-French factor is higher in the small-cap portfolio compared to the mid-cap and large-cap portfolio. Furthermore, the adjusted R-squared appears in all cases to be the highest in the five-factor model. Although the differences are again extremely small. On the other hand, Appendix C shows that the coefficients of the factors in the three-factor regression remain all significant, while this is not the case for the five-factor regression and quarterly regression models.

5.3 Robustness check

The results to this point indicate that the most significant factors in the REIT return model are the market and size factor. Hence, table 6 illustrates that also the value and profitability factor are important factors for explaining REIT returns. On the other hand, the investment and real estate factor appear to play no role in REIT pricing. In addition, on a monthly level the highest adjusted R-squared is found for the five-factor model and on a quarterly level, the highest R-squared is found for the three-factor model, although in both cases the differences are extremely small. Based on the statistical contribution of the factors separately the three-factor model remain most favorable for pricing REIT stocks returns. A way to test the robustness of the findings before is to discern whether the results hold over the sub-periods. Therefore, the entire period is divided into two sub-periods of 1997-2006 and 2007-2017. This obviously implies fewer observations to base the regressions on, which may more easily affect significance, especially the more factors involved to explain variance.

The four regression models are estimated again. The results of the four regression models over two sub-periods are presented in table 7. Overall, table 7 indicates that the results broadly hold for the first sub-period but they are significantly different for the second sub-period.

Table 7, compared to table 6, demonstrates that for the first sub-period the coefficient of profitability factor in the five-factor model and the coefficient of the value factor in the quarterly regression become both insignificant. A more striking observation in table 7, compared to table 6, is visible in the second sub-period which shows that only the coefficient of the market factor remains significant. It suggests that only market developments were relevant; which given the occurrence of the financial crisis affecting many parts of the economy, may hold logic. The coefficients of the size, value and profitability factor become all insignificant in this period. The reported outcomes in table 7 confirm the earlier finding that the market factor is an important factor in REIT pricing. The remarkable differences in the significance of the coefficients of the size, value, and profitability between the entire period and both sub-periods, indicate that the findings concerning the contribution of these factor to REIT pricing are not robust. Another explanation might be that the size, value and profitability factor play a role in REIT pricing over the long run, but that because of the financial crisis, the large movements in the market, its aftermath and the uncertainty it brought along, the factors beyond the market development could not play a role in REIT pricing in the period of 2007 to 2017. This could be argued since previous studies that provided evidence for the size and value factor as drivers for REIT returns, had a research period limited to only

2006. Therefore, the results in this study happen to the first ones that reveal that there is no relationship among the size, value and probability factor for common stocks and REIT returns after 2006. Further, table 7, compared to table 6, shows that the coefficient of the investment factor and the coefficient of the real estate factor remain insignificant. This lends support to the earlier findings that the investment factor and real estate factor play no role in REIT pricing. In addition table 7 demonstrates that the adjusted R-squared differs noticeably between both sub-periods. This percentage, for the monthly regression, is always higher in the second sub-period. In contrast to the quarterly regression wherein, this percentage is higher in the first sub-period. Taken both periods into account, the highest explanatory power occurs in the three-factor model regression.

To conclude, the results from the robustness test appear not to be exactly identical as the findings established before in table 6. The robustness test illustrates differences among the sub-periods, although in all cases it reveals insignificance of the profitability, investment, and real estate factor. Along with the fact that the highest explanatory happens to be in the three-factor model, the outcomes of the robustness test support the conclusion that the three-factor model is more appropriate for pricing REIT stock returns than the real estate model and the five-factor model.

Table 7. Factor sensitivities from regressions of the total portfolio of equity REIT returns on CAPM, Fama-French three-factors, five-factors and five-factors and five-factor with a real estate factor over two sub-periods

	Regression models							
	CAPM		FF3FM		FF5FM		FF5FM + RE	
	1997-2006	2007-2017	1997-2006	2007-2017	1997-2006	2007-2017	1997-2006	2007-2017
MRK	0,35	0,65	0,47	0,62	0,49	0,64	0,37	0,48
	(6,67)***	(2,04)**	(9,12)***	(9,82)***	(8,07)***	(9,18)***	(4,42)***	(4,68)***
SMB			0,27	0,03	0,31	0,06	0,45	0,08
			(4,93)***	(0,25)	(4,80)***	(0,47)	(4,75)***	(0,38)
HML			0,38	0,07	0,33	0,11	0,23	0,23
			(5,52)***	(0,69)	(3,15)***	(0,89)	(1,66)	(1,50)
RMW					0,10	0,16	0,03	-0,19
					(1,03)	(0,88)	(0,24)	(-0,72)
CMA					-0,01	-0,11	0,13	-0,06
					(-0,07)	(-0,51)	-0,82	(-0,22)
RE							0,25	-0,27
							(1,82)	(-2,13)
Int.	0,88	0,65	0,50	0,53	0,47	0,48	0,81	2,70
	(3,71)**	(11,32)***	(2,33)**	(2,11)**	(2,15)**	(1,80)*	(1,21)	(3,49)***
R2	0,28	0,50	0,47	0,50	0,48	0,50	0,72	0,63
Adj. R2	0,27	0,49	0,46	0,49	0,46	0,48	0,66	0,57
Obs.	119	132	119	132	119	132	39	44
*** p<0,01, ** p<0,05, * p<0,1								

6. Discussion

6.1 Answer research question

The central question in this study is "Does the Fama-French five-factor model with a real estate factor explain REIT returns better than the Fama-French three-factor model?" The main question can be answered as follows: The Fama-French five-factor model with a real estate factor does not explain REIT stock returns better than the three-factor model. The explanatory power is 57,6% for the five-factor model with a real estate factor, against 57,7 % for the three-factor model on a quarterly level. Although, given that the differences in explanatory power appear trivial, a more important finding is that the direct real estate factor is insignificant. The insignificant real estate coefficient indicates that direct real estate does not play a role in REIT pricing. Moreover, also the coefficient of the investment factor reveals to be insignificant. Given the fact that a simple regression model with only statistically contributing factors is more desirable, and the differences in explanatory power are particularly small, this study concludes that the three-factor model would be more appropriate for explaining REIT stock returns.

Another key finding is that without the real estate factor, on a monthly level, the Fama-French five-factor model provides, on the basis of only the explanatory power, a slightly better model compared to the three-factor model. The explanatory power is 45,9% and 45,3% for the five-factor and three-factor model, respectively. The difference between the explanatory power of the models is again extremely small, and therefore it is of great importance to focus on the contribution of the several factors to REIT pricing as well. The coefficient of the market factor reveals to be significant at all times. The coefficients of the size and value factor appear almost in all cases significant, the only exception is in the sub-period of 2007 to 2017. The coefficient of the profitability factor appears to be significant over the entire research period but remains insignificant in the robustness test. The investment factor turns out not once to have a relationship with REIT returns. Therefore, based on the contribution of the factors, the most favorable model for pricing REIT returns is again the three-factor model.

Then, the last finding is the unsurprisingly significant gain in predictive quality by using the three-factor model instead of the single-factor one. Altogether, REITs provide some exposure to common stocks, they do not to direct real estate. This provides implications portfolio managers, considering that REITs are useful as a diversifier in a mixed-asset portfolio.

6.2 Results in the light of earlier studies

The results with the inclusion of the real estate factor corroborate the findings of Anderson et. al, (2005) who found that there is no connection between REIT returns and direct real estate. They suggest that on a monthly level the direct real estate market is simply too slow-moving to be a significant contributor to REIT pricing.

The results of the regression model with a real estate factor are also in agreement with the findings of Pavlov and Wachter, (2011) who only found a relationship in the office sector REITs. The results of the model with a real estate factor also matched the findings of Seiler, Webb, and Myer, (2001) who showed that those two variables have different properties and therefore no connection. Further Corgel, McIntosch, and Ott, (1995) only found a minor connection between private unsecuritized real estate and REITs. In addition, Clayton and Mackinnon (2003) showed that since 1990 REITs exhibit a link to direct real estate. However, they illustrate a considerable drop in the importance of the real estate factor in explaining REIT returns after 1998. Therefore the current study could be seen as a follow-up study that concludes no connection since 1997. Clayton and Mackinnon (2003) argue that this drop could be due to the fact due of cyclical movement of the real estate market or it could be that the REIT sector became more efficient. "That is, if the REIT prices are now acting as better processors of information, then the REIT market may be reflecting changes in private real estate values far more quickly than a private real estate price index" (Clayton and Mackinnon, 2003, P. 52). Furthermore, the findings are contrary to earlier work in this area from (Boudry et al., 2011; Clayton and Mackinnon, 2001; Liu and Mei, 1992; Oikarinen, Hoesli, and Serrano, 2011; and Seranno and Hoesli, 2007) who all suggested that direct real estate can explain REIT returns on a quarterly level. Although, those studies all illustrate that the connection with direct real estate is cyclic and appears to be stronger during economic downturns. The reason that this study provides different outcomes, might be caused by the differences research periods. In addition to that, earlier studies all used different methods.

Further, the current study extends the work of (Peterson and Hsieh, 1997; and Serrano and Hoesli, 2007) by demonstrating that REIT returns are related to not only the Fama-French three factors but over the long run also to the profitability factor of Fama-French. In contrast to the results in the study of Fama-French (2015), no evidence was detected that there exhibits a relationship between the fifth factor, the investment factor. The lack of relationship with the investment factor in REIT returns might be attributable to the requirement of REITs, that they have to distribute 90% of their taxable income as dividends to their shareholders. This means that REITs, unlike other companies, need to rely on external capital such as debt or they have to issue new shares if they wish to invest. Therefore it is likely that their investment strategy of REITs differs from common companies. The other remarkable difference between the current study and the study of Fama-French (2015) for common stocks is that Fama-French proved an far better-fitted pricing model for common stocks when the profitability and investment factor are added. The current study has been unable to identify that for REIT stocks, the incremental explanatory power for the three-factor to the five-factor model is only 1%. This might have to do with the investment factor, which appears to be unimportant for REIT pricing. The lower model fit also implies that REIT stocks returns behave not entirely similar as common stocks returns.

The results of the superiority of the three-factor model over the single-factor model in REIT pricing are in agreement with those obtained by (Chiang, Lee, and Wisen, 2004; Chiang, Lee and Wisen, 2005; and Coskun, Selcuk-Kestel and Yilmaz, 2017). Furthermore, still a vast part of the variation in REIT returns cannot be explained by the common stock market factors and a real estate factor. The relatively low adjusted R-square for the range of models further support the ideas of Anderson et al. (2005) and Clayton and Mackinnon (2003) who both emphasize the increased component of idiosyncratic risk. They discuss that this has to do with the increase in institutional ownership and technology developments. The REIT market is now more dominated by institutional investors which causes increased volatility in REIT returns because of their "herding" behaviour as well as their greater turn-overs. Institutional investors trade more en-masse (Anderson et al., 2005). The other force is technology, the volatility of REIT returns is increased because firm-specific information is released more frequently and investors could act on this (Clayton and Mackinnon, 2003).

7. Conclusion

7.1 Summarising and concluding

REITs are a hybrid asset with features of stocks, bonds, and real estate. On the one hand, they are traded on common stock exchanges, for that reason, it is likely that the same factors will influence both general and REIT stocks to a greater or lesser extent. On the other hand, the relatively stable cash flow has a more similar appearance to the cash flow from bonds. And other than that, it is widely known that REITs are companies that derive most of their income from real estate real estate assets. Hence, it is reasonable that REITs returns move with the underlying real estate assets. Together this causes the issue that it is still undecided how REITs are priced and what their role is in a mixed-asset portfolio. Therefore, this study examines whether the REIT returns are related to the common stock market factors from the Fama-French five-factor model, in combination with a direct real estate factor. In order to accomplish that, the REIT returns are analyzed over a period of 1997 to 2017. Of all US equity REITs, a value-weighted portfolio is constructed and OLS regressions are run. For heterogeneity purposes, the total portfolio is also divided into three sub-portfolios on the basis of the market capitalization. As a robustness test, the total period is also divided into sub-periods to examine whether the results hold over the sub-periods.

The main results found in this study are that REITs appear to be to some extent identical to common stocks, as four of the five common stock market factors have a statically significant relationship with REIT stock returns. The coefficients of the factor market (MRKT), small stocks (SMB), value stocks (HML), and profitable stocks (RMW) are significant and positive. REIT returns do not have a statistically significant relationship with the investment factor (CMA). This might be assigned to the special requirement that REITs have to distribute 90% of their income to their shareholders. The Fama-

French five-factor model explains approximately 46% of the variation in REIT returns. In addition, the three-factor model explains approximately 45% of the variation in REIT returns.
Another key finding is that the direct real estate factor appears not to have a statistically significant relationship with REIT returns. The model with a real estate factor on a quarterly level explains approximately 58% of the variation in REIT returns. Given the fact that simple regression models with only relevant factors are desirable, and the differences in explanatory power are particularly small, this study concludes that the three-factor model would be more appropriate for explaining REIT stock returns.
Still a substantial part of the variation in REIT returns is unexplained in all models, this supports the conclusion that REITs cannot solely be classified as stocks or direct real estate, but rather contain a unique REIT sector element.

This study contributes to the gap in the literature since it is the first study that applies the Fama-French five-factor model, and particularly in combination with a real estate factor, on REIT stock returns. The reported results extend existing literature by presenting also the profitability factor as a priced risk factor in REIT returns over the long run. Furthermore, the current study lends support for the discussion concerning the relationship with direct real estate returns, by providing the striking outcome that there is no statistically significant relationship between direct real estate returns and REIT returns. Therefore, the current study provides evidence that REITs are a unique asset, and cannot be viewed similarly as common stocks or direct real estate. Those outcomes can contribute to the debate by providing evidence that REITs cannot be priced equal to common stocks and not even with a real estate factor. Taking into account that REITs exhibit not a strong link with all common stock market factors and do not have a connection with the direct real estate factor, REITs might be a proper diversifier in a portfolio with common stocks and direct real estate. It is essential for investors to understand the REIT dynamics for portfolio allocation decisions. Especially now, in the light of the recently increased popularity of REIT investing, it is of particular importance to understand the REIT dynamics and the investment characteristics.

7.2 Limitations of the current study and recommendations for future research

A key limitation of selecting the most appropriate model for pricing REITs by comparing the R-squared would be that when more independent variables are included in a regression model, the model naturally explains more of the variation in REIT returns. For that reason, the current study focusses already on the adjusted R-squared, which compensates for that by only increasing if the new variable enhances the model above what would be expected by chance and it also decreases when poor quality variables are added. Despite this, the comparison of the adjusted R-squared in the current study did not provide one clear winning model for pricing REIT stocks, because the several percentages reveal to be nearly

identical. In addition, the adjusted R-squared even increased when insignificant variables were added to the model. Therefore, it could be valuable to apply also another method.
Another convenient method to determine the best model for pricing REIT stocks might be out of sample forecasting. For future research, it would be recommended to apply this method as it might be another way to determine the best model for pricing REIT stocks. In addition to that, the forecast outcomes could be used for active trading strategies as well to detect profitable strategies. It would be particularly valuable for investors to be able to make profitable forecasts.

Another weakness of the current study is that the general results and the results of the robustness test are not completely identical. As the profitability factor only appears significant over the long-run and becomes insignificant in the robustness test and in the second period of the robustness test only the coefficient of the market factor remain significant. This might suggest that the profitability factor is only important in REIT pricing over the long-run and that since the financial crisis only the market factor remained a priced risk factor in REITs. Alternatively, it might also suggest that the results are not robust. Therefore, it might be desirable to use also another method. In addition to that, it might also be valuable to increase the research period, to create more observations.

Another weakness of the current study is that the applied real estate factor model is on a quarterly level which makes it hard to compare with the other models on a monthly level. However, all other earlier studies within this field cope with the same issue, because all direct real estate indexes are on a quarterly level. In the current study the coefficient of the direct real estate factor was insignificant, but also unexpectedly negative. Along with the fact that earlier literature concerning the relationship of direct real estate returns and REIT returns are inconclusive, future research could attempt to better understand this relationship. A way to do that, is to make use of another direct real estate benchmark or future studies could use of some sort of lag in the direct real estate variable.

The scope of this study is also limited, by focussing solely on the Fama-French models and a direct real estate factor. Since still a substantial part of the variation in REIT returns is unexplained the use of other explanatory variables could be of interest. It could also be interesting to use lags in the variables. This could provide further evidence on what drives REIT returns. Finally, to increase the external validity of the conclusions, future research could also attempt to use data from other countries as well.

References

Anderson, R., Clayton, J., Mackinnon, G., & Sharma, R. (2005). REIT Returns and Pricing: The Small Cap Value Stock Factor. *Journal of Property Research*, 267-286.

Bodie, Z., Kane, A., & Marcus, A. (2014). *Investments.* New York: McGraw-Hill Education.

Boudry, W., Coulson, N., Kalkberg, G., & Liu, C. (2011). On the Hybrid Nature of REITs. *The Journal of Real Estate Finance and Economics*, 230-249.

Chan, S., Erickson, J., & Wang, K. (2002). *Real Estate Investment Trusts : Structure.* Oxford: Oxford University Press.

Chen, N., & Zang, F. (1998). Risk and Return of Value Stocks. *The Journal of Business*, 501-535.

Chiang, K., Lee, M., & Wisen, C. (2004). Another Look at the Asymmetric REIT-Beta Puzzle. *Journal of Real Estate Research*, 25-42.

Chiang, K., Lee, M., & Wisen, C. (2005). On the TimeSeries Properties of Reai Estate Investment Trust Betas. *Real Estate Economics*, 381-396.

Chiu, A., Titman, S., & Wei, K. (2003). The Cross Section of Expected REIT Returns. *Real Estate Economics*, 451-479.

Clayton, J., & MacKinnon, G. (2001). The time-varying nature of the link between REIT, Real Estate and Financial Asset Returns. *Journal of Real Estate Portfolio Management*, 43-54.

Clayton, J., & Mackinnon, G. (2003). The relative importance of Stocks, Bonds and Real Estate Factor in Explaining REIT Returns. *Journal of Real Estate Finance and Economics*, 39-60.

Corgel, J., McIntosch, W., & Ott, S. (1995). Real Estate Investment Trusts: A Review of the Financial Economics Literature. *The Journal of Real Estate Literature*, 13-43.

Coskun, Y., Selcuk-Kestel, A., & Yilmaz, B. (2017). *Diversification benefit and return performance of REITs using CAPM and Fama-French: evidence from Turkey.* Ankara: Elsevier.

Dempsey, S., Harrison, D., Luchtenberg, K., & Seiler, M. (2010). Financial Opacity and Firm Performance: The Readability of REIT Annual Reports. *Journal of Real Estate Finance and Economics* , 450-470.

Fama, E., & French, K. (1993). Common risk factors in the return of stocks and bonds. *Journal of Financial Economics*, 3-56.

Fama, E., & French, K. (1997). *Value versus growth; the international evidence.* Woodbury: Dartmouth Office.

Fama, E., & French, K. (2005). *Profitability, Investment, and Average Returns.* Hanover: Amos Tuck School of Business, Dartmouth College.

Fama, E., & French, K. (2015). A Five Factor Asset Pricing Model. *Journal of Financial Economics*, 1-22.

Fama, E., & French, K. (2018, May 7). *Description of Fama/French Factors*. Retrieved from Kennth R. French: http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/Data_Library/f-f_factors.html

Hausman, A., & Johnston, W. (2013). Timeline of a financial crisis. *Journal of Business Research*, 2667-2670.

Hoesli, M., & Oikarinen, E. (2012). Are REITs real estate? Evidence from international sector level dat. *Journal of International Money and Finance*, 1823-1850.

Lewellen, J., & Resutek, R. (2016). The predictive power of investment and accruals. *Review of Accounting Studies*.

Liu, C., & Mei, J. (1992). The predictability of returns on equity REITs and their co-movement with other assets. *Journal of Real Estate Finance and Economics*, 401-418.

McIntosh, W., Liang, Y., & Tomkins, D. (1991). An examination of the Small-Firm Effect within the REIT Industry. *the journal of real estate research*, 9-17.

Mueller, G. (1998). REIT Size and Earnings Growth: Is Bigger Better, or a New Challenge? *The Journal of Real Estate Portfolio Management*, 149-157.

Nareit. (2018, Augustus 20). *REIT sectors*. Retrieved from Real Estate Working For You: https://www.reit.com/what-reit/reit-sectors

Nareit. (2018, October 10). *Understanding REITs: Industry Equity Market Cap Breaks $1 Trillion*. Retrieved from REIT news: https://www.reit.com/news/blog/nareit-media/understanding-reits-industry-equity-market-cap-breaks-1-trillion

Oikarinen, E., Hoesli, M., & Serrano, C. (2011). *The Long-Run Dynamics between Direct and Securitized Real Estate.* Turku: Turku School of Economics,.

Pavlov, A., & Wachter, S. (2011). *REITs and Underlying Real Estate Markets:*. Pennsylvania: University of Pennsylvania Law School.

Peterson, J., & Hsieh, C. (1997). Do common risk factors in the returns on stocks and bonds explain returns on REITs? *Real Estate Economics* , 321-345.

Randl, O. (2017). Course Asset Management. (pp. 31-91). Vienna: Vienna University of Economics and Business.

REITnotes. (2018, December 24). *REITs by market capitalization*. Retrieved from REIT-market-capitalization: https://www.reitnotes.com/reit-market-capitalization/

Seiler, M., Webb, J., & Myer, F. (2001). Can Real Estate Portfolios Be Rebalanced or Diversified Using Equity REIT Shares? *Journal of Real Estate Portfolio Management*, 25-42.

Serrano, C., & Hoesli, M. (2007). Forecasting EREIT Returns. *Journal of Real Estate Portfolio Management*, 293-309.

The New York Times. (2016, Augustus 27). Real Estate Strikes Out on Its Own in the Stock Indexes. *The New York Times*, p. B5.

Thomson Reuters . (2018, May 2). Thomson Reuters Datastream. New York, USA.

Venhorst. (2016). Statistics 2: Lecture 6. (pp. 1-9). Groningen: Rijksuniversiteit Groningen.

Wang, K., Erickson, J., & Chan, H. (1995). Does the REIT stock market resemble the general stock market? *The Journal of Real Estate Research*, 445-460.

Wilson, J. H., Keating, B. P., & Hodges, M. (2012). *Regression Analysis: Understanding and Building Business and Economic Models Using Excel.* Bandung: Business Expert Press.

Yamani, E., & Swansonc, P. (2014). Financial crises and the global value premium: Revisiting Fama and French. *Journal of Institutional Financial Markets, Institutions & Money*, 115–136.

Appendix

Appendix A. Correlation matrix on a quarterly level

	MRKT	SMB	HML	RMW	CMA	RE
MRKT	1,00					
SMB	0,31	1,00				
HML	-0,18	0,16	1,00			
RMW	-0,18	-0,26	0,45	1,00		
CMA	-0,29	0,10	0,71	0,47	1,00	
RE	0,13	0,04	-0,01	-0,10	-0,13	1,00

Appendix B. Factor sensitivities from regression on quarterly level

	Regression models			
	CAPM	FF3FM	FF5FM	FF5FM + RE
MRKT	0,44	0,41	0,45	0,46
	(7,69)***	(7,85)***	(6,97)***	(7,07)***
SMB		0,34	0,37	0,37
		(3,60)***	(3,72)***	(3,72)***
HML		0,25	0,20	0,21
		(3,62)***	(2,05)**	(2,919)**
RMW			0,12	0,12
			(1,07)	(1,06)
CMA			0,01	-0,01
			(0,08)	(-0,10)
RE				-0,11
				(-1,22)
Intercept	2,30	1,93	1,76	1,99
	(4,60)***	(4,51)***	(3,79)***	(3,98)***
R2	0,42	0,59	0,60	0,61
Adj. R2	0,41	0,58	0,57	0,58
No. Obs.	84	84	84	84

*** p<0,01, ** p<0,05, * p<0,1

Appendix C. Regression models over small, mid and large-cap portfolio

		Regression models			
Coefficient	Portfolio	CAPM	FF3FM	FF5FM	FF5FM + RE
MRKT	**Total portf.**	0,50 (12,55)***	0,49 (12,81)***	0,54 (11,79)***	0,46 (7,07)***
	Small-cap	0,42 (11,72)***	0,41 (12,08)***	0,45 (11,64)***	0,46 (7,53)***
	Mid-cap	0,62 (8,94)***	0,61 (8,79)***	0,69 (8,34)***	0,54 (4,34)***
	Large-cap	0,62 (9,33)***	0,69 (10,37)***	0,81 (10,37)***	0,77 (6,50)***
SMB	**Total portf.**		0,18 (3,36)***	0,24 (3,93)***	0,37 (3,72)***
	Small-cap		0,24 (5,37)***	0,28 (5,47)***	0,40 (4,36)***
	Mid-cap		0,26 (2,78)***	0,35 (3,24)***	0,37 (1,99)*
	Large-cap		-0,26 (-2,86)***	-0,13 (-1,27)	0,17 (0,96)
HML	**Total portf.**		0,26 (4,86)***	0,18 (2,43)**	0,21 (2,919)**
	Small-cap		0,33 (7,35)***	0,27 (4,22)***	0,26 (2,87)***
	Mid-cap		0,33 (3,43)***	0,19 (1,41)	0,36 (1,94)*
	Large-cap		0,29 (3,14)***	0,08 (0,60)	0,06 (0,32)
RMW	**Total portf.**			0,18 (2,15)**	0,12 (1,06)
	Small-cap			0,12 (1,75)*	0,15 (1,39)
	Mid-cap			0,27 (1,85)*	0,09 (0,42)
	Large-cap			0,41 (2,95)***	0,61 (2,96)***
CMA	**Total portf.**			0,04 (0,37)	-0,01 (-0,10)
	Small-cap			0,05 (0,51)	0,06 (0,43)
	Mid-cap			0,11 (0,56)	-0,09 (-0,35)
	Large-cap			0,18 (0,98)	-0,01 (-0,05)
RE	**Total portf.**				-0,11

					(-1,22)
	Small-cap				-0,10
					(-1,15)
	Mid-cap				-0,25
					(-1,47)
	Large-cap				0,05
					(0,32)
Intercept	**Total portf.**	0,71	0,62	0,53	1,99
		(4,01)***	(3,70)***	(3,04)***	93,98)***
	Small-cap	0,63	0,52	0,45	1,50
		(3,90)***	(3,64)***	(3,04)***	(3,09)***
	Mid-cap	0,86	0,74	0,59	2,95
		(2,77)***	(2,45)**	(1,87)*	(2,99)***
	Large-cap	0,36	0,32	0,08	0,10
		(1,20)	(1,11)	(0,28)	(0,10)
R2	**Total portf.**	0,39	0,46	0,47	0,61
	Small-cap	0,36	0,51	0,52	0,66
	Mid-cap	0,24	0,30	0,31	0,38
	Large-cap	0,26	0,31	0,34	0,40
Adj. R2	**Total portf.**	0,38	0,45	0,46	0,58
	Small-cap	0,35	0,51	0,51	0,63
	Mid-cap	0,24	0,29	0,29	0,33
	Large-cap	0,26	0,30	0,32	0,36
No. Obs.	**Total portf.**	251	251	251	84
*** p<0,01, ** p<0,05, * p<0,1					