The long-term growth rate of Real Estate Investment Trusts: The impact of macroeconomic and company specific variables

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Abstract

This thesis examines macroeconomic and company specific factors that determines the long-term growth rate of Real Estate Investment Trusts (REITs). The study employs quarterly panel data of 229 US REITs for the period of 1992Q1 to 2011Q4 resulting in 7,140 observations. The analysis applies the firm fixed effects estimator and variance decompositions. The long-term growth rate is found to be positively related to *inflation*, *valuation effects*, *performance* and *size*; and negatively related to *economic growth* and *profitability*. The study identifies *economic growth* (among macroeconomic factors) and *size* (among company specific factors) the most important influences on the long-term growth rate of US REITs. The study further provides information that the market determined an average long-term growth of 0.4% on a quarterly basis in the period under observation.

Keywords: Growth rate, REITs, Valuation, Discounted Cash Flow

Author's Declaration

I declare that the work in this thesis was carried out in accordance with the regulations of the University of Gloucestershire and is original except where indicated by specific reference in the text. No part of the thesis has been submitted as part of any other academic award. The thesis has not been presented to any other education institution in the United Kingdom or overseas.

Any views expressed in the thesis are those of the author and in no way represent those of the University.

Signed   Date: 28 December 2012

Stefan Hocke

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"If your determination is fixed, I do not counsel you to despair. Few things are impossible to diligence and skill. Great works are performed not by strength, but perseverance".

Samuel Johnson

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1. Introduction

1.1 Background to research

The research project focuses on the determination of the long-term growth rate within the valuation of Real Estate Investment Trusts (REITs). A REIT is a real estate company or trust that has elected to qualify under certain tax provisions to become a pass-through entity that distributes to its shareholder almost all of its earnings and capital gains generated from the disposition of its properties (Hoesli & MacGregor, 2000). With direct real estate investments, investors suffer from the illiquidity of the assets acquired, high transaction costs in arranging the acquisition and the lack of local market knowledge. As investment vehicles, investments in REITs provide an indirect stake in the cash flows and earnings of real estate assets without the problems of directly acquiring real estate assets. In the United States (US), the shares of REITs are traded on the major stock exchanges. Other REITs are either publicly registered but not traded on the stock exchange or private companies.

Since there is no standard of classifying US REITs, I have used the classification of Downs & Hartzell (1995) who give an objective overview about the US REIT market. Firstly, Downs & Hartzell (1995) categorize US REITs into three principal types. These are equity REITs, mortgage REITs and hybrid REITs. Equity REITs own or have an equity interest in rental real estate rather than making loans secured by mortgages. Mortgage REITs make or own loans and other obligations that are secured by mortgages. Hybrid REITs combine the investment strategies of both equity REITs and mortgage REITs. According to the National Association of Real Estate Investment Trusts (NAREIT) (2012), the market capitalization of the US REIT industry amounted to $ 451 billion (160 REITs) with equity REITs of $ 408 billion or 90.5% (130 REITS) and mortgage REITs of $ 43 or 9.5% (30 REITs) as of 31 December 2011. Hybrid REITs discontinued in the year 2010 in contrast to $ 0.7 billion market capitalization (4 REITs) in the year 2009.

Secondly, with regard to the real estate type, US REITs invest in different real estate types. According to NAREIT (2012), listed equity US REITs invested (as of August 2012) predominately in retail properties (28.2%), industrial and office buildings (16.8%), residential buildings (14.9%), health care (11.8%) and other real estate types such as lodging/resorts, self-storage, timber, infrastructure and diversified properties (28.2%).

Also, the geographic concentration of US REITs can be different. Some US REITs invest only across the US whereas other US REITs have an international focus.

Furthermore, US REITs differ in their operating time frame. Some US REITs are established to operate indefinitely (perpetual REITs) whereas other US REITs are established for a temporary period (finite-life REITs).

Finally, US REITs can be closed-ended or open-ended. Closed REITs issue a limited amount that the REIT uses for investments whereas open-ended REITs offer new shares to find further investments opportunities.

The majority of US REITs are equity REITs that are open-ended with an infinite life time. From a global perspective, tax benefited real estate companies exist in countries such as Australia, Belgium, Brazil, Bulgaria, Canada, Dubai, Finland, France, Germany, Great Britain, Greece, Hong Kong, India, Israel, Italy, Japan, Luxemburg, Malaysia, Mexico, Netherlands, New Zealand, Singapore, South Africa, South Korea, Spain, Taiwan, Turkey and the USA. The consideration of country weighted figures, measured by the Standard & Poor's (S&P) Global REIT Index provides a good indication of the relative importance of the most developed REIT markets. With a total weight of almost 64%, the US is the most important REIT market in the world (Badenes, 2007). Thus, the US REITs' industry holds a cutting-edge in theory and practice because of its historic development and market capitalization. The statutory requirement to obtain the US REITs status has the result that US REITs are a homogenous group with regard to taxation, accounting and business model.

The use of the US REIT market as a proxy for other REIT markets depends on the structural differences and similarities in the respective taxation and regulation rules. Therefore, I analyzed the most important REIT markets worldwide with respect to structural key differences in their organizational, income, asset and distribution rules as well as in their leverage restrictions. This qualitative analysis indicates the consistency of the REIT markets but does not replace a quantitative analysis of the national REIT market to examine specific research questions. I defined the most important REIT markets worldwide according to market capitalization. According to the European Public Real Estate Association (EPRA) (2012) as of 31 July 2012, the top five REIT markets worldwide are in the United States, Australia, France, United Kingdom and Japan.

Country	**Market capitalization**	**Number of REITs**
United States	$ 454.79 billion	189
Australia	$ 71.76 billion	45
France	$ 45.35 billion	40
Japan	$ 44.95 billion	35
United Kingdom	$ 33.87 billion	21

Table 1: Market capitalization of international REIT markets

In the following, I analyzed the essential organizational, income, asset and distribution rules as well as the leverage restrictions to provide an international comparison of REITs.

Country	Organizational rules
United States	- At least 100 shareholders - Five or fewer shareholder may not hold more than 50% of the REIT's value
Australia	- Minimum initial capital $ 1 - No minimum or maximum shareholder requirements
France	- Minimum share capital € 15 million (approximately $ 18 million) - No shareholder may hold 60% of share capital - At least 15% of the share capital must be held by investors who individually own less than 2%
Japan	- Investment certificates offered of at least ¥ 100 million (approximately $ 1.4 million) - At least 50 investors - Investments must be made at least of 50% in domestic market - No investor may own more than 50% of total certificates
United Kingdom	- Minimum share capital £ 50,000 (approximately $ 78,537), (UK listed) - Less than 10% of shares per shareholder

Table 2: Organizational rules in international REIT markets

Country	Income rules
United States	- 75% of gross income must be derived from real estate - Not more than 5% is allowed to be derived by non-qualifying sources
Australia	- Safe harbor rule ensures that at least 75% of revenues represents rental income from land
France	- Income must be derived from qualifying investments
Japan	- Income must be derived from qualifying investments
United Kingdom	- At least 75% of net profits by property rental activities

Table 3: Income rules in international REIT markets

Country	Asset rules
United States	- At least 75% of assets must be real estate, government securities or cash - Maximum 10% of non-REIT shares - Securities of taxable REIT subsidiaries must not exceed 25% of the REIT's total assets
Australia	- Purpose of business must be to derive rent - Flow-through taxation not for companies with trading business
France	- Maximum 20% of assets that belong to ancillary activities - 50% limit on assets leased under finance lease arrangements
Japan	- Equity holdings in other companies must be less than 50%
United Kingdom	- At least 75% of assets by property rental activities - Minimum of three assets in which no assets exceeds 40% of total assets - Worldwide investments allowed

Table 4: Asset rules in international REIT markets

Country	Distribution rules
United States	- At least 90% of taxable ordinary income
Australia	- 100% of income defined in the REIT's constitution
France	- 85% of tax exempt profits, 50% of capital gains and 100% of dividends must be distributed
Japan	- More than 90% of income must be distributed
United Kingdom	- 90% of tax-exempt profits,

Table 5: Distribution rules in international REIT markets

Country	Leverage restrictions
United States	- No legal restrictions
Australia	- No legal restrictions, restrictions in the deductibility of interest rates
France	- Thin capitalization rules: Restrictions on tax deductibility if (i) Related party loans exceed 1.5 times net equity (ii) Interests for related party loans exceeds 25% of the current income (iii) Interest paid to related parties > interest received from related parties
Japan	- No legal restrictions
United Kingdom	- Interest coverage ratio of 125% (profits / financing costs)

Table 6: Leverage restrictions in international REIT markets

In summary, the analysis shows that international REITs follow the US REITs structure in the most relevant parameters. In general, REITs in the analyzed countries have in common that they are exempt from taxes at corporate level and are therefore pass-through investment vehicles. In terms of distribution, the analysis shows that in the relevant countries REITs have to distribute at least 85% of their tax-exempt income. In addition, in all countries REITs do not underlie strict leverage restrictions. Despite smaller differences, the international asset and income rules have the common objective to ensure that REITs focus in their investment on real estate. With regard to organization rules, the countries regulations differ in the minimum required share capital and number of investors. The minimum share capital ranges from $ 1 in Australia to $ 18 million in France. These requirements may have influence on the average size of REITs in the respective country. In the United Kingdom and Australia, the majority of REITs are former listed property companies that converted to REITs. Consequently, these REITs are exposed to more property developments than REITs in other countries. Australian REITs are in particular more exposed to international investments through offshore investments and fund management activities than their international counterparts. Besides the mentioned criteria, REITs differ in their national currencies and accounting standards. These inconsistencies result in problems comparing the performance and balance sheet in an international context. Furthermore, the consistency of global REITs is also influenced by non-structural influences such as the macroeconomic situation, volatility and market trends.

In the United States, the first REIT was created in the year 1960 after the Real Estate Investment Trust Act came into effect. The first US REIT was listed in the year 1965 on the New York stock exchange. Over time several changes in the legislation of REITs occurred. In the year 1974 the Foreclosure Property Rules were enacted. The Foreclosure Property Rules were the first significant change to REIT tax rules. In the event of a REIT obtains possession of a property after foreclosure proceedings or default, the REIT is allowed to operate the property for 90 days and then has it operated through an independent contractor. In the year 1986 the Tax Reform Act came into effect. Besides real estate provisions, several other rules that prevent taxpayers from using partnerships to shelter earnings from other sources were established. In addition, a multitude of simplifications changes were enacted including one that allows REITs to be internally advised and managed. The Omnibus Budget Reconciliation Act in the year 1993 made it easier for pension plans to invest in REITs. This change was incorporated in the "five or fewer" rule that says that no more than 50% of the shares held by five or fewer individuals during the last half of each taxable year. The REIT Simplification Act in the year 1997 is part of the Taxpayer Relief Act. Besides other issues, REITs as of now are allowed to provide a small amount of non-customary services to its tenants without disqualifying the other rents collected from them. In addition, changes were enacted that permit the creation of timber REITs. The REIT Modernization Act in the year 1999 is part of the Ticket to Work and Work Incentives Improvement Act. REITs are allowed to form one or more taxable REIT subsidiaries (TRS) that can perform services to REIT tenants and others. The REIT Improvement Act in the year 2004 is part of the American Jobs Creation Act. The new legislation eliminated a discretionary barrier to foreign investors to buy publicly listed REIT stocks and allows a REIT to either correct a mistake or pay monetary penalties for most violations of the REIT tax rules, instead of facing possible loss of REIT status as under prior law.

In practice, the valuation of US REITs is conducted with three main approaches (Geltner, Miller, Clayton & Eichholtz, 2007): Firstly, Dividend Discount model or Discount Cash Flow models (DDM or DCF); secondly, earnings multiple shortcuts to DCF; and finally, premium to Net Asset Value (NAV) of REIT Properties. The dividend discount model is a variant of the DCF equity-approach and focuses exclusively on dividend payments instead of flows to equity. The amount of dividends is influenced by the company's payout ratio that reduces the flow to equity by the retention of profits. The DDM-formula shows a subsequent stream of dividends discounted at the cost of equity that investors expect to receive on other companies with equivalent risks. Dividends are expected to grow forever at a constant growth rate and so the DDM-formula can be simplified for a growing perpetuity (Brealey & Myers, 2003).

$$P_0 = \frac{D_1}{r - g}$$

$P_0 = current\ share\ price$
$r = rate\ of\ return\ on\ equity$
$D_1 = expected\ dividend$
$g = long\text{-}term\ growth\ rate$

In the DDM-model the company's value is calculated per share. The company value *(V)* is determined by the multiplication of current share price and number of outstanding shares. The denominator *(r - g)* in the DDM-formula is basically a capitalization rate (cap rate).

1.2 Research problem

The purpose of this thesis is to investigate a fundamental company valuation issue. In the valuation of US REITs with the DDM-formula, the long-term growth rate is an important and sensitive value driver to calculate a company's value. The research has the objective to identify variables that are significant in determining the long-term growth rate. Since the determination of the growth rate is associated with a high degree of uncertainty, the research provides guidance to identifying the key variables out of a complex set of likely variables that impact on the long-term growth rate. If unrealistic assumptions are made in the determination of the long-term growth rate, then resulting share prices and company values will be distorted. The implied uncertainty in forecasting a company's long-term (infinite) growth rate makes it very complex for an appraiser to identify influencing variables on the long-term growth rate. Thus, overoptimistic assumptions can lead to unrealistic company values and extreme stock prices that are not supported by the company's fundamentals of value.

The research question ask what macroeconomic and company specific factors have been relevant in the determination of the long-term growth rate of US REITs? In addition, the thesis presents evidence for the practitioner how the long-term growth rate has developed in the past. The thesis further identifies factors that can be considered in practice to determine the long-term growth rate.

I determine the long-term growth rates of US REITs in the past by solving the DDM-formula for a growing perpetuity to growth. The calculation is conducted for each US REIT per quarter for the period of 1992Q1 to 2011Q4. Subsequently, I conduct explanatory research using a quantitative research methodology to identify macroeconomic and company specific variables that have a causal connection to the long-term growth rate. The objective of the research is to identify variables on which the long-term growth rate can approximately be estimated. This approach is supported by several researchers.

The following approaches justify the modification of the DDM to calculate the implied growth rate and the testing of influencing variables for US REITs. In the first instance, I discuss a selection of previous work that explored the relationship between both macroeconomic characteristics and company specific variables, and the implied growth rate.

Damodaran (2008) states that the comparison of the market's implied long-term growth rate with macroeconomic indicators or company specific financial ratios may be worth knowing. In addition, the author mentions that to proponents of market efficiency, the market price provides information about the underlying implied earnings growth rates. Damodaran (2008) incorporates the calculation of an implied growth in his study about growth and value. The implied growth rate is calculated for a wide range of industries. The result identifies the growth rates that the market implicitly used in the past. The author justifies his approach with the theoretical concept of fundamental valuation with the Gordon Growth Model. The calculation of the implied growth rate from the market prices is justified because of the possibility to reasonably calculate an investor's rate of return. Consequently, the rate of return equals the company's return on equity. The research of Damordaran (2008) has various weaknesses that can be improved in further research. Firstly, Damodaran (2008) calculates the implied long-term growth based on cross sectional data for only one period (year). A one period analysis has only limited explanatory power to identify fundamental interdependencies. This approach can be improved by using panel data that consider multi-dimensional data on the basis of a wide range of companies over multiple times periods. Since REITs publish their dividends quarterly the dataset can be generated on a quarterly basis that leads to the collection of more observations and thus an improved statistical evaluation. Secondly, Damodaran (2008) does not present the precise determination of the return on equity used to calculate the long-term growth rates. The return on equity calculation is fundamentally important and the influencing parameters such as risk free rate, beta and equity risk premium have to be dynamic and individual for every company on a quarterly basis. Since there is no transparency in the research of Damodaran (2008) how the return on equity is determined, further research is required to test the results on a transparent and appropriate way to determine the return on equity. Finally, Damodaran (2008) does only calculate the implied long-term growth rate but does not test the implied growth rate with economic variables for potential influences. Further research can identify the factors that influence the level of the long-term growth rate. In summary, the approach of Damodaran (2008) presents a reasonable approach to calculate the long-term growth rate that has to be improved with regard to the aforementioned aspects. The research of Damodaran (2008) finds that it is not growth per se that creates value but growth with positive excess returns.

Geltner, Miller, Clayton & Eichholtz (2007) state that solving the formula of the Gordon Growth Model often provides an interesting empirical perspective of any one of its three components. The authors argue that the historical track record of the firm in providing growth in its dividends can be used to provide an empirical starting point for estimating growth. In doing so, the Gordon Growth Model is used as a purely mechanical mathematical tool. The statement of Geltner, Miller, Clayton & Eichholtz (2007) gives a methodological argument to calculate the implied long-term growth rate although the authors have not conducted an empirical study of this issue. The authors justify this approach from a theoretical methodological perspective.

Gebhardt, Lee & Swaminathan (2000) introduced a technique to estimate the cost of equity. The authors use the DDM to generate a market implied cost of capital for a large sample of US firms. Subsequently, a panel regression is conducted that estimates the relation between the implied cost of equity and various firm and industry characteristics. The results show that the implied risk premium is systematically correlated with several firm and industry characteristics which suggest an alternative approach to estimate the cost of capital. From a methodological perspective the approach of Gebhardt, Lee & Swaminathan (2000) to calculate the implied cost of capital is similar to the approach of this thesis to calculate an implied growth rate which is subsequently tested for the influence of macroeconomic and company specific variables. The authors emphasize that few academicians have employed the DCF model to calculate implied cost of capital. In comparison, financial practitioners have frequently used the implied cost of capital. The authors justify their approach with the practical relevance to determine the cost of capital. In addition, practitioner-oriented publications such as Madden (1998), Damodaran (2003, 2006), Gordon & Gordon (1997) and Pratt & Grabowski (2010) further justify the calculation of implied cost of capital.

Christofi & Christofi (2010) reconcile the dividend growth valuation model and the DCF model and they use as benchmark valuation criteria. The author's objective is to demonstrate how the implied growth rate and the terminal value multiple from the DCF model can be used as an alternative valuation benchmark. The research investigates the issues of the expected risk premium on stocks and the implied long-term growth rate. The implied long-term growth rate in the Dow Jones Industrial Average Index is calculated by solving the Gordon Growth formula for constant perpetual growth which resulted in a growth rate of approximately 6% p.a. which was consistent over a period of three years. The authors conclude that the implied growth rate can be used to identify whether stocks are underpriced, overpriced or fairly priced. Christofi & Christofi (2010) justify their approach with an explanatory research study by Copeland, Koller & Murrin (2002), who found that the correlation between market price (defined as actual share price) and value (based on DCF model) using forecasts from Value Line was 0.97. In addition, the authors argue that the DCF method is widely used by security analysts and financial managers and is consistent with the maximization of shareholder value.

Foerster & Sapp (2005) used a panel regression model to estimate the relationship between dividend growth and several key economic factors. In addition, the authors analyzed the ability of several valuation methods including the DDM to explain actual share prices. Foerster & Sapp (2005) conclude that the dividend based models including the Gordon Growth Model perform best at explaining the observed share price for one firm that has a long history of paying dividends. The authors considered the DDM because it is the most commonly used fundamental valuation model in practice. Foerster & Sapp (2005) use a regression model to forecast dividend growth and justified their approach with the potential relationship between dividend growth and macroeconomic factors. In addition, the authors follow the approach of Booth (1998) who developed a new model for estimating risk premiums.

1.3 Justification of research

In contemporary literature the issue of long-term growth in the context of business valuation has failed to attract the intensity of scientific research that other areas of valuation theory have accomplished. With regard to US REITs an analysis of the long-term growth rate for one year was conducted by Damodaran (2008). Beyond Damodaran (2008) there have not been previous attempts at identifying the influences on the long-term growth rate of REITs in general and US REITs in particular. The research of Damodaran (2008) is a reasonable approach to calculate the long-term growth rate but includes various weaknesses that can be improved in further research. I improve the approach of Damodaran (2008) by using multi-dimensional panel data with a high number of companies over a multiple time periods on a quarterly basis. In addition, I calculate individual and dynamic rates of return on equity to thoroughly derive the long-term growth rate. Since Damodaran (2008) uses only rough estimates to calculate the rate of return on equity, I improve the research by a detailed analysis and calculation of every parameter of the rate of return on equity. Furthermore, I examine the influence of macroeconomic and company specific variables on the long-term growth which was not conducted by Damodaran (2008).

The thesis will add to the literature by offering novel observations on the significance of certain company specific and macroeconomic factors that have influence on the long-term growth rate of US REITs. For the first time, research on the long-term growth rate of US REITs is based on a dataset that is generated by an extensive quantitative analysis of the rate of return on equity and economic characteristics on an individual REIT basis. Furthermore, the results provide the practitioner with information about the influences of the long-term growth rate and therefore contribute to an improved calculation procedure for the long-term growth rate for prospective valuations. The results provide rationale and a point of reference about the correlation of the long-term growth rate with other variables as well as the effective level of past long-term growth rates. The scope of the study is limited to US REITs because specific legal and tax regulations in the US create a unique business case. The focus on the US REITs sector is substantiated by Bredin, O`Reilly & Stevenson (2007) who state that the relative size and maturity of the US REITs sector in comparison to the overall equity market may lead to differences in the result for US REITs. This view is confirmed by Tinz (2010) who argue that a cross-industry analysis of the long-term growth rate is flawed because industry-specific growth trends are neglected. Such specificity constrains the generalizability of cross-industry analysis. Nevertheless, the results of the research could have the potential to be transferred for REITs in markets with similar legal and tax regulations.

1.4 Methodology

The methodology of the research project is based on a panel data regression analysis. Panel data are repeated measurements at different points in time on the same individual unit, such as person, firm, state, or country. Subsequently, regressions can consider both variations over cross-section data and variations over time. Panel data can be balanced and unbalanced. In a balanced panel, data of all individual units are observed in all time periods. In contrast, an unbalanced panel data means that some data is missing. In the research project the observed unit is US equity REIT and the measurement is on the long-term growth rate. There are several types of panel data and objectives, leading to different models and estimators. The simplest estimator for panel data is based on the pooled Ordinary Least Squares (OLS). OLS estimation is straightforward but inference needs to control for likely correlations of the error term over time for a given individual (within correlation) and possible correlation over individuals (between correlation) (Mitchell, 2010). Alternative estimators are the fixed effects model and the random effects model. The fixed effects model assumes fixed unknown constants α (fixed individual effect) that are estimated along with other independent variables β. The fixed effects α consider all (un)observable time-invariant differences across units. The error term is assumed to be independent and identically distributed over units and time. The fixed effects model does not impose that α and x_{it} are uncorrelated.

$$y_{it} = \alpha + \beta_1 x_{it} + u_{it}$$

The random effects model assumes that each factor that influences the dependent variable and that is not identified as an independent variable is considered in the error term. The random effects model separates the error term into an individual specific component that does not vary over time and a remainder that is assumed to be uncorrelated over time. Thus, all correlation of the error terms over time refers to the individual effects of the random variable α that are independent and identically distributed.

$$y_{it} = \alpha + \beta_1 x_{it} + v_i + u_i$$

The choice between the different panel data models depends on the nature of the data set. As a general rule, Cottrell (2009) argues that if the panel comprises observations on a fixed and relatively small set of units, there is a presumption in favour of fixed effects. If the panel comprises observations on a large number of randomly selected individuals there is a presumption in favour of random effects (Cottrell, 2009). The selection of the panel data model is further supported by the Hausmann test or the Breusch-Pagan test that are usually implemented in statistical software.

1.5 Thesis outline

The structure of the thesis refers to the hour-class model of Ryan, Scapens & Theobald (2002) which suggests the composition of a thesis in the form of an empirical study. The hour-class model has its focus on the components literature review and results that should have the largest weight in the structure of the thesis. Other components such as introduction, methodology, research problem hypotheses, methods and conclusion should be weighted equally. In addition, the authors emphasize that the dissertation should be interpretive and dialectical rather than purely descriptive.

Chapter 1 introduces the background of the research, the research problem and the justification of the research. In addition, the chapter outlines the methodology and the framework to examine the research problem. Delimitations of scope and key assumptions, and their justifications are listed as well.

In chapter 2 the literature review represents the theoretical foundation of the research. The literature review builds a structured treatment of valuation literature and creates an interpretive and critical reconstruction of the relevant literature and an analysis of the research problem within that literature. The analysis of the theoretical framework shows that in contemporary literature the issue of the long-term growth rate in particular of US REITs has failed to attract the intensity of scientific research in company valuation and consequently a research gap exists.

Chapter 3 describes and evaluates the paradigm and selected methodology to examine the research problem. The chapter discusses the research philosophy, describes the research strategy including the generation of the research data and outlines the sample that is applied in the research model.

Chapter 4 shows the development of the research questions and names the hypotheses to be addressed. In addition, the chapter considers the definitions of the independent research variables and key input parameters.

Chapter 5 describes and evaluates the research methods employed for the collection of data and the incorporation into a panel regression model. Strengths and weaknesses of the panel regression model are mentioned.

Chapter 6 analyzes the collected data and presents whether the independent variables have a significant influence on the long-term growth rate of US REITs. A table of the panel regression analysis gives an overview about all tested variables. In this chapter patterns of data are analyzed in terms of statistical validity. The results are discussed and evaluated with regard of their significance in answering the research question and solving the research problem. The contribution to knowledge for the research problem theory is outlined and implications are drawn for theory and practice.

Chapter 7 summaries the research project and concludes the research issues and propositions and their contribution to knowledge. In addition, significant variables on the long-term growth rate are highlighted with a recommendation of further research. The thesis closes with the indication of practical implications.

1.6 Delimitations of scope and key assumptions, and their justifications

- Growth is restricted to a business administration perspective and does not comprise the meaning of growth in other fields of study.
- The research is restricted to the real estate industry, in particular to US equity REITs. US mortgage REITs which provide debt financing for commercial or residential properties through investments in mortgages and mortgage-backed securities are not included. As well US hybrid REITs which are a combination of US equity and US mortgage REITs are not considered because of their different business models. Cotter & Stevenson (2006) empirically showed that there is no significant relationship with regard to return and volatility between equity, mortgage and hybrid REITs. The authors argue that the market distinguishes between different REIT sub-sectors and recognizes the fundamental differences in the composition of equity and mortgage REITs.
- In the research project it is assumed that a company's share price equals its value. This assumption is based on the semi-strong version of the efficient-market hypothesis. The efficient-market hypothesis claims in its weak version that prices on traded assets already reflect all past publicly available information. The semi-strong version claims both that prices reflect all publicly available information and that prices instantly change to reflect new public information (Fama, 1970). In contemporary literature various studies have investigated weaknesses of the efficient market hypotheses. Stout (2004) categorized these findings according to the model assumptions of the efficient market hypothesis such as homogeneous investor expectations, effective arbitrage and investor rationality. Therefore, the author identifies three issues in today's finance literature. Firstly, the expanding body of work on asset pricing when investors have heterogeneous expectations. Secondly, recent theoretical and empirical research on how and why arbitrage may move certain types of publicly available information into price more slowly and incompletely than earlier writings suggested. Finally, the exploding literature in behavioral finance, which examines what happens to prices when market participants do not all share rational expectations (Stout, 2004). On the other hand proponents of the efficient-market hypothesis argued that market efficiency does not only mean having no uncertainty about the future but also that it is a simplification of the world which may not always hold true. Nevertheless, the market is practically efficient for investment purposes for most individuals.
- The variables employed in the Gordon Growth Model should reflect long-term stabilized or maintainable levels of each variable. The Gordon Growth Model assumes a future orientation of its parameters. Therefore, the long-term variables

can only be an approximation of reality. In the research it is assumed that a long-term estimation of the parameters in the Gordon Growth formula would result in temporary aberrations or transient effects that could distort the empirical application of the model to determine the long-term growth rate. Thus, all variables are consistently derived on a quarterly basis.

2. Literature review

The literature review has the objective to create an effective, structured and comprehensive overview about relevant academic literature of the research topic. This overview presents a sound basis for the critical analysis and interpretation of the research results and the existing literature. In the following paragraphs I will discuss the question whether REITs are stocks or real investments. In addition, I will present the various valuation methods of REITs. Furthermore, I discuss in the subchapters the related background theories in detail and link them to the research problem area. Other specific issues such as growth environment assumptions of the market and capital structure or payout ratio are discussed in separate sub chapters.

REITs have the purpose to own and operate income producing real estate. In the United States, REITs were created in the year 1960 to make investments in large-scale, income-producing real estate accessible to all investors through liquid securities. Prior to the creation of listed real estate equities, access to the investment returns of commercial real estate equity as a core asset was available only to institutions and wealthy individuals having the financial strength to invest directly in real estate. The US REITs status has the privilege to reduce or eliminate corporate income taxes. The US REIT industry is without any doubt the most developed REITs market worldwide with a market capitalization of $ 455 billion as of July 2012.

US REITs listed on the stock exchange are essentially valued with the same methods that other stocks are valued. This assumption challenges the question whether US REITs are stocks or real estate investments? In addition, the question whether the performance of listed real estate is predominately influenced by real estate market or by stock markets has been intensively discussed in the literature. These questions are relevant for the valuation of US REITs because an appraiser or analyst has to forecast earnings, profit margins and the respective growth rates. According to Basse, Friedrich & Vazquez Bea (2009), literature presents mixed empirical results that examined a systematic link of US REITs to the stock market and the real estate market. Worzala & Bajtelsmit (1997) confirmed in a survey among asset managers that practitioners are uncertain how to assess the value of REITs in practice.

The question whether US REITs are stocks or real estate investments was initially analyzed by Kuhle (1987) who found empirical evidence that to a certain degree, REITs are able to offer diversification effects for investors holding stock portfolios. This finding was questioned by Bharati & Gupta (1993), Mueller & Pauley (1995) and Mull & Soenen (1997) who found positive correlation between the yields of REITs and traditional stock investments. Han & Liang (1995) stated that the relationship between US REITs and the US stock market is more stable with the CRSP Index than with the S&P 500 which can be explained by the small cap effect because US REITs have in general lower market capitalizations than companies in other industries. Additional research based on REITs was conducted by Oppenheimer & Grissom (1998) who found a positive correlation between stocks and REITs. The result of Mull & Soenen (1997) was further confirmed by the research of He, Webb & Meyer (2003). Stevenson (2002) presented further evidence of a strong relationship between US REITs and small cap stocks as well as value stocks. The result between US REITs and small cap stocks was further confirmed by Lee & Stevenson (2005). In addition, Clayton & MacKinnon (2001) showed that US REITs are similar to both stocks and real estate but with varying correlation over time. The authors' results seem to show that US REITs have a stronger correlation with stocks until the year 1992 and beyond that year with real estate. Clayton & MacKinnon (2001) give an indication about the character of US REITs but does not present general evidence.

In contrast, Gilberto (1990) presented no positive correlation between the returns of US REITs and direct real estate investments at all. The author as well identified a common real estate factor. Myer & Webb (1993) have mixed results about the question whether US REITs are stocks or real estate. In addition, the relationship between US REITs and the real estate market in the United States was analyzed by Pagliari & Webb (1995) who identified only low correlation. Corgel, McIntosh & Ott (1995), Ghosh, Miles & Sirmans (1996) and Liang & McIntosh (1998) found significant instabilities in the correlation between the returns of stocks and direct real estate investments. Similar empirical evidence was identified by the research of Chandrashekaran (1999). He (2000) identified cointegreation between US REITs and US house prices. This result was confirmed by Glascock, Lu & So (2000). Stevenson (2001) confirmed that there is no positive correlation between US REIT returns and direct real estate investments. Nishigaki (2007) confirmed the relation between US REITs and US house prices.

In conclusion, Sebastian & Schätz (2009) as well as Hoesli & Oikarinen (2012) showed that the medium to long-term performance of listed real estate correlates significantly with the development of direct real estate markets. In the shorter term the performance is influenced by stock market developments. The US REIT market is therefore predominately influenced by the development of the underlying properties, which can be interpreted as the key driver of listed real estate in the long run. The authors conclude that long-term investments in listed real estate not only provide opportunities for portfolio diversification but also allow the combination of advantages of both real estate assets, including benefits in terms of liquidity, transparency and management.

In summary, the question whether US REITs are stocks or real estate investments is not clearly answered because of the mixed results of various studies. The studies of Sebastian & Schätz (2009) and Hoesli & Oikarinen (2012) prove that the performance of real estate equities is influenced by the underlying properties in the long-term but not in the short-term. This research finding matches to the dual asset market situation of REITs. On the one hand REITs have access to the private property market and can directly trade individual properties. On the other hand the stock market enables REITs to trade shares that indirectly provide equity ownership of the underlying properties. The research findings of Sebastian & Schätz (2009) and Hoesli & Oikarinen (2012) seem to identify that the dual asset market access is reflected in the time-varying correlations between the performance of REITs and the stock market and real estate market. The profound empirical analysis of the study gives a solid contribution in answering this research issue.

The valuation of US REITs is another important issue in the literature and that has raised controversial discussion, in particular about the selection of the most appropriate valuation methods. According to Geltner, Miller, Clayton & Eichholtz (2007), in practice REITs are frequently valued with the following three main methods:

- Dividend Discount model or Discount Cash Flow model (DDM or DCF)
- Earnings Multiple Shortcuts to DCF
- Premium to Net Asset Value (NAV) of REIT properties

The most appropriate methods according to Geltner, Miller, Clayton & Eichholtz (2007) are similar in comparison with corporate valuation methods. Ryan (2006) considers four basic methods of valuation: the asset based approach, relative valuation methods, flow methods and contingent methods of valuation. The author mentions that flow valuation methods such as DDM or DCF are most frequently applied in practice. The contingent methods of valuation are not mentioned by Geltner, Miller, Clayton & Eichholtz (2007). Contingent methods are based on the option pricing theory. The real options method presents a supplemental valuation method that can be used to take flexibility and optionality into account that are less considered in traditional valuation methods. Option for actions arise to specific management decisions that are typically investment or disinvestment options such as initial public offerings, mergers and acquisitions or (dis)investment decisions with regard to venture capital companies. For example, Marcato & Sebehela (2011) describe option pricing for US REITs M&A under stochastic volatility. Hence, the real option valuation method can be applied as a supplemental valuation method to traditional methods in case of extraordinary management decisions. If such extraordinary options are missing, the real option valuation method is of inferior importance in practice.

The DDM and DCF model as well as the earnings multiples value US REITs in the same manner as other operating companies that are listed on the stock exchange. In the DDM and DCF model the share price equals the present value of expected future dividends. With regard to earnings multiples the share price equals a multiple of the REIT's cash flow. In contrast, the NAV approach is based on the current equity market value of the REIT's

property assets. The share price is determined by adding a premium or discount for future growth opportunities to the REIT's NAV.
The question whether REITs have to be valued with the DCF approach or the NAV approach is an ongoing debate in the literature. Proponents of the NAV approach are for example Green Street Advisors who base their company analyses on the NAV. In addition, Gentry, Jones & Mayer (2004) conducted a simple buy and sell strategy based on NAV premiums and discounts that were calculated by Green Street Advisors. As a result, the authors presented large positive excess returns per month in a period of 1990 to 2002. In addition, Rehkugler (2003) describes the NAV approach the most appropriate method to value real estate companies. On the other hand, there are opponents of the NAV approach such as Geltner, Miller, Clayton & Eichholtz (2007) who believe that REITs should be valued as any other operating companies and generally recommend the DCF method.

The NAV approach calculates the value of the REIT through a sum of the parts approach, that is the individual properties are isolated and valued separately. The sum of the individual property values equals the properties' market value. Subsequently other assets are added and financial liabilities are subtracted (net working capital) which results in the NAV.

	Book value of properties
+/-	Hidden reserves / hidden losses
=	**Market value of properties**
-	Financial liabilities
+/-	other assets / other liabilities (net working capital)
=	**Net Asset Value**

Table 7: Calculation of Net Asset Value

The valuation of the properties is conducted with concepts of real estate valuation such as the cost approach, the sales comparison approach or the income capitalization approach. The NAV approach has the advantage to consider the individual risk and return structure of each property. In addition, the approach eliminates extraordinary items that would distort the true value of the company's assets. In contrast, there are several methodological disadvantages of the NAV approach.

Firstly, the NAV approach does not consider the company's ability to pay out dividends. Even if the calculated NAV increased due to increased property values, an investor who is interested in high dividend payments is not able to derive potential dividends payments (Schäfers & Matzen, 2010).

Secondly, in real estate valuation the income capitalization approach assumes cash flows that are usually customary in the market during the sustainable use of the property. Actual costs and income of streams are not considered. In addition, the approach ignores corporates taxes and synergy effects between the properties. As well value proposition due to portfolio management and legal and taxation advantages are not reflected in the net asset value (Tillmann, 2003). The NAV approach considers the REIT as a passive portfolio of real estate and not a dynamically operating real estate company.

Thirdly, the NAV approach is difficult to calculate because US REITs are allowed to publish limited data about their properties with respect to cash flows and operating costs. Assumptions about missing data can lead to unrealistic property and portfolio values (Schäfers, Siepmann & Stock, 2002).

Also, the NAV includes the market values of other asset and liabilities. From an external perspective, the available information of both components is often insufficient to calculate not biased values (Thomaschowski, Rehkugler & Nack, 2003).

Furthermore, the inherent differences of corporate valuation methods and real estate valuation methods lead to differences in the value of a REIT. The income capitalization approach is different in comparison to the discounted cash flow method with regard to the income and expense components to calculate cash flow and the discount rate. The DCF value is in general higher than the NAV because of the consideration of for example portfolio gains, synergies and the influence of the management. Even if the net asset value is calculated, the determination of the company's market value with the help of a premium or discount is unclear. In the period of 1990 to 2008 US REITs showed NAV premiums on a yearly basis of plus/minus 30% (Clayton & MacKinnon, 2009). The main reason for this discrepancy is that the stock market valuation of property (indirectly through REITs) and the private property market valuation of property (directly) are in the short-term not always consistent. In the long-term both markets tend to agree in their property values which indicates that premiums or discounts follow a mean reverting process (Gentry, Jones & Mayer, 2004). This statement is confirmed by Patel, Pereira & Zavodov (2009) who identified a tendency for discount to NAV to revert to the long-term mean value of 20%. In case the share price of the REIT is higher than the NAV per share than the stock market apparently assumes positive growth opportunities for the REIT (Gentry, Jones & Mayer, 2004). In practice, the NAV approach is widely accepted as a bottom-up approach that is able to at least verify calculated DCF values. One of the strongest proponents of the NAV approach is the research company Green Street Advisors Inc. who apply NAV approach as the primary method to determine the value across companies and use the DCF approach as a back-up approach.

In the following subchapters, the literature review continues with a classification model according to Perry (2002). The classification model has the objective to break down the relationship between the background theories (with regard to valuation methods and return on equity) and the research problem area (with regard to the Gordon Growth Model) and between the research problem area and the research problem. In the background theories, the concept of fundamental (intrinsic) value and other related concepts are introduced. The research problem area comprises the various ways to calculate the terminal value in the DCF model. Subsequently, the research problem of the long-term growth rate is discussed as a basis for research questions and hypotheses.

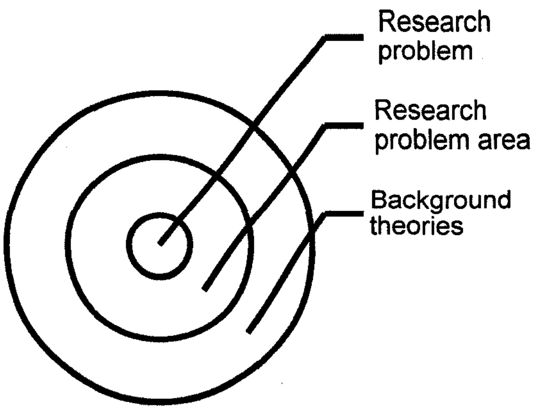

Figure 1: Classification model of Perry (2002)

2.1. The background theories

The three valuation approaches are based on the theory of intrinsic value that is determined by a fundamental analysis of the company. The theory of fundamental value was introduced by the dissertation of John Burr Williams (1938) who focused on the theory of valuation with the DCF model based on a company's dividends. The focus on intrinsic value on Williams' dissertation was affirmed by Joseph Schumpeter (Bernstein, 2005). The theory of intrinsic value resulted in the methodology of fundamental analysis of stocks that is conducted on historical and present data but with the objective of making financial forecasts and predicting the probable share price performance. Thus, the intrinsic long-term value of a company equals the present value of the company's future net cash flows in the form of dividend distributions and selling price. Williams (1938) established the idea of an intrinsic value with the concept of DCF and DDM valuations that was elaborated by Myron J. Gordon and Eli Shapiro (1956).

Further developments that influenced the determination of the intrinsic value are the capital asset pricing model (CAPM) by Sharpe (1964), Lintner (1965) and Mossin (1966) that is based on the work of diversification and modern portfolio theory by Markowitz (1952). As an alternative to the CAPM the arbitrage pricing theory by Ross (1976) was developed that focus on various macro-economic factors influencing an asset's systematic risk. A further successful development of the CAPM is the three factor model by Fama & French (1992, 1993). The authors improved the robustness of the CAPM through the consideration of the *size* effect and distress effect in the model. Carhart (1997) supplemented the three factor model by an additional fourth factor to consider momentum.

Williams (1938) indicated that the present value of all future distributions does in no way depend on what the company's capitalization is. This concept was later substantiated with the theorem of Modigliani & Miller (1958) who argued that under the assumptions of an efficient market and the absence of taxes, bankruptcy costs, agency costs and asymmetric information the value of a company is not influenced by financing (capital structure irrelevance principle). In practice, the theory of intrinsic value was applied in various investing strategies by well-known stock investors such as Benjamin Graham & David Dodd (1934) and Philip Fisher (2003). Other value investors are for example T. Rowe Price, William J. Ruane, Irving Kahn, Charles Brandes or Warren Buffet. Koller, Goedhardt & Wessels (2005) state that significant deviations from intrinsic value are relatively rare and short lived. Nevertheless, the authors mention that from a behavioral finance perspective, markets can fail to reflect economic fundamentals under the conditions of irrational investor behavior, systematic patterns of behavior across different investors and limits to arbitrage in financial markets. Behavioral anomalies are for example over or under reaction to REIT dividends announcements or the disposition effect among REIT management on property level which means that REITs tend to sell winner properties and hold loser properties. In contrast, opponents of behavioral finance theory such as Fama (2009) argue that anomalies are quickly priced out of the market or explained market microstructure arguments. However, behavioral finance anomalies do not affect the results of this research since I have assumed the semi-strong version of the efficient-market hypothesis. The market efficiency hypothesis is not a perfect explanation of everything that happens in the markets but it seems to be the best working proposition used by investors and researchers in a practical sense.

2.1.1. The valuation of REITs

This paragraph focuses on the different variants of the DCF method and explains the respective methodological differences in determining the company value. Today, the major US REITs are publicly traded in the stock exchange and viewed as operational firms that actively manage their real estate portfolios. Subsequently, US REITs are valued in essentially the same way other publicly traded firms are valued (Geltner, Miller, Clayton & Eichholtz, 2007). The DCF method is the most frequently used method of determining the value of a company. The idea behind the DCF method is that the present value of a company can be estimated by discounting its dividends or expected cash flows using the firm's appropriate discount rate (Pratt & Grabowski, 2010). DCF valuations can be categorized into two variants: The entity-approach and the equity-approach. In addition, sub-categories exist such as the adjusted present value method, the entity-approach based on total cash flows and the dividend discount model. If the assumptions of the cost of capital and free cash flows are the same, all methods lead to the same result. The following graph gives a useful overview about the different variants of the DCF method.

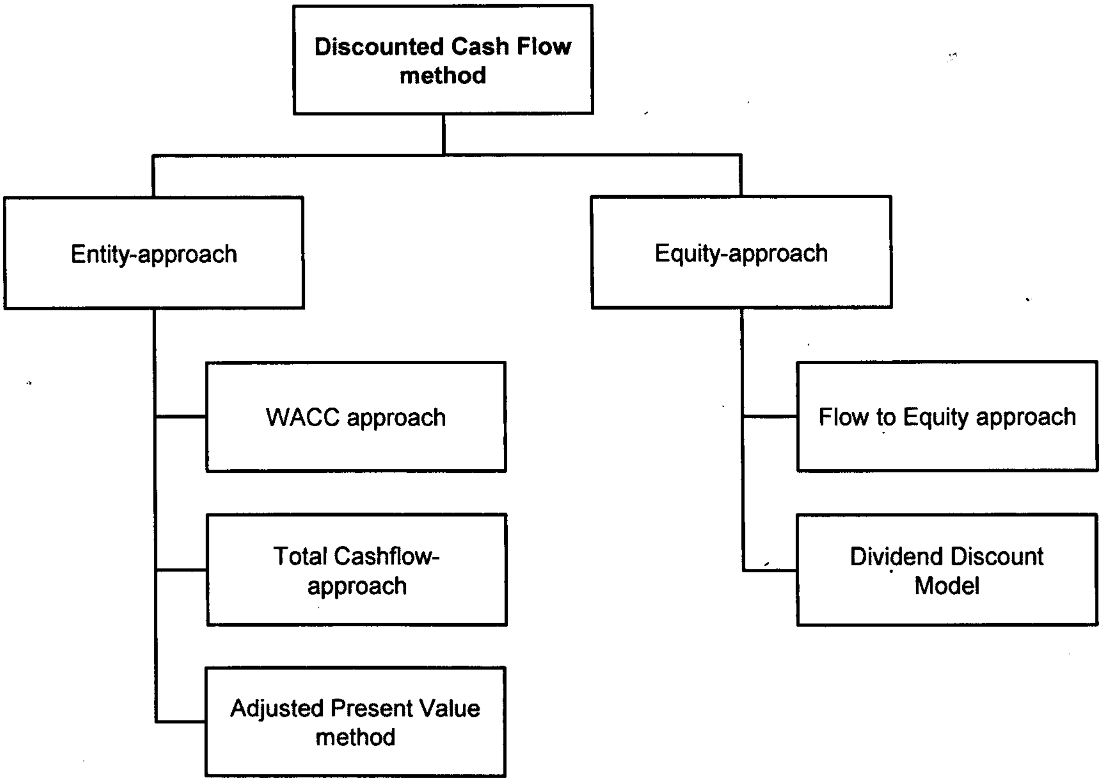

Figure 2: Variants of the DCF method according to Ernst, Schneider & Thielen (2010)

DCF methods derive the value of a company based on the assumption of prospective returns which are expressed through discounted expected cash flows. In all DCF methods the calculated result equals the company's market value of equity. If it is assumed that a company will exist in perpetuity (going-concern principle), then the DCF formula can be separated into a planning period and the terminal value (Preinreich, 1932).

$$V = \sum_{t=1}^{T} \frac{CF_t}{(1+i)^t} + \frac{TV_T}{(1+i)^T}$$

where:

$$TV = \frac{CF_T}{i-g}$$

with:

$V = Company\ value$

$CF = Cash\ Flow$

$TV = Terminal\ value$

$i = capitalisation\ rate$

$g = long\text{-}term\ growth\ rate$

In the entity-approach, the company's value is derived by discounting the future cash flows that concern both shareholders and creditors. The discount rate represents the company's cost of capital and consists of cost of equity and cost of debt weighted to the capital structure of the company. Thus, the discount rate is also named the weighted average cost of capital (WACC) and the entity-approach is often named the WACC method. The sum of discounted cash flows of the planning period is added to discounted terminal value. In the terminal value the capitalization rate of constant cash flows is reduced by an estimated long-term growth rate to consider the company's infinite growth in cash flows. According to an empirical study of Bausch & Pape (2005), the terminal value contributes approximately 90% to total company value. Consequently, a key value driver in the valuation of a company is the expected long-term growth rate of cash flows. The company's value results by adding non-operating assets and subtracting interest-bearing liabilities.

In the equity-approach, the current value of the company consists of the present values of future cash flows that concern shareholders (flows to equity), which are derived from financial projections for a certain number of business years. In order to calculate the terminal value, constant cash flows are assumed for all further years after the planning period, and the subsequent terminal value is discounted. The discount rate equals the required return on equity and is usually determined with the CAPM. The sum of discounted cash flows and terminal value leads to the company's value.

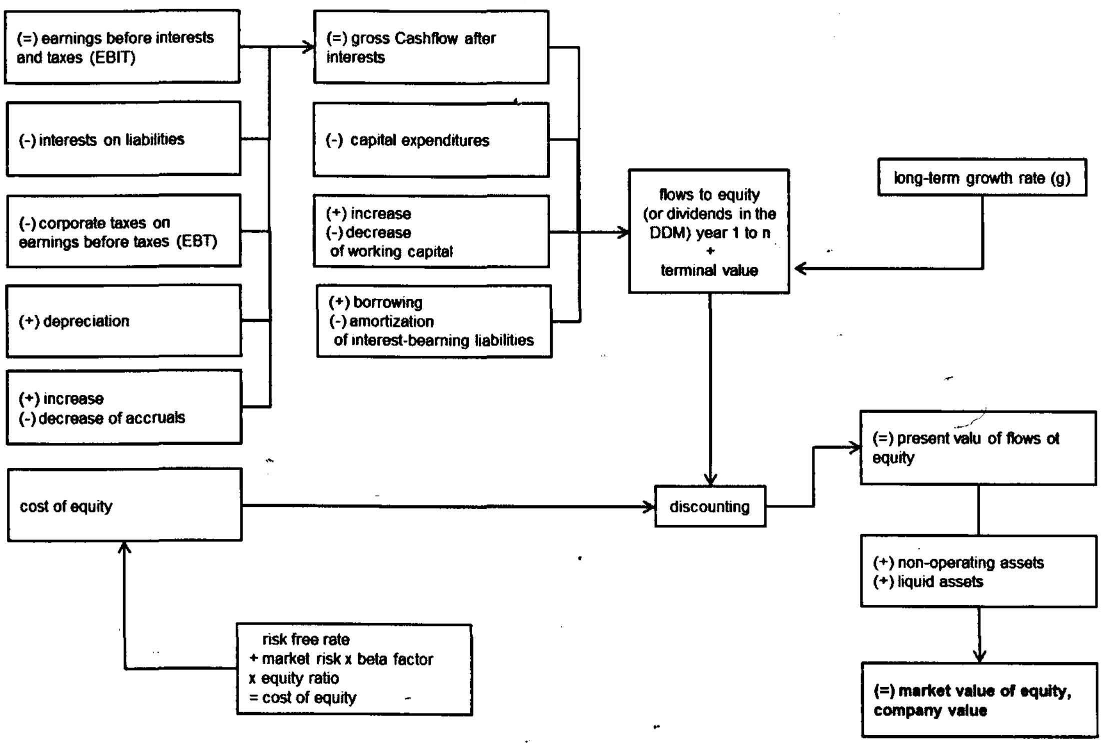

Figure 3: DCF (equity approach) according to Ernst, Schneider & Thielen (2010)

The dividend discount model (DDM) is a variant of the equity-approach and focuses exclusively on dividend payments instead of flows to equity. The amount of dividends is influenced by the company's payout ratio that reduces the flow to equity by the retention of profits. The DDM-formula shows a subsequent stream of dividends discounted at the rate of return on equity that investors expect to receive on other companies with equivalent risks. Dividends are expected to grow forever at a constant growth rate and so the DDM-formula can be simplified for a growing perpetuity (Brealey & Myers, 2006). In the DDM-model the company's value is calculated per share. The company value V is determined by the multiplication of current share price and number of outstanding shares. The denominator $(r - g)$ in the DDM-formula is basically a capitalization rate (cap rate).

The simplification of the DDM has its strengths and weaknesses. One weakness is the assumption of constant dividend growth into the indefinite future. Since earnings are subject to volatility, the company's dividends can be volatile as well. Secondly, the model is only applicable for companies that constantly pay dividends. Also, the model assumes that the company's growth rate in dividends is lower than the rate of return on equity. A negative denominator would contradict the going concern principle because the shrinkage of the company can only be finite. In contrast, the model has the strength that it contains only a minimum number of parameters. This makes it comprehensible and pragmatic for a wide range of users. Secondly, the DDM can lead to reliable results if the company to be valued has a low volatility in earnings, constant dividend payments and a stable rate of return on equity. Empirical evidence suggests that the DDM explains greater than 70% of the company's share value (Ryan, 2006). Also, the DDM can give very interesting insights in terms of pricing and growth assumptions of the market participants. In conclusion, the applicability of the DDM depends on the industry and company being valued. US REITs are normally well established companies with stable and regulated dividend payments and low earnings volatility since their business models focus on rental income that is, in turn, based on long-term lease agreements. In addition, US REITs are listed on the stock exchange which makes the DDM's input parameters observable and transparent.

The entity-approach based on total cash flows differs in comparison to the entity-approach in the incorporation of the tax benefit from debt financing in the operating cash flows. Therefore, the tax shield is not considered in the cost of debt. This variant has the disadvantage that operating cash flows are mixed with effects resulting from financing.

The adjusted present value method is a variant of the entity-approach. In the method the calculation of the company's value is subdivided value into three components. Firstly, the market value is calculated based on the assumption that the company is exclusively equity financed. Thus, the company's operating cash flows are discounted with the cost of equity. Secondly, tax benefits that result from debt financing are incorporated by discounting the tax shield with the average interest rate of the company's debt. The net present value is added to the market value. Finally, interesting bearing liabilities are subtracted from the market value and the net present value of the tax shield.

2.1.2. Return on equity on the basis of the Capital Asset Pricing Model

In the DCF models the CAPM is the most widely used framework for calculating the return on equity. Graham & Harvey (2001) and Bruner, Eades, Harris & Higgins (1998) present empirical evidence that about 80% of the companies in their surveys use the CAPM to calculate expected equity returns. The CAPM was developed by Sharpe (1964), Lintner (1965) and Mossin (1966). The underlying theory of the CAPM is based on the work of Markowitz (1952) and Tobin (1958). The CAPM is based on several empirical inputs such as the risk-free rate, beta and the market risk premium. The formula of the CAPM is set out below:

$$r_e = r_f + (r_m - r_f) \times \beta$$

$r_e = return\ on\ equity$

$r_f = risk\ free\ rate$

$r_m = market\ return$

$\beta = beta$

As an abstraction of the world, the CAPM is based on assumptions which present at the same time the weaknesses of the model. According to Focardi & Fabozzi (2004) the simplification of the assumptions may seem unrealistic but from a mathematical point of view, these assumptions make the CAPM more traceable. The assumptions are based on Sharpe (1964).

1. Investors make investment decisions based on the expected return and variance of returns.
2. Investors are rational and risk averse.
3. Investors subscribe to the Markowitz method of portfolio diversification.
4. Investors all invest for the same period of time.
5. Investors have the same expectations about the expected return and variance of all assets.
6. There is a risk-free rate asset and investors can borrow and lend any amount at the risk-free rate.
7. Capital markets are completely competitive and frictionless.

In general, the assumptions 1 to 5 refer to the decision making of investors. The assumptions 6 and 7 deal with the characteristics of the capital market. The CAPM indicates in assumption 1 that the model uses the same parameters that are used in the portfolio theory. Assumption 2 says that greater risk has to be compensated with a higher return. The CAPM states in assumptions 3 that a risk-averse investor focuses on the portfolio theory of Markowitz and has the object to reduce portfolio risk by combining assets with negative or at least low correlations with each other. The assumption 4 assumes that all investor make investment decisions over a single period investment horizon. The length of that period is not specified and can lead to inconsistency. In practice, the investment decision is more complex than assumed and investors have more than one investment horizon. Nevertheless, the assumption is necessary to simplify the mathematics of the model. Assumption 5 reflects the homogeneous expectations assumption which means that investors have the same expectations with regard to the influencing parameters such as asset returns, variances, and covariances that are necessary to derive the efficient portfolios. Assumption 6 states that there is a risk free rate and that an investor is able to borrow and lend at this risk free rate. In the last assumption the CAPM assumes that the capital market is perfectly competitive. In detail this means that the number of buyers and sellers is sufficiently large. The market cannot be influenced by an individual investor because of all investors are small enough relative to the market. The investors are risk takers and the market price is determined by the equality of supply and demand. In the market no transaction costs or other impediments exist that could influence the interaction of supply and demand of an asset.

Ogier, Rugman & Spicer (2004) states that no clear evidence has yet been produced to either support or disprove the CAPM as explaining required returns. Copeland, Koller & Murrin (2002) and Kothari, Shanken & Sloan (1995) argue that despite all theoretical and practical weaknesses the CAPM must not be rejected because there is no alternative theory that leads to better results. Other authors modified the CAPM to incorporate other influencing factors. For example, Brennan (1970) introduced the consideration of differential personal taxes into the CAPM. Mayers (1972) introduced non-marketable assets into the overall pricing structure of the model. Another example is the work of Jagannathan & Wang (1996) who included human capital into the asset pricing structure.

While in practice the CAPM is most frequently used to determine the rate of return on equity, in research other approaches such as the Arbitrage Pricing Theory (APT), the Fama-French three factor model or the four factor model of Carhart (1997) are being used. No clear evidence has yet been presented to either support or disprove the CAPM to explain the rate of return on equity. In the literature Ogier, Rugman & Spicer (2004) argue that situations in which CAPM are less robust than other models include small companies, companies with extreme book to market ratios and highly leveraged companies. The APT of Ross (1976) extends the CAPM to a multivariate linear model including the sensitivity of the security to macro indicators such as inflation, industrial production or the term structure of interest rates. Fama & French (1993) introduced a three factor model which is based on the CAPM but introduces the consideration of the size and distress effect. Firstly, the size effect is measured as a size premium defined as the difference in return between a portfolio of the smallest stocks in the economy and a portfolio of largest stocks. Secondly, the distress effect is measured as a premium defined as the difference in return between a portfolio of the highest book to market value stocks and a portfolio of the lowest book to market value stocks. Carhart (1997) presented a four factor model which additionally considers momentum. The momentum factor equals the difference in returns between the top and bottom third of all ordinaries stocks, ranked on the basis of their prior six month returns, lagged by two months. While the CAPM is not as empirically robust as other approaches, the model has a virtue of simplicity and is still most frequently used in practice. There, the CAPM simulates an adequate rate of return on equity on an arms-length basis.

2.1.3. Components of the Capital Asset Pricing Model

In the following paragraph the components of the CAPM, namely **risk free rate**, **beta** and **market risk premium** are introduced and relevant literature is specified.

The determination of the **risk free rate** is based on the separation theorem according to Tobin (1958) who argues that investors can separate an investment into a capital investment that is risk free and a non-risk free portfolio. The investor's return on equity is separated into a risk free rate and an investment that includes risk as a function of the investor's risk aversion. The risk free rate represents the return an investor can achieve on the least risky asset at the market. The risk free rate can be stated in either nominal or real terms which are enabled by the equation of Fisher (1977). It is important that the risk free rate and any cash flows to be discounted are consistent to each other with regard to real and nominal terms and currency. In practice, the determination of the risk free rate is usually estimated by the yield on a short dated government security. Ryan (2006) argues that the best estimate of the risk free rate of return is the return on a short term government bill. The use of a short dated bill minimizes the included uncertainty. A longer maturity would potentially include more volatility through the inflation or changes in the general level of interest rates (maturity risk or investment rate risk). In contrast, authors such as Koeller, Goedhart & Wessels (2005) argue that the term of the risk free rate has to be consistent with the term of the discounted cash flow (consistency principle). Otherwise the bondholder must reinvest at possible higher or lower rates when the short-term bill matures. This could result in misestimates of the opportunity cost of capital of long-term investments. However, the selection of the risk free rate's term is not fully clarified in the literature because of the advantages and disadvantages of each procedure. In conclusion, one can assume that at maturity of a short-dated treasury bill, the refinancing of the borrowing is possible by rescheduling the holdings of the risk free security at similar price levels.

In the CAPM the **beta factor** is a measure of systematic risk. According to Sharpe (1964) the CAPM separates the total risk of a company into systematic and unsystematic risk. Systematic risk reflects risks that result for example from macroeconomic and political influences. Other forms of systematic risk are changes in currency exchange rates, changes in commodity prices, cyclical fluctuations, tax reforms, wars and natural catastrophes. The systematic risk is non-diversifiable and influences companies in different degrees. An investor is not able to eliminate the systematic risk through diversification. In contrast, the CAPM assumes that unsystematic risk can be diversified away by holding a diverse portfolio. The unsystematic risk comprises all company specific risk factors for example competitiveness of products offered, existence of market barriers, number and size of competitors, market launch of substitution projects, degree of dependence from suppliers and customers and, quality of management. As a result, the only risk that equity investors are confronted with is the systematic risk.

A company's beta represents the systematic risk by measuring the historical covariance between the returns on the company's share price and the returns from the stock market (index) as a whole. A company beta of one means that the company's returns completely follows the market's returns. If the company's beta is zero, the company's returns are independent of the market's returns. A positive beta that is greater or smaller than one means that the company's returns follow to a certain degree to the market's return. If the company's beta is greater (smaller) than one, the company's volatility in returns and therefore its risk is higher (lower) than that of the market. A negative beta shows that the company's returns move in opposite to the market's returns.

$$\beta_e = \frac{Cov(r_i, r_m)}{\sigma^2(r_m)}$$

With:

r_i, r_m= *Covariance between stock returns on stock (i) and the returns on the market index (m)*

$\sigma^2(r_m)$ = *Variance of the market index (m)*

For the derivation of beta the ordinary least squares regression is applied that measures the change in a company's share price plus the received dividend income and the change in the value of the stock market (index) in the past. In the literature, Black, Jensen & Scholes (1972) contributed to the reduction of biases with the use of estimated betas rather than historical betas. This approach is further outlined in a detailed overview by the work of Campell, Lo & MacKinlay (1997). Black (1972) has rejected the assumption that investors can borrow at the risk free rate. In contrasts the author mentions that combinations of portfolios on the efficient frontier are efficient under the assumptions that all frontier portfolios have a correspondent uncorrelated portfolio. Risk and return can be expressed as a linear relationship. Fama & French (1992) argued that there is no empirical support for a relationship between average return and beta. The authors examined the share returns of companies listed on the New York Stock Exchange between the years 1963 to 1990 and found that differences in beta do not explain the performance of different shares. In contrast, a company's total market value and market to book ratio explained these differences. The research results of this study are often titled with the expression "beta is dead". Fama & French (1996) introduced a three-factor model as an alternative to the CAPM. The three factor model reflects the equity risk premium, the effects on return on equity through company size and the ratio of book-to-market value. Subsequently the controversial debate about the beta as a measurement for systematic risk continued with the research of Kothari, Shanken & Sloan (1995) who identified empirical support for a relationship between beta and return based on annually estimated betas. Roll & Ross (1994) categorized proxies that present particular relations between expected returns and historical betas. In case of a no relation, a market portfolio proxy lies not only inside the efficient frontier but also close to the frontier. The authors argue that market portfolio proxies are mean-variance inefficient. The assumption that there is an exact linear relation between expected returns and historical betas when the market portfolio is on the ex-ante mean-variance efficient frontier has found little support from an empirical research perspective. The appropriate estimation of the CAPM's input parameters and in particular of beta resulted in considerable debates. In the literature, some statistical adjustments are suggested for the usual estimation of beta. For example, Blume (1971) suggested an adjustment for mean reversion, Scholes & Williams (1977) proposed an adjustment for non-synchronous trading and Vasciek (1973) presented adjustments of beta with regard to the highest and lowest standard errors. In the literature, the measurement error of beta is predominately accepted. The adjustment of Blume (1971) has the objective to reduce this measurement error. Blume (1971) identified portfolios consisting of securities with betas closer to one were more stable than those portfolios including stocks with betas at the extremes. This means that a greater measurement error appears with betas of extreme values. As a consequence of this, Blume (1971) developed a formula to adjust the (raw) beta to an adjusted beta.

$$\beta_{adj} = \beta_{raw} \times P + 1 \times (1 - P)$$

With:
P = measure of estimation error
1 = beta of the market portfolio

In practice, this technique is applied by some information service providers such as Bloomberg and ValueLine. In doing so, these companies weight the raw beta by a factor of 0.66, that is P = 0.66 and the market portfolio by 0.33. Gray, Hall, Bowman, Brailsford, Faff & Officer (2005) presented empirical evidence that the use of the Blume adjustment significantly improves the beta estimate regardless of the length of the estimation period. Furthermore, the authors suggest to use a longer period than five years of data and to adjust the beta towards one by the Blume adjustment. In the absence of any such data, the authors recommend that the best estimate for a company's beta is one.

The market return represents the additional expected return of an investor who invests in a certain market rather than in a risk free rate. The determination of **market risk premium** highly depends on the applied measurement approach. In the literature, the determination of the market risk premium is controversially discussed within the scope of several researches that focused on the issue that the input variables of the CAPM are subject to measurement errors and proxies. In particular, Black, Jensen & Scholes (1972) and Miller & Scholes (1972) discussed the determination of the market portfolio with the help of proxies. As a result, both papers recommend the identification of the market risk with proxies. In addition, Foster (1977) argued on the basis of a selected market portfolio proxy that the chosen proxy provided plausible results to determine the market portfolio. In contrast, Roll (1977) argued against the use of a proxy and emphasizes on the importance to determine the exact identification of the market portfolio despite its problematic practical realization. The so called Roll-critique argues that the datasets used are unable to capture true market portfolios that should include all measures of an investor's wealth such as property portfolios, future earnings potential or pension expectations. In essence, the Roll critic argues that the efficient market portfolio is unobservable unless all tradable securities in the global market place can be identified which seems to be impossible.

In practice, there are basically two approaches to determine the market risk premium: The **historic approach** and the **forward looking approach**.

Firstly, the **historic approach** is based on the assumptions that the past is a reliable predictor of the future; investors' expectations are based on historic performance of the market; and that future market conditions do not differ substantially from those in the past. The historic approaches adhere to several biases such as the selection of time period, the use of arithmetic or geometric mean and the use of non-survivor data. In the literature, the market risk premium is continuously examined by several authors for example Ibbotson Associates (2012), Damodaran (2011), Dimson, Marsh & Staunton (2002, 2007, 2012), Fama & French (2012) or Brealey, Myers & Allen (2006). Fernández, Aguirreamalloa & Corres (2011) examined the selection of the US market risk premium by professors, analysts and companies in a survey with 5,731 answers. According to this research, Ibbotson Associates are most frequently used within the sources of contemporary academic literature. Furthermore, the analysis shows that respondents, and thus market participants, determine the equity risk premium from a variety of different sources.

Ibbotson Associates' data published in the SBBI classic yearbook is a leading source of historical market data, including data on the equity risk premium and firm size-premium, market commentary, and other historical analyses of the capital markets. In comparison to other sources, the SBBI classic yearbook has the advantage to consider adjustments for size and both short-term and long-term risk free rates. In addition, the long time series data of Ibbotson Associates seems to be of highest quality since the data was not necessary to be subsequently corrected in comparison to other sources. These characteristics make the Ibbotson Associates' data the most widely cited source of the historical equity risk premium.

The size premium is an adjustment over the equity risk premium in the CAPM. The size premium is empirically observed and reasoned by the tendency that companies of smaller size are associated with greater risk and thus higher cost of capital. In addition, the size premium captures a marketability premium because the equity of smaller firms tends to be less actively traded than the equity of larger firms. Glascock, Hughes & Varshney (1998) showed that REITs are typically small firms with lower trading volumes relative to common stock companies. In addition, Below, Kiely & McIntosh (1995) found that liquidity is lower. Wang, Erickson & Chan (1995) and Su Han, Wai Kin & Ko (1998) demonstrated that fewer analysts cover REITs. The adjustment of these characteristics is described in Pratt & Grabowski (2010) who recommend the use of Ibbotson Associates data in the CAPM method. According to the authors, no further adjustments besides the size premium (except for company specific adjustments) have to be made because beta reflects any industry effects.

Secondly, the **forward looking approaches** forecast expected returns from investing in the stock market to estimate the equity risk premium. In general, forward-looking approaches solve the DCF formula to market return and thus calculate an implied equity risk premium. Various authors have calculated implied equity risk premiums in which the long-term growth rate of dividends has to be determined as well. For example Cornell (1999) and Claus & Thomas (2001) have used analyst forecasts to determine the long-term growth rate. Fama & French (2001) calculated the equity premium by using long-term dividend growth rates as a proxy for future growth with a focus on the growth of dividend yields instead of cash flows. Koeller, Goedhart & Williams (2002) modified their key driver formula with a focus on the long-term real GDP growth rate. Gebhardt, Lee & Swaminathan (2001) and Lee, Ng & Swaminathan (2003) introduced different adjustments to improve the consistency of the data. The implied calculation of the equity risk premium is often criticized because of the use of analyst forecasts that have a potential upward bias and are only reliable for a short-term period.

On the other hand, some authors have forecasted the equity risk premium with the help of regressions. In doing so, the equity risk premium is regressed against financial ratios such as dividend yield ratio, book to market ratio or earnings to price ratio. The equity risk premium regression approach was tested by authors such as Fama & French (1988), Stambaugh (1999), Goyal & Welch (2003) or Lewellen (2004). As a result, the equity risk premium regression identified some variables that do predict prospective market returns but did not precisely estimate the equity risk premium. In addition, the equity risk premium forecast can be negative. Other critics have doubts on the explanatory power of financial ratios and argue to use historical averages.

2.1.4. Applying the Capital Asset Pricing Model

In the calculation of the long-term growth rate of US REITs, the CAPM is applied since the model is most frequently used in practice and despite of the weaknesses and theoretical debates. With regard to the aforementioned explanations the CAPM's parameters were carefully selected.

Since the short-term Treasury bill removes the maximum level of uncertainty, the **risk free rate** equals the one month US Treasury bill. In doing so, I have avoided to include uncertainty that results from the volatility of the inflation rate during a longer term. The one month Treasury bill has the shortest maturity of all securities issued by the US government. The security is noted in nominal term which is consistent with the other input parameters that are also measured in nominal terms. The one month Treasury bill is also consistent with country and currency risk that are relevant for US REITs and therefore avoids potential biases. The level of the risk free rate is adjusted for every quarter in the period under observation.

The **beta factor** is assumed to be dynamic and individual for every REIT. In practice, the determination of beta raises further questions. The calculation challenges the choice of period over which the beta is measured, the frequency and number of observations are used, the choice of the data service provider and whether a comparator or sector analysis is conducted. Thus, from a practical perspective, the determination of the beta is very complex because of the various parameters that influence the calculation. In the research, I acknowledge that betas should be varying over time since associated risk characteristics of REITs change over time. Hence, I calculated dynamic betas for 60 months' time windows on monthly frequency data with reference to the S&P 500 for each REIT in each quarter. The calculation is based on data of the SNL Financial database. I adjusted the calculated betas according to Blume (1971) to adjust for mean reversion.

The **market risk premium** is determined based on a historic approach. In the research I have chosen the equity risk premium of Ibbotson Associates (2012) for midcap stocks since REITs are typically classified as either small or midcap stocks in the literature. The equity risk premiums of Ibbotson Associates (2012) are calculated over the years 1926 to 2011. Since the equity risk premium of the year 2012 is not yet available, I used the premium of the year 2011 since differences on a year to year basis are marginal. I have selected the midcap classification to avoid the risk of assuming excessive risk premiums. I acknowledged the temporal variation of the market risk premium by the use of dynamic risk premiums for the respective quarter in the period under observation. The use of the market risk premium of Ibbotson Associates is widely covered in corporate finance textbooks such as Pratt & Grabowski (2010) and Drukarczyk & Schüler (2009). The selection of the mid cap equity risk premium of Ibbotson Associates (2012) is further justified in particular for US REITs. According to Glascock, Hughes & Varshney (1998) REITs are typically small firms with lower trading volumes relative to common stock companies. Below, Kiely & McIntosh (1995) showed that liquidity for REITs is lower than for companies in other industries. Wang, Erickson & Chan (1995) and Su Han, Wai Kin & Ko (1998) found that fewer analysts cover REITs. Furthermore, I use an equity risk premium based on a practical-oriented forward looking approach to test the robustness of the equity risk premium of Ibbotson Associates and thus of the regression results.

2.2. The research problem area

The terminal value represents the company's continuing value respectively value in perpetuity. This concept was transferred from the Gordon Growth Model. In the terminal value formula the company has reached a steady state, with constant growth, margins, capital turnover, and cost of capital (Koller, Goedhart & Wessels, 2005). Besides the established terminal value formula, several alternative approaches are used in practice.

Koller, Goedhardt & Wessels (2005) evaluate alternative approaches to determine the terminal value. The authors categorize the most common alternative approaches into other DCF approaches and non-cash flow approaches. In the category other DCF approaches the terminal value formula is modified and certain assumptions are made. One variant is the convergence formula in which it is assumed that the return on new investments converges to the cost of capital. If the return on new investments equals the cost of capital it is not possible to generate any excess profit and thus growth is eliminated. Furthermore, the authors present the so called aggressive-growth formula. This variant assumes that earnings in the terminal value grow at a constant rate which is most often the *inflation* rate. The discounting of the terminal value is conducted with the real cost of capital. This variant can result in overstated company values.

In the non-cash flow approaches category, Koller, Goedhardt & Wessels (2005) present three alternative approaches, namely multiples (for example price to earnings ratio or market to book ratio), liquidation value or replacement costs that are also applicable to determine the terminal value. In summary, the Gordon Growth formula in the DCF approach is the dominating formula in theory and practice to determine the terminal value of a company. The alternative approaches are used in extraordinary circumstances such as insolvency negotiations or during corporate acquisitions.

In the literature, DCF models are differentiated between single-factor models and multi-factor models. A single-factor model assumes that earnings constantly grow in perpetuity (Brealey, Myers, & Allen, 2006). The multi-factor models are subdivided into two-stage and three-stage models. In a two-stage model it is assumed that earnings are accurately predictably over three to five years in a first phase called planning period, and that the company grows for an infinite time in a second phase called terminal value (Ballwieser, 2007). In a three-stage model it is assumed that earnings do not abruptly melt down in a first phase but rather growth on a lower level in a second phase before zero growth is expected in a third phase (Uzik & Weiser, 2003), (Coenenberg & Schultze, 2003), (Koller, Gebhardt, & Wessels, 2005), (Henselmann, 1999). In practice, the two-stage model is widely established. The Institute of Public Auditors in Germany, Incorporate Association – IDW, describes in its principles for the performance of business valuations that the two stage model is frequently used but also stresses that the time-horizon of phases depend on size, structure and industry of the company to be valued (IDW, 2008). In spite of the importance of a multi-factor model described in the literature, it has to be mentioned that in theory single-factor and multi-factor models lead to the same result. The decision which phase model is used lies in the freedom of choice of the valuer.

The calculation of the terminal value is relevant to the research problem area of this thesis. There are several different approaches in the literature used to calculate the terminal value: The Annuity Model, the Growth Model, Exit Multiples, the H-Model, the Fade Factor model and others.

- The Annuity model assumes that cash flows are constant in perpetuity and that the company is not able to realize any growth in earnings. This model is applicable to saturated markets and for companies without capacities and willingness to expand their business (Ernst & Häcker, 2007).

- The Growth model is based on the Gordon Growth Model (Gordon & Shapiro, 1956) and assumes that the company's income grows with a constant rate in perpetuity. The growth model is implemented in the various DCF approaches. From a growth perspective, it does not matter whether dividends per share or total free cash flow of a business are forecasted. The value today always equals future cash flow discounted by the opportunity cost of capital (Brealey, Myers & Allen, 2006).

- Exit multiples assume that a company will be worth some multiple of future earnings or book value in the continuing period. In practice, the company's value is often based on the multiple today (Koller, Goedhardt & Wessels, 2005). Possible multiples can be either trading or transaction multiples such as price/earnings ratio, enterprise value/EBITDA ratio or sales price/EBITDA ratio. The multiple is calculated within a peer group of comparable companies and multiplied with the respective reference figure of the company to be valued. The risk of exit multiples is that they are volatile which can result in huge distortions of the terminal value (Ernst & Häcker, 2007).

- The H-model (Halfway-model) assumes a high growth rate at the beginning of the general planning phase, which declines linearly over time and eventually converges to a (lower) constant long-term growth rate (Fuller & Hsia, 1984).

- The Fade Factor model considers a very competitive environment for the company which causes a declining reduction in the growth rate. A high fade factor results in a faster decline of the growth rate (Schwetzler, 2003). Fade-factors can be viewed as a measurement for the degree of competition within an industry.

- In addition, there are other less stringent models to calculate the terminal value. According to Lee (1999), the terminal value is solely the part of the company value that is generated after the planning period. Stowe, Robinson, Pinot & McLeavey (2002) solely define the terminal value as the phase after the planning period. This shows, that some authors have a more flexible concept to calculate the terminal value

In theory there are several ways to calculate the terminal value while in practice the growth model according to Gordon & Shapiro (1956) is established and most frequently used because it is relatively simple to apply. Since it can be assumed that the majority of the market participants use the Gordon Growth Model, the following explanations focus on the model's details. The model has the underlying assumptions of a constant growth rate of dividends, the going-concern of the company, equal opportunistic costs of the investor and that the constant growth rate of a company is smaller than its cost of capital. In the Gordon Growth Model the market value of a company's equity is derived fundamentally from the assumption of an infinite-horizon valuation. In doing so, the company's cash flows to equity are equated with the company's dividends. Now, the Gordon Growth Model simplifies the formula of fundamental stock valuation models (DDM) into a constant-growth perpetuity formula with the assumption that dividends are expected to grow in each year at a constant rate into the indefinite future. Based on this assumption the DDM formula is transformed to the simpler Gordon Growth Model-formula to determine the market value of a company's equity.

$$V = \frac{DIV_1}{r - g}$$

With:

$DIV_1 = expected\ annual\ dividend$

$V = Value\ of\ the\ company's\ equity$

$r = averae\ cost\ of\ equity$

$g = long\text{-}term\ growth\ rate$

The return on equity equals the company's average return on equity expressed in a single long-term multi-period expected return similar to an investor's internal rate of return. According to the model's assumptions, the parameters of the Gordon Growth Model formula are all measured before individual taxes of the REIT investor. In the Gordon Growth Model formula dividends are not forecasted for each future year. In contrast, an expected long-term average growth rate of the company's dividends is estimated. The long-term growth rate is mathematically defined as compounded annual growth rate and lead to the same result as the geometric mean (Sachs & Hedderich, 2009).

$$x_{geometric} = \sqrt[n]{X_1 \times \cdots \times X_n} = \sqrt[n]{\frac{X_n}{X_1}}$$

With $X_1 > 0$

The long-term growth rate is inherently not quantifiable and represents an approximation of reality. This allows the empirical analysis of the long-term growth rates in the past. The expected long-term growth rate of dividends reflects the REIT's growth from assets in place (existing property cash flow growth as levered), growth from investment of retained earnings (that is cash flow from investments made with earnings retained into the REIT) and future growth opportunities (Geltner, Miller, Clayton & Eichholtz, 2007).

Since the long-term growth rate is a key input parameter in the fundamental valuation method, the growth rate is always connected to the market's efficiency. Investors who use the fundamental analysis to identify misvalued shares and trade on this information contribute to eliminate any mispricing in the market and make the stock market more efficient. Consequently, in an informational efficient stock market the observed share prices are correct and reflect all available information which equals the company's value (Mishkin, 1997). However, it seems unrealistic that every market participant is perfectly informed and knows how to analyze this information. Stiglitz (1993) argues that economists have shown that efficient markets do not require that all participants know how to analyze the information and have rational expectations as to what a security price should be. Efficient markets require that a few people have the information to a certain extent that the efficient markets condition holds. Thus, a comprehensive fundamental analysis should not to be done by every investor since the marginal market participants whose transactions have an impact on the market do such research.

There are several reasons that justify the use of the Gordon Growth Model to determine the value of US REITs. According to the theory of fundamental (intrinsic) value of Williams (1938) and the efficient market hypothesis of Fama (1970) the fundamental market value of equity equals the share price multiplied by the number of shares. Knoll & Hansen (2009) assume a significant correlation between the growth of dividends and profits because dividends are generated from a company's profits. A general assumption of this correlation can be criticized because of the influence of political decisions on dividend payments. But, US REITs form an exception because US REITs are legally required to distribute at least 90% of its taxable income to shareholders annually in the form of dividends. Consequently, this regulation further strengthens the use of dividends as a proxy for cash flows to equity. The return on equity can be derived by the CAPM that determines a company's cost of equity based on capital market theory.

According to Geltner, Miller, Clayton & Eichholtz (2007), US REITs that are traded on stock exchanges are characterized by high liquidity and large transaction volumes. In addition, REIT share prices are highly visible and determined by the market through the interaction of supply and demand from a large number of buyer and sellers. The additional input parameters of the Gordon Growth Model are as well easily observable which enables an investor to use the DDM-formula in particular to determine the value of an US REIT. As a result, the availability of all input parameters of the DDM-formula at the stock markets makes it possible to quantify the long-term growth rate of an US REIT.

In summary, in the case of US REITs the Gordon Growth Model's input parameters such as dividends, share prices and return on equity are empirically observable public information at the capital markets and can be used for further research. In my research, I use the observable input parameters to calculate the implied long-term growth rate which is, in turn used as the dependent variable to test macroeconomic and company specific impacts.

2.3. Growth environment assumptions of the market

The following paragraph has the objective to explain general growth mechanism in the US REITs industry. The growth mechanism is most probably considered by market analysts and is included in terms of independent variables that are tested in the regression.

The market's determination about the REIT's long-term growth rate depends on the assumptions about the growth environment of the REIT to be valued. According to Damodaran (2008) the growth environment consists of the two forces sustainable growth (expansion) and efficiency growth (economic growth). The market's perception of the long-term growth rate depends on the ability of the REIT's management to identify both sustainable and efficiency growth opportunities. Growth opportunities can arise from buy-low and sell-high deals, project developments, the improved management of underlying properties as well as economies of scale, the building of franchise value and so forth (Geltner, Miller, Clayton & Eichholtz, 2007). Improvements in these factors result either in higher revenues or lower expenses of the company. As a result the company's income and profit margins increase which enables the company to increase its growth opportunities respectively long-term growth rate through new investments. According to the aforementioned authors the market assumes the growth environment of an REIT in three possible categories. In the first assumption there is no expansion and some payout of dividends. The REIT is simply viewed as a passive, pass-through entity that owns a static portfolio of properties and has a constant leverage ratio. The growth in dividends is generated from underlying properties. The second category assumes internally financed expansion but no growth opportunities. The REIT grows through the reinvestment of operating profits in identical properties in comparison to the already acquired properties maintaining a constant leverage ratio. The third category assumes internally financed expansion and growth opportunities. The REIT's management is able to identify growth opportunities through new properties and efficiency improvements of internal processes to create value.

Furthermore, the Institute of Public Auditors in Germany, Incorporate Association (IDW) recommends appraisers to specify in valuation reports the determination of the long-term growth rate in three components. Firstly, the nominal growth rate, including the determination and explanation of the effective *inflation* rate, economic *inflation* rate and the assumed shifting of the *inflation* rate to consumers. Secondly, the real growth rate, including explanations of the company's industry, market environment and competitors and performance analyses. Finally, the growth rate induced by the retention of profits, including the specification of the assumed long-term payout ratio. This means in particular the selection of comparable companies, the period under consideration and the procedure of calculating the average (median, arithmetic mean, geometric mean). In practice, the specifications of the IDW are predominately applied by auditors. The guidelines of the IDW are also applied by other market participants because of the high reputation and expertise of the association with regard to corporate valuation. The IDW recommendation contributes to standardization and transparency in the determination of the long-term growth rate. In the theory, Tinz (2010) agrees with these guidelines and argues that the long-term growth is separated into three components. Firstly, nominal growth based on the *inflation* rate; secondly, real growth based on improvements in economic efficiency; finally, internal growth based on retention and reinvestment of profits.

2.4. *Capital structure* and payout ratio in the Gordon Growth Model

In the valuation of US REITs with the Gordon Growth Model under certain assumptions the US REIT's value is independent of its capital structure (leverage ratio) and dividend payout policy. In academic literature the issues of capital structure and dividend policy has motivated intensive attention in scientific research. Modigliani & Miller (1958, 1961, 1963) showed in their Modigliani-Miller theorem four different results. Firstly, under certain conditions a company's debt-equity ratio does not affect its market value. Secondly, a company's leverage has no effect on its weighted average cost of capital, which means that the cost of equity is a linear function of the debt-equity ratio. Also, a company's market value is independent of its dividend policy. Finally, equity-holders are indifferent about the company's financial policy. The Modigliani-Miller-theorem is based on the assumptions of a tax-free world, no capital market frictions (that is no transaction costs, asset trade restrictions or bankruptcy costs), symmetric access to credit markets (that is companies and investors can lend or borrow at the same rate) and company financial policy reveals no information (Villamil, 2008). In case of US REITs the assumptions of the Modigliani-Miller theorem do partly not apply to the real world. In particular, the capital structure may have an impact on the return on equity through the leverage effect. In the research project, the use of the DDM requires discounting dividends with the cost of equity. Therefore, no adjustments for the capital structure are necessary. Other assumptions of the Modigliani-Miller theorem do apply in the case of US REITs because of the regulated conditions a company has to fulfill to achieve the US REITs status. For example, the US REIT's tax legislation means that US REITs pay only little or no corporate income taxes. The US REITs tax status implies that US REITs do not have an incentive to use debt as a means of shielding earnings from taxation through the deductibility of interest (Geltner, Miller, Clayton & Eichholtz, 2007). As a consequence, US REITs meet one of the major assumptions of the Modigliani-Miller theorem and the REITs' share price should not be affected by the capital structure. Furthermore, US REITs meet the assumption of no bankruptcy costs since the year 1993 no default of a corporate bond issued by an US REIT has occurred (NAREIT, 2011). The absence of bankruptcies (and as a result of no bankruptcy costs) and tax legislation, means US REITs approach the perfect world model assumptions of the Modigliani-Miller theorem. In addition, Geltner, Miller, Clayton & Eichholtz (2007) argue that the *capital structure* irrelevance principle means the assumption that a change of a REIT's payout ratio and a subsequent smaller or larger amount of dividends does not affect the company's value per share, keeping the company's return on equity and growth opportunities constant. This assumption means that the payout ratio does not affect the company's required rate of return on equity but rather the allocation between dividend yield and growth. As a result, these assumptions are incorporated by the formula of the Gordon constant dividend growth model, in which expected dividends equal the company's current level of earnings multiplied by the payout ratio ($Div_1 = payout\ ratio \times\ earnings$). Geltner, Miller, Clayton & Eichholtz (2007) suggest that the growth rate in dividends can be defined as the growth rate in the underlying property equity value and the payout ratio multiplied with the underlying equity yield.

$$g = (1 + g_E + p \times r_E)$$

With:

$g_E = growth\ rate\ in\ the\ underlying\ property\ equity\ value$

$r_E = underlying\ equity\ yield$

$p = payout\ ratio$

The authors show that the value of the company's equity is independent of the payout ratio and therefore not affected by shifting g_E to $g = g_E + p \times r_E$ as a result of changing the payout ratio, keeping the company's risk and fundamental growth opportunities (that is positive net present value opportunities) constant. The numerator of the Gordon Growth formula may be the company's current dividends per share or the company's earnings per share. This verification is based on the assumption that the stock market correctly determines the company's value and that the company does not change its risk profile (that is average cost of equity) holding constant its real growth opportunities and business risk.

2.5. The research problem

The concept of the Gordon Growth Model was implemented in DCF models in a so called terminal value. The terminal value assumes a geometric growth of income (cash flows or dividends) and the perpetual existence of the company (going-concern principle).

$$TV = \frac{CF_T}{i - g}$$

With:

$TV = Terminal\ value$

$CF_T = stable\ Cash\ flow$

$i = rate\ of\ return\ on\ equity$

$g = long-term\ growth\ rate$

In case of multi-factor models it is widely discussed how long the time period has to be before the terminal value is calculated. In the literature, it is argued that a detailed forecast of cash flows has to be performed until the company reaches a steady state. Once this state is reached, the Gordon Growth Model can be applied to determine the terminal value (Peemöller & Kunowski, 2005). In addition, it is demanded that the company transforms to a stable growth firm. Stable growth companies are characterized by a relatively low systematic risk, tend to relatively higher debt ratios and have relatively lower rate of returns and reinvestment rates (Damodaran, 2006). In theory, if a company has a positive development of its earnings and has reached a steady state, the valuer has the freedom of choice to use a single factor model to value the company. In that case the planning period is no longer considered.

The Gordon Growth Model is enhanced by some authors. Damodaran (2006) suggests the following formula to calculate the terminal value:

$$TV = \frac{EBIT_{n+1}(1-t)(1-b)}{CoC_n - (b \times RoC)}$$

With:

$t = tax$

$b = retention\ rate$

$CoC = Cost\ of\ Capital\ (WACC)$

$RoC = Return\ on\ Capital$

Hence, the long-term growth rate equals the product of retention rate and return on capital. Damodaran (2006) argues that the expected growth rate depends on the level and quality of the company's reinvestments and is not an externally estimated parameter. According to Damodaran (2006) growth is generated by two components: Firstly, investment in new assets which is called sustainable growth; and secondly, improved efficiency on existing assets which is called efficiency growth. In the assessment of the retention rate not only investments in fixed assets are considered but also changes in net working capital and expenses for research and development. In contrast to the Gordon Growth Model, the long-term growth rate is not isolated. The level of the long-term growth rate depends on the development of the other components of the formula such as EBIT, payout ratio, taxes, cost of capital and the return on capital. An endogenous (indirect) calculation of the retention rate will lead under circumstances to more accurate long-term growth rate. If the assumptions are the same both variants lead to the same result.

$$g = RoC \times (1 - d)$$

$$RoC = Return\ On\ Capital$$
$$d = payout\ ratio$$

In theory, in a steady state a company's rate of return would not exceed its costs of capital assuming functioning markets and pure competition. For example, if a company had achieved higher rate of returns, new competitors would be attracted until the rate of returns decreased as far as new competitors would not find an incentive to enter the market. In this case, new investments would not positively contribute to the company's value. The present value of new investments would equal zero. Thus, in a steady state a company's competitive advantages are exhausted. In contrast, there are authors who argue that on the one hand the decrease of rate of returns is a long-term process and on the other hand that a company is able to achieve a rate of return above its cost capital in the long run (Odagiri & Yamawaki, 1990), (Henselmann & Weiler, 2007). Unfortunately, in valuation literature the level of the reinvestment rate in a steady state is inadequately discussed.

Copeland, Koller & Murrin (2002) developed the value driver model to calculate the terminal value:

$$TV = \frac{NOPLAT_{T+1}\left(1 - \frac{g}{ROIC}\right)}{WACC - g}$$

With:
$NOPLAT = Net\ Operating\ Profit\ Less\ Adjusted\ Tax$
$ROIC = Return\ On\ Invested\ Capital$
$WACC = Weighted\ Average\ Cost\ of\ Capital$
$g = long\text{-}term\ growth\ rate$

While in the terminal value calculation of Damodaran (2006) the long-term growth rate is calculated, in the terminal value model of Copeland, Koller & Murrin (2002) the long-term growth rate has to be estimated. Copeland, Koller, Murrin (2002) introduced the return on invested capital. Therefore, the formula shows whether growth generates, destroys or has no effect on the company's value. If the rate of return of reinvestments after the planning period is lower than the cost of capital (WACC), growth will not contribute positively to the company's value.

In the literature, numerous concepts are mentioned in order to determine the long-term growth rate. Geißel (2009) summarize some relevant concepts and issues in the determination of the long-term growth rate in the DCF model. But there is no profound literature review that gives an overview about the different concepts to calculate the long-term growth rate. The following paragraphs present concepts to determine the long-term growth rate with both historic approaches and forward-looking techniques. The forward looking techniques are further subdivided into endogenous or exogenous approaches. On the other hand the historic approaches are subdivided into implicit calculative approaches, statistical approaches and approaches that use (non) linear extrapolations. The classification of the different concepts represents the theoretical framework of the research project. These alternative approaches are all based on the Gordon Growth Model.

2.5.1. The past oriented determination of the long-term growth rate

- **(Non) linear extrapolation through regressions or simple long-term averages**

  Hail & Meyer (2002) suggest the linear or non-linear extrapolation of the long-term growth rate. In doing so, developments in the past are carried forward into the future. The long-term growth rate is calculated with simple regression models or as the average of multiple years. In addition, the authors argue that aggregated growth estimations of financial analysts can be used because of the financial analysts' predominant knowledge. For the verification of the financial analyst's growth estimates within a probability distribution the expected value or standard deviation can be calculated. As an alternative, Hail & Meyer (2002) suggest using implied growth assumptions of current market data in combination with the management's outlook. Implied growth assumptions can be derived by solving the price/earnings ratio to growth. On the other hand, the long-term growth rate can be determined by the estimation of its significant components. Hail & Meyer (2002) argues that long-term growth depends on the retention ratio (1 – payout ratio) of the distributable income and the return of the reinvestment.

  Damodaran (2001) argues that the long-term growth rate can be estimated by looking at the historical growth rate of a company's earnings. In case of stable companies, historical growth rates can be used as an estimate of the expected future growth rate. The author emphasizes that historical growth rates are not always a good indicator of future growth rates in particular not for young companies such as technology firms. In addition, other problems occur such as the calculation of the average (arithmetic versus geometric average) or negative earnings in the past. Furthermore, Damodaran (2001) empirically proves that revenue growth correlates more consistently over time than earnings growth does. In addition, Mueller (1998) states that historical statistics show that US REITs' price growth is more highly correlated to funds from operations (FFO) per share growth than to total size growth. As a result, the study empirically proves that the relation between dividend yields and expected growth is negative. This interdependency is explained from a mathematical perspective as well. If the DDM formula is solved to growth a higher dividend yield reduces the return on equity and thus the long-term growth rate. Hence, high dividend yields and low prices express lower expectations of future dividend growth.

In contrast to Hail & Meyer (2002) and Damodaran (2001), in valuation literature the usage of historical data to estimate growth rates is controversially discussed. Chan, Karceski & Lakonishok (2003) argue that the use of linear or non-linear extrapolation has to be declined from a statistical point of view because of the low persistence and predictability of growth. The authors analyzed historical long-term growth rates across a broad cross section of stocks using several indicators of operating performance. The study found a relatively small number of companies that had historically grown at high rates and could be expected to continue growing at similar rates into the future. Chan, Karceski & Lakonishok (2003) concluded that there is no persistence in long-term earnings growth and there is low predictability even with a wide variety of predictor variables. In addition, valuation ratios have limited ability to predict future growth. The institute of public auditors in Germany, incorporated association (IDW) argues that since historical data cannot be taken without a detailed analysis of the company's current situation historical data seems to be unsuitable (IDW, 2008). In addition, Moxter (1983) states that extrapolation violates the principle of future orientation of DCF valuations.

Although the research project focuses on data from United States, in Germany some researchers estimate the long-term growth rate by the analysis of valuation reports. In the United States, similar research on valuation reports of REITs or other sectors does not exist which presents a research gap. Nevertheless, the subsequent literature provides an interesting approach to determine the long-term growth rate which could be applied for US REITs as well.

Schüler & Lampenius (2007) identified that the long-term growth rate is assumed to be 1% in practice. In their research of 125 valuation reports of German companies between the years 1985 to 2003 the authors found that the long-term growth rate was assessed to be 1% in 51 valuation reports (40.8%). The long-term growth ranged from 0% to 2.6% and was on average 0.65%. Munkert (2005) presented similar results in a research study with a sample of 171 valuation reports between the years 1986 to 2003. The results ranged from 0% to 3.25% and were on average 0.69%. The author observed in his study that companies with different growth perspectives were assessed with the same long-term growth expectations and that the determination of the long-term growth rate was not subject to a systematic procedure. Other studies focused on the long-term growth rate that was established in valuation reports for legal settlements. Rathausky (2008) empirically analyzed 133 valuation reports in conjunction with squeeze-out settlements between the years 2002 to 2004. The long-term growth rates determined by jurisdiction ranged from 0.5% to 3.25% with an arithmetic mean of 0.85%. Munkert (2005) presented comparable results based on jurisdiction in Germany between the years 1986 and 2003 that ranged from 0% to 2.6%. In addition, Hachmeister, Kühnle & Lampenius (2009) empirically analyzed 117 valuation reports based on squeeze-outs between the years 2002 and 2008. The arithmetic mean was 0.83% with a range from 0% to 3.25%. In Germany the Institute of Public Auditors (IDW) recommends a long-term growth rate between 0% and 2.5%. Although the IDW is recognized as an authority in valuation issues, the question arises whether its recommendation should be applied without any scrutiny.

- **Statistical approach**

  Widman, Schieszl & Jeromin (2003) apply a statistical approach and argue that a company's profits often do not grow on the level of the *inflation* rate. In an empirical study, the authors analyzed annual reports of German companies from the years 1971 to 1994. The result shows that on average a company's earnings have grown by 1.7% per annum while the average *inflation* rate has been 3.7% on average. In the years 1971 to 2001 a company's averaged earnings have grown by 1.4% per annum and the average *inflation* rate has been 3.1%. The cause for the lower growth of the company's earnings in comparison to the *inflation* rate seems to be reasoned by companies that were not able to transfer completely their cost increases to their sales prices. Widman, Schieszl & Jeromin (2003) conclude that there is a cyclical stable relation between *inflation* rate and the level of growth in a company's earnings of 45% to 50%. Based on this empirical result, the authors recommend that the long-term growth rate is determined by 50% of the respective *inflation* rate. Subsequently, the calculated long-term growth rate has to be reduced by a premium for insolvencies.

The approach of Widman, Schieszl & Jeromin (2003) and the following discussion of the results was unfortunately not conducted for US companies. Similar research for US REITs or other sectors does not exist. However, the results of Widman, Schieszl & Jeromin (2003) present an interesting approach that indicates the level of the long-term growth rate and its interdependencies. The discussion of the results of Widman, Schieszl & Jeromin (2003) are presented in the following paragraph.

Munkert (2005) criticizes that the calculated earnings growth number of 1.7% is not verifiable and calculates an earnings growth rate of 3.38% (unweighted arithmetic mean), 0.19% (weighted arithmetic mean) and 2.18% (geometric mean). This would result in a ratio of 90% with the arithmetic mean and 60% with the geometric mean.

Furthermore, Munkert (2005) states that a historical growth rate has only limited reliability to forecast growth in the future. In addition, other authors analyzed the earnings growths of German companies in several empirically studies. Knoll, Lobe & Tartler (2009) analyzed the growth rate of cumulative earnings of companies in the years 1960 to 2006 which resulted in a growth rate of 6.5%. The authors additionally calculated the growth rate of net incomes which was 6.0% (before taxes) and 6.5% (after taxes). Hansen & Knoll (2005) examined the growth of dividends in the years 1977 to 2004 and identified a growth rate of 3.5%. Knoll & Sedlacek (2008) analyzed the growth rate of Earnings Before Interest, Taxes (EBIT), Earnings Before Taxes (EBT), net incomes and dividends and presented long-term growth rates of 12.8% (EBIT), 13.4% (EBT), 12.3% (net income) and 10.7% (dividends). The empirical analyzes of various measures of profit seems not to lead to significant results because of the wide range they encompass. The heterogeneous results are difficult to compare and require further research. In summary, even though the aforementioned results are not specifically contextually relevant to US REITs, the results portray attempts to estimate the long-term growth rate. The sampled companies were from different sectors that do not share similar attributes with US REITs. However, the results show that there can be varying results in the estimation of the long-term growth rate on the basis of historic data.

- **Concepts based on retrograde calculations to determine the implied long-term growth rate**

Geltner, Miller, Clayton & Eichholtz (2007) states that the Gordon Growth Model (or constant growth perpetuity model) can be used as a mathematical tool to solve for any one of its three constituent variables (dividends, cost of equity and growth) as a function of the other two variables. This allows for empirical analyzes and speculation, especially if combined also with the CAPM. Gebhardt, Lee, & Swaminathan (2000) calculated for example the implied cost of capital. Other studies focus only on one component of the cost of capital for example the implied beta by Borgman & Strong (2006) or the implied cost of equity by Gode & Mohanram (2001). Easton, Taylor, Shroff, & Sougiannis (2002) simultaneously estimated sample averages for cost of equity and expected growth in earnings. Nekrasov & Ogneva (2011) modified the work of Easton, Taylor, Shroff, & Sougiannis (2002) by firm specific cost of equity and firm specific expected growth in earnings. The study considers companies available in the Institutional Brokers Estimates System (I/B/E/S), Compustat and CRSP in the years 1980 to 2007. A cross-sectional prediction model is applied that first regresses past realized growth on past growth characteristics and then applies the resulting coefficients to current growth characteristics to arrive at a growth forecast. In the regression model the authors specify the analyst long-term growth forecast, research and development expenditures, and the difference between industry return on equity and the firm's average forecasted return on equity as growth drivers respectively independent variables. The result robustly predicts earnings growth beyond the five year horizon. The approach of Nekrasov & Ogneva (2011) not only uses a past oriented calculation of growth but also allows a future oriented determination of the long-term growth rate.

Damodaran (2001) gives emphasis to the weak relationship between past and future growth and mentions that firms and sectors grow through growth cycles, with high growth in one period followed by low growth in the next period. However, as an exception the historical long-term growth rate can be used as an estimate of the expected future growth rate in case of mature growth or mature companies who are in a steady and stable state. In addition, Damodaran (2008) argues that there may still be value in comparing the market implied growth in earnings to growth estimates used in valuation. Damodaran (2008) separates the long-term growth rate into the components sustainable growth through investments in assets (expansion) and efficiency growth through increased efficiency. Both types of growth were calculated for US companies of different industries including REITs in the year 2007. US REITs were further separated to their underlying real estate types. The calculation of efficiency growth rates resulted in -0.91% for diversified REITs, 5.62% for industrial REITs, -2.49% for office REITs, -0.52% for residential REITs, 0.89% for retail REITs and 7.89% for specialized REITs. Sustainable growth rates amounted to -42.33% for diversified REITs, -20.13% for industrial REITs, -39.79% for office REITs, -21.25% for residential REITs, -33.46% for retail REITs and -0.27% for specialized REITs. Even though the study does not show the input parameters to calculate the sustainable growth rates in detail and focus only on one year, Damodaran (2008) gives a rough estimation about the level of growth rates of US REITs without analyzing their fundamental influencing factors.

Christofi & Christofi (2010) focus on the methodology of the DDM and its use as a benchmark valuation criteria. The authors argue that valuation literature does not explore the application of the DDM using actual data. Christofi & Christofi (2010) have the objective to demonstrate how the implied growth rate and the terminal value can be used as an alternative valuation benchmark and suggest the usage in theory and practice. Based on Dow Jones industrial average stocks, Christofi & Christofi (2010) calculated an implied long-term growth rate of 6%. The findings of Christofi & Chrstofi (2010) show that the DDM can be useful to calculate the long-term growth rate.

Hail & Meyer (2002) suggest using the implied growth rate as an alternative to the extrapolation of growth rates in the past. The authors recommend that the appraiser focuses on current market data in combination with the management's outlook by solving the price/earnings ratio to growth.

From a methodological perspective, research studies on implied valuation input parameters have used historical data as proxies for forecasts in the determination of the relevant parameter. Subsequently, the influences on the respective variable are explained with the help of a regression analyzes. Often an implied variable is used as benchmark criteria to show market expectations Rappaport (1986) suggest a value driver model that includes value growth duration in coherence with a competitive advantage period. Mauboussin & Johnson (1997) introduced the concept of a market-implied competitive advantage period that combines competitive advantage with shareholder value creation. In Rappaport & Mauboussin (2001) the concept of a market-implied competitive advantage period is extended as part of a stock selection programme. In summary, the approaches of the aforementioned authors show that the methodology to determine the implied growth rate based on retrograde calculations can be used for new concepts in the finance and controlling area.

2.5.2. The present / future oriented determination of the long-term growth rate

- **Exogenous estimation with consensus forecasts for listed companies**

Hail & Meyer (2002) state that aggregated growth estimations of financial analysts can be used to determine the long-term growth rate. This is because financial analysts possess predominant knowledge about the company or sector and adequate estimations are possible. Subsequently, the estimates have to be statistically analyzed within the probability distribution by expected value or standard deviation. Damodaran (2008) states that analyst estimates of growth and earnings have some predictive value for short-term earnings forecasts but are not reliable for long-term growth forecasts. The author stresses that financial analyst's growth estimates are normally not longer than five years. In doing so, earnings or growth forecasts have often a tendency towards herd behaviour (Scharfstein & Stein, 1990). Dechow, Hutton & Sloan (2000) state that analyst evaluations are more often based on stock recommendations and the accuracy of annual earnings forecasts than on the accuracy of long-term growth forecasts. Ramnath, Rock & Shane (2008) present that financial analysts are influenced by incentive and behavioral biases. Damodaran (2008) argues that analyst's forecasts are useful but often inherent with significant errors because the analyses are influenced by unreliable historical data and data mining and non-observance of significant shifts in the fundamental characteristics of the company. Short-term forecasts are on average reliable while long-term forecasts increasingly deteriorate in accuracy. Thus, consensus estimates of long-term growth from equity research analysts are over optimistic and contribute very little to predicting realized growth over long horizons (Chan, Karceski & Lakonishok, 2003), (Damodaran, 2001). This conclusion is confirmed by Herrmann (2002) who argues that consensus forecasts have partial prediction power for the long-term growth rate.

As well, Cragg & Malkiel (1968) identified that there is little evidence to suggest that analysts provide superior forecasts of earnings when the forecasts are over three or five years. In contrast, Vander Weide & Carlton (1988) find that consensus estimates of five years growth is superior to historically oriented growth estimates in forecasting future growth.

- **Exogenous estimation with macroeconomic indicators**

Baetge, Niemeyer & Kümmel (2005) argue that *economic growth* can be used as a benchmark for the long-term growth rate. *Economic growth* is usually defined as (both real and nominal) Gross Domestic Product (GDP) growth. Albrecht (2004) as well as Copeland, Weston & Shastri (2005) and Stellbrink (2005) argue that the use of the macroeconomic indicator GDP growth as a benchmark in terms of an upper limit is rational because if a company's growth rate would be higher than that of the economy, the company's volume would exceed that of the economy in perpetuity. Koller, Goedhardt & Wessels (2005) states that only few companies can be expected to grow faster than the economy for long periods. Albrecht (2004) argues that the long-term growth rate of a company can possibly exceed the growth of its economy in the short-term. Koller, Goedhardt & Wessels (2005) empirically analyzed cross-industry the revenue growth of companies between the years 1963 to 2003. As a result, real revenue growth of 6.3% was calculated. In comparison, the real GDP growth in the United States accounted for 3.3%. The authors argue that self-selection, specialization and outsourcing, global expansion, the use of medians and non-organic growth, are possible reasons for the difference. Booth (1998) and Foerster & Sapp (2005) estimated the long-term growth rate with several macroeconomic indicators such as the change of the Gross National Product (GNP), the *inflation* rate, the yield of a long-term government bond and conclude that the GNP is one of the best performing estimates of the long-term growth rate. The sample of Booth (1998) comprises Canadian telecommunications companies for the period of 1975 to 1995 while Foerster & Sapp concentrated solely on the Bank of Montreal for the period of 1885 to 2003. Even if the sampled companies were from different sectors that do not share similar attributes with US REITs the results show that macroeconomic indicators do have an influence on the long-term growth rate. Knoll, Lobe & Tartler (2009) assume significant correlation between long-term growth of corporate profits and the development of the GDP. In addition, Schultze (2003) and Copeland, Koller & Murrin (2002) assume that the GDP can serve as a benchmark for the long-term growth rate. In opposition to aforementioned authors, one can argue that the definition of GDP is more comparable to sales than to earnings of a company from a company perspective. GDP is defined as the value of all goods and services produced in an economy within a particular time span (Blanchard, 1997). Thus, the adequacy of GDP growth as a benchmark is in question because the long-term growth rate refers to a company's earnings.

Other macroeconomic indicators range from using the growth rate of private consumption or productivity to the *inflation* rate. Koller, Goedhardt & Wessels (2005) claim that the best estimate of the long-term growth rate is probably the expected long-term rate of consumption growth for the industry's products plus *inflation*. Widman, Schieszl & Jeromin (2003) established the influence of the *inflation* rate to a company's earnings growth. In opposition to the aforementioned authors, Kajanoja (2004) argues that the consideration of the *inflation* rate in the estimation of the long-term growth rate involves two difficulties: Firstly, the estimation of the expected *inflation* rate. Secondly, the assessment whether increases in prices can be completely passed on to consumers. These difficulties are important issues because the practical application of the *inflation* rate as an estimator for the long-term growth rate demands the *inflation* rate`s quantification and the knowledge whether prices increases can be shifted to the consumer.

In practice, it is assumed that prices in procurement markets and selling markets have the same development and that there are no changes in quantities. Valuers often lower the long-term growth rate and argue that only a few companies are able to completely pass on the *inflation* rate to selling markets.

Furthermore, other authors include macroeconomic indicators in their concepts to determine the long-term growth rate. For example, Albrecht (2004) incorporates the expected *inflation* rate and expected *economic growth*. Koeller, Goedhardt & Wessels (2005) exclude company specific variables and focus only on macroeconomic indicators and combine the *inflation* rate and rate of consumption growth for the industry's products. Lally (2008) and Bradley & Jarrell (2003) focus besides the retention ratio and the nominal rate of return mainly on the *inflation* rate.

In the concept of Lally (2008) the author uses the DDM to determine the value of the company. The model establishes a direct link of *inflation* to the long-term growth rate. With regard to Gordon & Shapiro (1956), Lally (2008) assumes a constant growth rate for expected dividends as well. In addition, a constant retention ratio and nominal rate of return for the company's earnings are assumed. The long-term growth rate is calculated as an endogenous variable within the terminal value formula.

$$g = inf + (i^n - inf) \times b$$

$$for\, i > inf$$

With:
$g = \textit{long-term growth rate}$
$inf = \textit{inflation rate}$
$i^n = \textit{nominal rate of return}$
$b = \textit{retention rate}$

The long-term growth rate by Lally (2008) is determined by the expected *inflation* rate and the expected real growth of retained earnings. The formula implicitly assumes that dividends will grow in perpetuity on the level of the *inflation* rate even if there is no retention. The rate of return equals the return on equity.

In the concept of Bradley & Jarrell (2003) the formula to estimate the long-term growth rate is similar to the formula of Lally (2008) but considers the discounted cash flow model to determine the value of the company. The long-term growth formula consists on one hand of the product of payout ratio $(1 - b)$ and *inflation* rate and on the other hand of the product of retention rate and the nominal rate of return.

$$g = b \times i^n + (1 - b) \times inf$$

With:
$g = \textit{long-term growth rate}$
$b = \textit{retention rate}$
$i^n = \textit{nominal rate of return}$
$inf = \textit{inflation rate}$

If rearranged the formula equals the long-term growth formula of Lally (2008). The long-term growth rate formulas of Lally (2008) and Bradley & Jarrell (2003) commonly incorporate an additional component for the influence of *inflation*. Wiese (2005, 2007), Knoll (2005), Wagner, Jonas, Ballwieser & Tschöpel (2006) and Meitner (2008) agreed on an additional consideration of *inflation*.

In opposition to these authors, Friedl & Schwetzler (2008) criticised the consideration of an additional component for *inflation*. If the long-term growth rate of earnings is determined within the scope of a consistent nominal calculation, a consideration of an additional component owing to the influence of *inflation* has to be abandoned. A combination of growth components owing to the influence of retention and *inflation* is not compatible with a consistent nominal calculation that considers direct cash flows or accounting earnings. The correct long-term growth rate equals the growth formula of Gordon & Shapiro (1956) even if *inflation* has been considered (Friedl & Schwetzler, 2008). Furthermore, Kiechle (2010) argues that the growth models of Gordon & Shapiro (1956), Bradley & Jarrell (2003) and Lally (2008) converge to identical overall growth rates.

- **Endogenous estimation with macroeconomic indicators and company specific value drivers**

Albrecht (2004) provides a comprehensive work to determine a range of the long-term growth rate in the terminal value. The long-term growth rate is subdivided into the components expected *inflation*, expected real economic growth and company specific growth. Firstly, expected *inflation* equals the difference between the expected long-term real interest rate and the nominal interest rate. Secondly, expected real economic growth is derived from economic performance per capita and natural demographic development. Thirdly, company specific growth is analyzed with the long-term market growth and whether the company is able to stabilise on that level of market growth. Albrecht & Kantar (2004) calculated an implied earnings growth rate of the German Stock Index (DAX) companies in the years 1974 to 2002 of 6.5%. In addition, Albrecht, Kantar & Xiao (2005) calculated an implied earnings growth rate of DAX companies in the years 1974 to 2003 of 6.8%. Albrecht (2004) agrees with Baetge, Niemeyer & Kümmel (2005), Schultze (2003) and Copeland, Koller & Murrin (2002) that the GDP can serve as a benchmark for the long-term growth rate. Basically, Albrecht (2004) argues that in the long run a company cannot grow faster than its market albeit the author admits that a company with a growth rate that is slightly above the market is able to keep this growth for a maximum of 50 years. For example this anomaly is explained with changes in the sector segmentation of an economy. Albrecht (2004) argues that company specific growth can be anticipated in the level of the long-term growth rate and that the market share of a company will decrease because of increasing competition and fast growing markets.

The approach of Tschöpel, Wiese & Willershausen (2010) defines an analytical compound growth rate that is separated into nominal growth and internal growth based on the retention of profits. Internal growth equals the retention rate multiplied with the rate of return of reinvestments. Nominal growth is determined by payout ratio multiplied with company specific *inflation* rate.

$$g_{analytical} = (1 - q) \times r_{bt} + q \times infl_c$$

With:

$g_{analytical}$ = *analytical compound growth rate*

r_{bt} = *rate of return of reinvestments before taxes*

$infl_c$ = *company specific inflation rate*

q = *payout ratio*

The authors argue that the analytical compound growth rate should approximate the implied long-term growth rates determined by market. Tinz (2010) confirmed this hypothesis with empirical results based on more than 100 German companies in the years from 1998 to 2008. The results show an arithmetic growth rate of free cash flows of 6.3% (5.95% excluding inactive companies) and an arithmetic growth rate of dividends of 6.94% (7.55% excluding inactive companies). Tschöpel, Wiese & Willershausen (2010) determined an analytical compound growth rate in the range of 6% to 9%. The determination is based on company specific *inflation* rates of 1% to 3%, payout ratios of 30% to 50% and leverage ratios of 20% to 40%. The cost of capital is based on a nominal risk free rate of 4% to 5%, a beta factor of 1 and a market risk premium after taxes of 4.5% to 5%. The comparison of the results of Tinz (2010) with that of Tschöpel, Wiese & Willershausen (2010) shows an approximation of empirical observable long-term growth rates with expected theoretical derived growth rates. However, the analytical compound growth rate does not include growth that is generated through improved economic efficiency of a company. The authors argue that in a steady state, companies are not influenced by capacity optimizations, temporal market distortions and cyclical or temporal characteristics.

- **Endogenous estimation with company specific value drivers**

  The concept of Higgins (1977, 1981, 2007) suggests the determination of the long-term growth rate of sales as the product of profit margin, retention ratio, asset turnover and financial leverage ratio. The rationale behind this concept is the assumption that a company's long-term growth rate of sales is determined by company specific ratios. This concept is relevant because the company specific variables are tested as well for their influence on the long-term growth rate of US REITs. The concept of Higgins (1977) is included in the thesis to confirm its importance mentioned in several corporate finance textbooks as well as to confirm its relevance for US REITs. In addition, the analysis will show whether the growth formula is transferable to determine the long-term growth rate of earnings respectively dividends.

The basic formula of the long-term growth rate of Higgins (1977) for discrete time frameworks is:

$$g = \frac{P(1-D)(1+L)}{T - P(1-D)(1+L)}$$

With:

$P = profit\ margin$

$D = dividend\ payout\ ratio$

$L = debt\text{-}to\text{-}equity\ ratio$

$T = assets\text{-}to\text{-}sales\ ratio$

The formula above has been enhanced for continuous time frameworks in Higgins (1981):

$$g = \frac{P(1-D)(1+L)}{T}$$

With:
$P = profit\ margin$
$D = dividend\ payout\ ratio$
$L = debt\text{-}to\text{-}equity\ ratio$
$T = assets\text{-}to\text{-}sales\ ratio$

A similar contribution is provided by Ulrich & Arlow (1980) who do not discuss the issue of opening versus closing assets and equity. In Higgins (2007) a more applicable variant of the long-term growth rate has been defined:

$$g = \frac{retained\ earnings}{profit} \times \frac{profit}{sales} \times \frac{sales}{assets} \times \frac{assets}{equity}$$

This formula has been modified with respect to compounding assumptions. Ashta (2008) suggests opening equity and opening assets in the four ratios. In practice, the mid-year assumption or end-of-year convention are frequently used. In addition, Higgins (2007) assumes a constant target leverage ratio. Ashta (2008) proposes with the ratio of opening assets divided by opening equity a more realistic alternative.

The approach of Henselmann & Weiler (2007) assumes a steady state of a company and determines the long-term growth rate by the difference between the long-term rate of return and the cost of capital. The authors created a scoring model with specific variables for the industry such as market share, change in market share and the company's resources such as brand value, export quota, intensity of marketing, product quality, company growth, company size and vertical integration. Each variable is assessed within a certain range of points. The calculated coefficient lies between 0 and 1 and is multiplied with the maximum excess rate of return. This individual long-term excess rate of return (above or below the cost of capital) is added to the cost of capital defined by the weighted average cost of capital. Finally, the long-term growth rate is calculated by the industry-specific retention ratio multiplied with the company's individual long-term rate of return.

$$g = WACC + (sc \times r_{max}) \times q_{ind}$$

With:

g = *long-term growth rate*

WACC = Weighted Average Cost of Capital

sc = scoring coefficent

r_{max} = *maximum excess rate of return*

q_{ind} = *industry-specific retention ratio*

Company long-term excess rate of returns in different countries and industries have been empirically derived by Odagiri & Yamawaki (1990). As a result, an averaged company long-term excess rate of return of 3.4% has been calculated (Odagiri & Yamawaki, 1990).

2.5.3. Integrating and synthesizing the research

In the following, the different concepts and essential empirical studies to determine the long-term growth rate are classified. The classification gives an overview of the respective methodological proceeding of each concept.

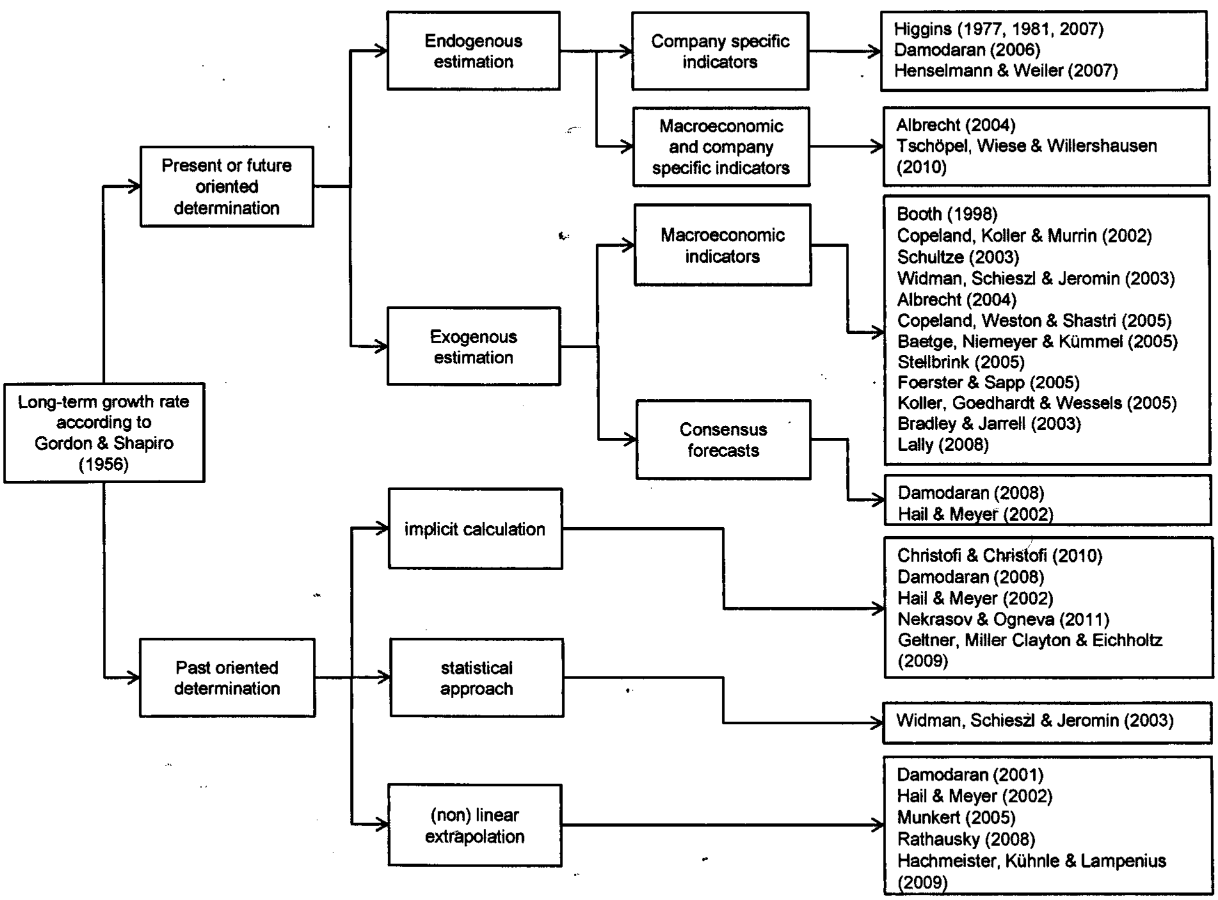

Figure 4: Literature review of different concepts and empirical studies

In summary, the literature review shows that the determination of the long-term growth rate has its seeds in the Gordon Growth Model. In this model the introduction of the long-term growth rate lead to different approaches to determine this variable. The discussed approaches are differentiated between past and present or future orientation. From a quantitative perspective, the majority of references were found on the use of macroeconomic indicators. In practice, the different approaches can be combined to verify each other. For example, the implicit calculation of the long-term growth rate enables the appraiser to compare expectations of the market by the endogenous estimation with macroeconomic or company specific indicators. Some authors combined different approaches in their concepts. The approach of Nekrasov & Ogneva (2011) connects a future estimation of the long-term growth rate with (past oriented) implicit calculation. Albrecht (2004) combines the exogenous and endogenous determination of the growth rate.

As a result of the literature review, the identified interdependencies of macroeconomic and company specific influences on the long-term growth are classified. Firstly, macroeconomic influences are classified into *economic growth* and *inflation*. Secondly, company specific influences are classified into *profitability*, *capital structure*, *valuation effects*, *performance* and *size*.

In the following, the independent variables that proxy for each classification are introduced and evaluated with regard to supportive literature and relevance in the panel data analysis.

***Economic growth* – US real GDP growth**

The gross domestic product is the most comprehensive parameter to measure a country's economic activity. US GDP is published by the US Bureau of Economic Analysis and subdivided into three calculations: expenditures calculation, calculation of funds raised and calculation of funds distribution. The expenditures calculation is again subdivided into private consumption, state consumption, fixed assets investments, inventory investments, exports and imports. The change of the GDP is defined as growth and is published quarterly and annually (Kater, Bahr, Junius, Scheuerle & Widmann, 2008). For the consideration of real GDP growth the nominal GDP growth is adjusted for *inflation* in each year. The GDP growth is considered an influencing variable on the long-term growth rate in Booth (1998), Copeland, Koller & Murrin (2002), Schultze (2003), Albrecht (2004), Foerster & Sapp (2005), Baetge, Niemeyer & Kümmel (2005), Copeland, Weston & Shastri (2005), Stellbrink (2005), Koller, Goedhardt & Wessels (2005) and Lally (2008). In addition, Raudszus (2012) presents evidence that equity REITs experience positive abnormal returns in comparison to common stocks in the periods of external shocks and bank failures. The author argues that market participants consider REITs a real asset respectively safe harbor investment during turbulent times. If this statement is true, economic growth should have a negative correlation with the long-term growth rate. I expect that the impact of *economic growth* is significant but rather reflected in the growth of the REITs' dividend than in the growth of the REITs' stock price which results in a lower growth rate respectively negative relation between dependent and independent variable. Hence, this impact is most likely to be driven by the special nature of REITs: The regulation of dividend payouts and the nature of real estate, with long-term constant income streams based on rents, make REITs a stable income (dividend) generating investment for which growth opportunities are limited compared to companies in other industries.

***Inflation* – change in US consumer price index**

The US *inflation* rate is measured with the quarterly percentage change of the consumer price index (CPI). The US Bureau of Labor Statistics (2011a) defines the consumer price index a measure of the average change over time in the prices paid by urban consumers for a market basket of consumer goods and services. The CPI covers goods and services in the categories food and beverages, housing, apparel, transportation, medical care, recreation, education and communication and other goods and services. From an operating perspective, REITs have access to the private property market and can directly trade individual properties which can be used as a hedge against inflation. On the other hand, REITs are traded at the stock market that enables REITs to provide equity ownership of the underlying properties. The listing at the stock market has the effect that the stock price of the respective REIT is influenced not only through its operational business but also through the general market environment. The *inflation* rate is considered an influencing variable on the long-term growth rate in the growth models of Booth (1998), Bradley & Jarrell (2003), Albrecht (2004), Koeller, Goedhardt & Wessels (2005), Foerster & Sapp (2005) and Lally (2008). Widman, Schieszl & Jeromin (2003) identified a long-term statistical relation between the long-term growth rate of industrial companies and *inflation*. On the other hand, REITs are often used as an *inflation* hedge according to Glascock (2002). Case, Wachter and Worley (2012) argue that real estate can be a perfect *inflation* hedge based on the strong assumption that future rent growth and discount rates are in line with expected and actual *inflation* rates. The author's conclusion is derived by the analysis of return data of US REITs and their relation to the US *inflation* rate. I expect a positive correlation of *inflation* and long-term growth because the REITs income streams consists mainly of rents that are normally indexed to the consumer price index which should have a direct impact on dividends.

***Profitability* – Return on Assets (ROA)**

In the research the influence of *profitability* is measured by the return on assets. ROA is determined by the division of net income to total assets and corresponds to the return on total capital. In the literature, *profitability* is often measured with return on invested capital (ROIC) or return on capital employed (ROCE). ROIC shows the return on the company's adjusted invested capital. In order to take various financing structures into account, when calculating this indicator the invested capital is compared with the net operating profit after taxes. A company only creates value for its shareholders (defined as economic value added) if the ROIC is higher than a company's cost of capital (Wiehle, Diegelmann, Deter, Schömig

& Rolf, 2010). ROCE calculates the return on the company's total capital employed on the balance sheet rather than the capital invested. Ryan (2006) states that ROCE is the most commonly used performance ratio in business. In case of REITs, ROA is predominately applied to measure *profitability* because the ratio is not directly influenced by leverage. For example, Shelor & Anderson (1998) use ROA to measure the financial performance of REITs. As well, Feng, Price, McKay & Sirmans (2011) use the ROA in their overview of equity REITs for the period 1993 to 2009. The authors mention that ROA and ROE are widely used in the corporate finance oriented real estate literature. *Profitability* is considered an influencing variable on the long-term growth rate in Nekrasov & Ogneva (2011), Damodaran (2008, 2011), Higgins (2007) and Ross, Westerfield & Bradford (2002). As a general rule, typical growth companies are less profitable than mature companies. Glascock, Hughes & Varshney (1998) describe REITs as typical small and younger firms in comparison to common stock companies. However, I expect that REITs have less growth opportunities due to the dividend payout requirement. Hence, I expect that the relationship between *profitability* and growth is significant but less pronounced in the REITs market. In addition, the growth opportunities are normally higher for younger and smaller companies than for matured companies. Simultaneously younger and smaller companies have more volatility in their income and thus in their *profitability*. Since most of US equity REITs are classified as small cap companies, I expect a negative relation between *profitability* and long-term growth rate.

***Capital structure* – market debt ratio or book debt ratio**

Effects of the *capital structure* on the long-term growth rate are measured by book or market debt ratio. The leverage ratio equals total liabilities to total assets. The ratio of liabilities to total assets allows assumptions to be made about a company's stability and can be viewed as a liquidity ratio (Wiehle, Diegelmann, Deter, Schömig & Rolf, 2010). Total liabilities comprise the sum of interest-bearing liabilities. Off-balance sheet financings such as leasing are generally not considered. In the literature, Higgins (2007) considers the leverage ratio an influencing variable in developing a sustainable growth formula. I have tested both the market and book value of leverage as an independent variable because leverage enables the expansion and potentially improved performance of the REITs' real estate portfolio through the leverage effect. Nevertheless, I expect that growth firms apply less leverage because of the firm's riskier nature. As firms mature typically profits are levered with more debt. A significant correlation of leverage with the long-term growth rate would show that the market assumes that leverage drives or inhibits growth in the long-term.

***Valuation effects* - Market to book ratio or Tobin's Q**

Market to book ratio and Tobin's Q are typical valuation ratios that determine whether a stock is over or undervalued. The market to book ratio is calculated by the current market capitalization divided by the net book value of firm (book value of equity). The book value represents the intrinsic value of the company's assets. Hidden reserves may show book value which is significantly below their current market value. In general, a low market to book ratio indicates that a company is valued low. As a rule, the market to book ratio is greater than one. This means that shareholders will usually pay a premium to the positive future prospects of the company (Wiehle, Diegelmann, Deter, Schömig & Rolf, 2010). Tobin's Q is similar calculated to the market to book ratio. By definition, Tobin's Q is calculated as the ratio of total capital value (equity plus debt) to the replacement value (replacement cost) of the firm's assets. In practice, the ratio is often simplified because the calculation of the replacement value requires substantial information. Thus, total liabilities are added both to market capitalization in the numerator and to total book equity in the denominator. In the literature the issue whether market to book ratio influences the long-term growth rate of a company is controversially discussed. Tobin (1969) introduced the market to book ratio as a measurement of growth opportunities. Frank & Goyal (2009) state that the market to book ratio is the most commonly used and reliable proxy for growth opportunities. Chan, Karceski & Lakonishok (2003) consider the market to book ratio an influencing variable on the long-term growth rate. In contrast, Erickson & Whited (2009) presented evidence and came to the conclusion that the market to book ratio is a poor measure of growth opportunities. The market to book ratio is tested in this research because of its particular attention as a proxy for growth opportunities in the literature. In the case of US REITs market to book ratios should be close to one in most of the periods of the panel data because US REITs are not typical growth companies such as companies of the technology sector. On the other hand, US REITs can have wide differences between market value and net asset value. The result will show whether the market considers the market to book ratio or Tobin's Q relevant for the determination of the long-term growth rate. I expect that typically higher market valuations are induced by more growth opportunities and lower market valuations are induced by a lack of growth opportunities. As result market to book ratio or Tobin's Q are expected to serve as a positively related indicator for long-term growth.

***Performance* – variation in share price**

The DDM assumes that share prices increase when the forecasts of future growth rates increase because the return on equity is reduced. Extreme low or high expectations about the level of growth can result in volatile stock prices until the company's growth rate is normalized on a rational level. Thus, the relationship between stock price and growth is very important that the model represents a long run equilibrium valuation of the company. The variation of the share price is included in the regression model to examine whether the stock's *performance* influences the level of growth or is alternatively based on variations of return on equity or dividends. In addition, the testing shows whether short term changes in a REITs' stock price have an influence on the long-term growth rate. The result could indicate the existence of momentum and market timing effects. In the literature, momentum effects are considered by Sornette (2000) who states that the company's growth rate behaves as a control parameter for the observable share price. The author argues that a low growth rate phase is described by the firm foundation theory while a large growth rate phase is the regime of speculation and crowd behavior. I expect a positive relationship of share price variations on the long-term growth rate. Depending on the level of the growth rate, the analysis will show whether an increase of the stock price is based on the anticipation of increases in dividends in future periods (which reflects growth) or on momentum effects. Other authors such as Baker & Wurgler (2002) or Chang, Chen & Hilary (2008) analyzed market timing effects for industrial companies. Chang, Chen & Hilary (2008) argue that the benefits of timing the issuance of equity are more pronounced than the benefits of timing the issuance of debt since equity is generally easier to price than debt. Baker & Wurgler (2002) focused on the market timing and effects on *capital structure*. Li, Ibrahim, Ong & Ooi (2007) found that market timing effects in the issuance of equity and debt applies as well for REITs. The authors argue that REITs are less asymmetric than common stocks because equity REITs have higher predictability in future income because of long-term lease contracts and high proportion of tangible assets. Since stock market conditions can not only passively influence the long-term growth rate but also drive REIT managers to exploit market timing I control for these effects with the consideration of stock performance. I expect that market timing effects exists as well in relation to the long-term growth rate but that they are less pronounced because of the inherent characteristics of REITs.

***Size* – market capitalization**

In the research the influence of *size* is measured by the market capitalization of the respective REIT. The "bigger is better" hypothesis is based on the assumption to realize economies of scale of the REIT's expenses and cost of capital. Economies of scale presume the possibilities of business combinations through mergers and acquisitions or combined buying and developing activities. The expansion of REITs can even lead to profitable investment results if net present value on the property level is negative because of increased economies of scale and thus decreasing averaged total costs. Ambrose, Highfield and Linneman (2005) identified strong evidence of economies of scale for the general and administrative expenses. The increasing size of REITs leads to lower average expenses and higher profit margins. In addition, the authors identified that larger REITs have lower cost of capital and higher liquidity. Ciochetti, Craft & Shilling (2002) presents evidence that institutional investors have a preference to invest in more liquid REITs, which are generally larger REITs. In addition, more liquid REITs have lower trading costs. On the other hand, the majority of REITs are small cap stocks with regional competency and a specialized investment focus. These REITs pursue a "small is beautiful" strategy that quickly identifies investment opportunities and thus leads to faster growth in comparison to larger REITs. Yang (2001) argues that economies of scales in substantial fixed expenses are contradicted by diseconomies of scale through the management of a multi-market and expansion oriented REIT. Block (2006) combined both positions and emphasized on the importance of the management to develop local market competencies and to efficiently manage the organization of the REIT. In addition, the author mentions that advantages through *size* depend on the investment focus and business model of the REIT. I use the natural logarithm of market capitalization to measure firm *size* analogous to most finance studies, such as Frank and Goyal (2008). The logarithmic transformation allows for a possible nonlinear impact of firm *size*. I expect that investors allocate higher growth rates to larger REITs since they generally offer more liquidity.

3. Methodology

The methodology is based on the DDM-formula that is solved to growth. The DDM-formula is suited for the calculation of the implied long-term growth rate because US REITs must pay out at least 90% of its taxable income to shareholders annually in the form of dividends. Other binding criteria to receive the US REIT status that reduces or eliminates corporate income taxes are defined by US legislation. The conditions to receive the US REITs status are important to understand that the use of the DDM is appropriate to analyze the long-term growth rate of US REITs. The following conditions of the US REIT status were summarized by Chan, Erickson & Wang (2003) and the European Public Real Estate Association (EPRA) Global REIT Survey (2011):

- The ownership has to be held by a minimum of 100 shareholders,
- Ownership by institutional investors such as pension funds does not violate the five or fewer rule,
- At least 75% of assets must be real estate (including mortgages), government securities or cash,
- At least 75% of income must be from property rental or interest on mortgages,
- At least 95% of income must be from real estate or passive sources (for example dividends or interest),
- No formal (stated) restrictions with regard to debt,
- 90% of income must be distributed to shareholders,
- No requirement to file prior to conversion,
- Unrealized built-in capital gains are taxable. Most REITs utilize the Umbrella Partnership (UPREIT) structure to defer this tax bill,
- Exchange listing is not required. Three types of REITs are permitted: Publicly traded, US Securities and Exchange Commission (SEC) registered but non-exchange traded and private,
- REIT may own up to 100% of a Taxable REIT Subsidiary (TRS),
- Ownership of TRS's can be no more than 20% of REIT assets,
- Dividends from TRS qualify under the 95% income rule, but not under the 75% income rule.

The listed regulations enable the use of dividends rather than flows to equity which implies a stable and significant parameter in the DDM-formula. The binding payout ratio of at least 90% avoids distortions as a result of dividend smoothing or other decisions by the company's management to pay out a smaller amount of dividends than possible.

3.1. Research philosophy

The research philosophy in this thesis is based on a positivistic research approach. Positivist approaches in social science assume that things can be studied as hard findings and the relationship between these findings can be established as scientific laws. For positivists, such laws have the status of truth and social objects and can be studied in much the same way as natural objects (Smith, 1996). Positivism adopts a clear quantitative approach to investigate phenomena. In contrast, a post-positivist approach is not concerned with the consideration about sentiment and awareness. Post-positivism or logical empiricism reflects reality on a subjective and inductive perspective through observations and experiences. The word "logical" emphasizes that post-positivism reflects itself as an epistemology without metaphysical recourses (Töpfer, 2010). In particular Popper (1959) criticized the post-positivist approach for its claims to truth and scientific knowledge through inductive reasoning. In contrast, Popper focused on the premises of objectivity and deduction in the subsequent development of critical rationalism which diametrically differs from the post-positivist approach.

According to Ryan, Scabens & Theobald (2002) the epistemological positions in social science can be reduced to pairs of polar alternatives: empiricism and rationalism and, realism and idealism. Therefore, there are hybrid approaches such as critical rationalism and approaches based on contingency and situation.

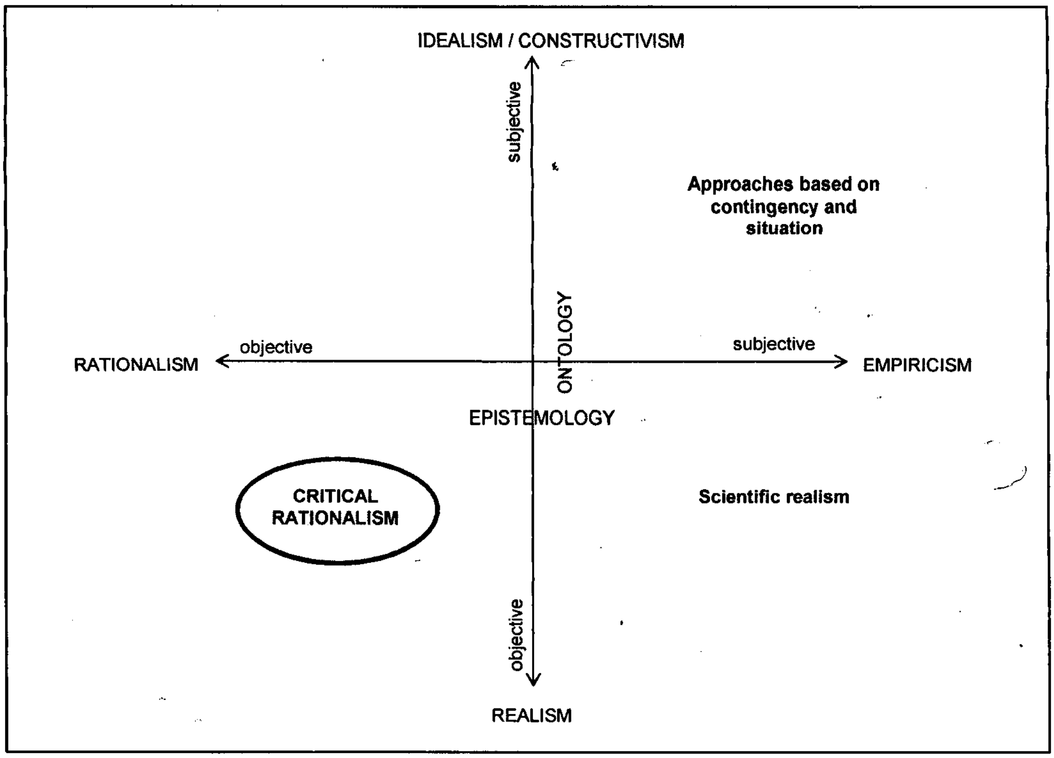

Figure 5: Epistemological positions to Singer & Willimczik (2002)

Today, two epistemological approaches are dominating scientific work in business administration: Constructivism and critical rationalism.

1. Idealism / constructivism focuses on meta-theoretical questions as well as the combination to empiricism based on contingency and situation.
2. Critical rationalism focuses on methodological questions for example how are theories formulated, tested or modified.

The research philosophy of the thesis is assigned to critical rationalism. The relevance of each research philosophy on the research study depends on the impact of objectivity versus subjectivity and epistemology versus ontology. The research issue of the long-term growth rate is empirically observable and thus objective because the topic is independent and refers to a reality that is beyond human awareness. The research topic is not a subjective one because the research issue is not only ascertainable on a subjective level with sensory organ and human awareness. Therefore, the concept of idealism / constructivism is not appropriate because the research issue is not subjective and not constructed or perceived by the subject. The concept of empiricism is also not appropriate because the research issue does not depend on the human awareness. Realism is partly appropriate because the concept is based on an independent and objective reality that can be perceived by thinking and experience. Rationalism meets as well the character of the research issue because in this concept the content and form of awareness is based on sense and rationality and not on human awareness. In summary, the concepts of realism and rationalism are appropriate concepts for the research issue. The concept of critical rationalism combines both rationalism and realism and is therefore the relevant research philosophy of the research study.

Critical rationalism is fundamentally established by the ideas of Karl Popper. Popper's philosophy of science is based on the assumption that human rationality is fallible in principle. Knowledge that is reasoned with rational statements is not axiomatic and can only be preliminary. As long as a theory is not empirically disproved it will be preliminarily true. A famous example to explain this concept is the hypothesis that all swans are white. This hypothesis is preliminarily true as long as no black swan is observed. Once a black swan is observed the hypothesis is disproved. In the view of Popper, in social science knowledge cannot be increased through inductive reasoning (from individual instances to generalizations) (Popper, 1959). This means that single observations or experiments are not helpful for general statements or axioms. In contrast, knowledge can only be increased through deductive reasoning (from generalizations to individual instances). Thus, a statement cannot be entirely confirmed (verification). Rather a researcher has to pursue to increase knowledge by the falsification of statements. Once a statement has been falsified appropriate measures have to be implemented for correction (methodical rationalism). In the pursuit to increase knowledge, Popper (1959) argues that a hypothesis has to be falsifiable, that is a statement has to be empirically observable and disprovable. If the hypothesis is not empirically disproved, the hypothesis is accepted as preliminary true or currently confirmed.

3.2. Research data

The research data is taken from the information service provider SNL Financial. The SNL US REIT equity database is one of the most comprehensive databases for financial data and business sector analysis of the US REITs industry. The long-term growth rates are calculated quarterly for each US equity REIT for the years 1992Q1 to 2011Q4. I used quarterly data because the use of annual intervals requires long historical time series data to obtain a meaningful regression (Ryan, 2006). Survivorship bias is excluded through the inclusion of defunct REITs that do not exists as separate entities until the end of the sample reasoned by mergers or acquisition or that join the sample after the year 1992 reasoned by a later Initial Public Offering (IPO). According to Lemmon, Roberts & Zender (2008), survivors tend to be more profitable and larger with fewer growth opportunities and higher levels of asset tangibility and leverage.

With regard to the National Association of Real Estate Investment Trusts (NAREIT), as of 31 December 2011, 130 (81%) of the 160 publicly traded US REITs are US equity REITs that own and most often manage commercial real estate and derive most of their revenue and income from rents. These companies own properties across many major property sectors and many major geographic regions. Therefore, the analysis is representative for the US REITs industry as a whole.

The **dependent variable** in the panel regression analysis is the long-term growth rate that is calculated in the following steps:

1. In the Gordon Growth Model the value of the share price equals the present value of all future dividend cash flows that the owner of that share will receive into perpetuity assuming constant growth. The expected dividend is defined as the dividend of the subsequent quarter. Such application differs from the model assumption of expected (anticipated) dividends but given the use of time series data, the resulting error is likely to be insignificant. The long-term growth rate is derived by solving the Gordon Growth formula for growth.

$$P_0 = \frac{D_1}{r-g}$$

$$P_0 \cdot (r-g) = D_1$$

$$(r-g) = \frac{D_1}{P_0}$$

$$g = r - \frac{D_1}{P_0}$$

With:

$P_0 = share\ price$
$D_1 = expected\ quarterly\ dividend$
$r = rate\ of\ return\ on\ equity$
$g = long-term\ growth\ rate$

2. Share prices are derived from the SNL Financial database for each US equity REIT for the periods of 1992Q1 to 2011Q4. Share prices are taken at the end of the respective period.
3. Expected dividends are as well derived from the SNL Financial database for each US equity REIT for the periods of 1992Q1 to 2011Q4. In each period the expected dividend equals the dividend of the subsequent quarter.
4. Return on equity is calculated quarterly with the CAPM for each individual US equity REIT in the period of 1992Q1 to 2011Q4. The variability in the rate of return on equity is taken into account through the calculation of individual and dynamic rate of returns on equity for each US REITs in every period.
5. The components of the return on equity are calculated as follows:
   - The risk free rate equals the respective rate of return of the one month US Treasury bill in each quarter in the period of 1992Q1 to 2011Q4.
   - The beta factor is quarterly calculated for every REIT since associated risk characteristics of REITs change over time. The dynamic betas are calculated for 60 months' time windows on monthly frequency data. I conducted a sensitivity analysis to verify whether the results are robust to different specification such as a shorter estimation window for the dynamic betas (24 months) which would assume that REITs change faster in their characteristics. The raw beta factors are further adjusted according to Blume (1971).
   - The market risk premium is based on the empirical work of Ibbotson Associates' SBBI valuation yearbook 2012. Ibbotson Associate's US market risk premium is selected for midcap stocks since REITs are typically classified as either small or midcap stocks in the literature. I have selected the midcap classification to avoid the risk of assuming excessive risk premiums. The applied risk free rate to calculate the equity risk premium equals the one month US Treasury bill. The variability of the market risk premium is taken into account through the consideration of dynamic market risk premiums in each period of 1992Q1 to 2011Q4.
6. The long-term growth rate is calculated on the basis of the derived input parameters for each US equity REIT in each quarter in the period of 1992Q1 to 2011Q4, resulting in 7,140 observations.

The **independent variables** are company specific and macroeconomic variables. The company specific variables are derived from the SNL Financial database for each US REIT in each quarter in the period of 1992Q1 to 2011Q4. Macroeconomic variables are derived as well for each quarter and taken from the US Department of Commerce, Bureau of Economic Analysis (US GDP growth) and the US Department of Labor, Bureau of Labor Statistics (US *inflation* rate). The selection of each independent variable is based on the presented theoretical concepts to determine the long-term growth rate in the systematic literature review. In summary, the following company specific and macroeconomic variables are selected to be tested in the panel regression analysis:

Influence	Independent variable	Type of variable
Economic growth	Real GDP growth	Macroeconomic
Inflation	Change of consumer price index	Macroeconomic
Profitability	Return on assets	Company specific
Capital structure	Market or Book to debt ratio	Company specific
Valuation effects	Tobin's Q or Market to book ratio	Company specific
Performance	Change in stock price	Company specific
Size	Market Capitalization	Company specific

Table 8: Independent variables of the panel regression analysis

In the regression the independent variables are lagged by one period (quarter) compared to the dependent variable to reduce endogeneity and improving the ability to draw causal inferences.

3.3. Sample

The sample comprises all US REITs of the SNL Financial database in the period from 1992Q1 to 2011Q4. The data was collected directly from the SNL Financial database in September 2012. SNL Financial provides very incomplete data on US REITs for the years before 1992. This resulted in an analysis of 229 US REITs for 20 years respectively 80 time periods. The number of observations is reduced due to insolvencies, mergers and acquisitions or IPOs after the year 1992 which resulted in a sample of 7,140 observations. US REITs were created not until the year 1961 and data was collected since the year 1992. Therefore, the number of observations is inherently limited. Thus, the number of observations used in the research project is similar to datasets of other research projects that focus on US REITs and were published in prevalent journals. The data of the SNL Financial database fulfill the criteria of goodness. Firstly, objectivity of the sample is warranted because the researcher is not able to influence the research result that is based on the conducted analysis and interpretation of the data. Secondly, reliability of the sample is fulfilled because repetitions of the conduction and analysis of the data will lead to identical results. Finally, the validity of the sample is given because the SNL Financial database collects data concise and comprehensive. No special adjustments have been made to the data.

The total market capitalization of the US REITs by 30 September 2012 was $ 514 billion, measured by the FTSE NAREIT All Equity REITs index. The respective proportion of each sector of the total market capitalization is showed in brackets. The sample consists of the following property sectors: Industrial (21% or $ 109 billion), office (13% or $ 65 billion), retail (27% or $ 137 billion), residential (15% or $ 76 billion), diversified (7% or $ 36 billion), hotel (5% or $ 28 billion) and other (12% or $ 64 billion).

I controlled the sample for the influence of a market dominating position of one or a few companies by applying the Herfindahl-Hirschmann Index (HHI). The HHI was developed by Hirschmann (1964) and is a ratio that measures market concentration. The US Department of Justice considers a market with a result of less than 1,000 to be a competitive marketplace; a result of 1,000-1,800 to be a moderately concentrated marketplace; and a result of 1,800 or greater to be a highly concentrated marketplace (US Department of Justice, 2011). I calculated the HHI based on the market shares of each of the 229 US REITs. Market share is defined as the market capitalization of the respective US REIT to total market capitalization of the sample's US REITs. The calculation resulted in an averaged HHI of 304 which clearly shows that not a single or few US REITs have a dominating market position. As a result it is important that not one or a few companies dominate the market. The graph shows that an increasing number of REITs (right hand scale) leads to decreasing HHI (left hand scale). Historically the number of REITs increased sharply because of the REIT Simplification Act of 1997 which resulted in the improved diversification of the REITs' sector and thus more competition. In 2011Q4 the HHI was 314 and the number of REITs was 105 which reflect the US equity REITs sector a competitive market place. The increase in the number of REITs in the period of observation results in an expansion of the reported data set. Even with this change, the overarching sector structure presented in the data remains the same.

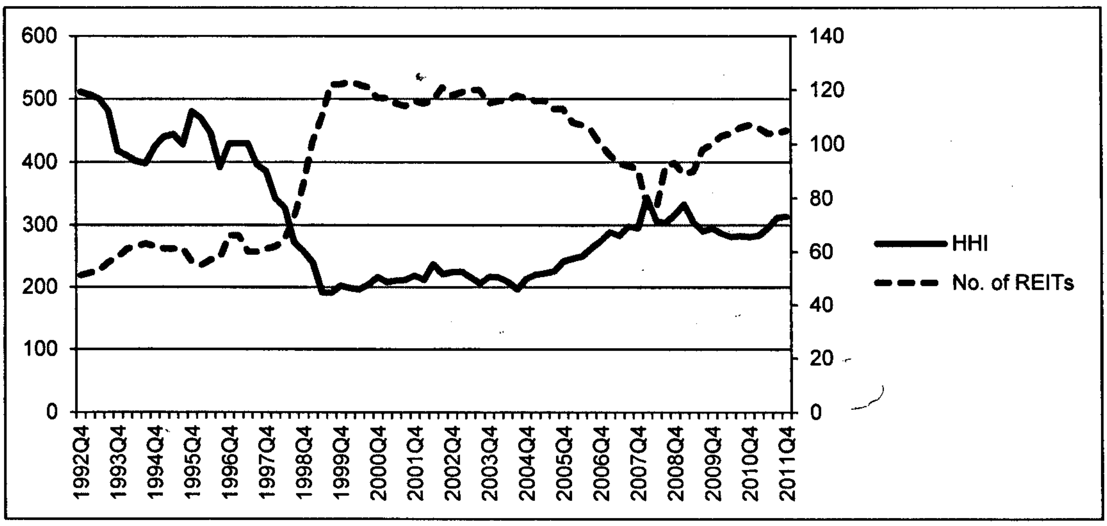

Figure 6: Herfindahl-Hirschmann Index vs. number of US equity REITs

4. Research problem and hypotheses

The testing of hypotheses is an inherent component in the process to approach the research problem within the research philosophy of critical rationalism. This process to increase knowledge can be subdivided into two steps. Firstly, proposals (hypotheses) to solve realistic problems (causal connections) are formulated. Secondly, empirical tests are applied and hypotheses are falsified (respectively eliminated). As a result of this procedure, hypotheses are filtered that have been proved in reality. In summary, critical rationalism uses a posteriori hypothetical deductive investigation that pursues knowledge through falsification, by the combination of rationalism and realism (critical) (Popper, 1959).

The research problem reflects the high degree of uncertainty associated with the determination of the long-term growth rate. In the valuation of US REITs with the DDM, the long-term growth rate is a key value driver. The implied uncertainty in forecasting an US REIT's long-term growth makes it very complex for an appraiser to identify influencing variables on the long-term growth rate that determine the level of the long-term growth rate. If unrealistic assumptions are made, then the resulting value of the US REIT can be implausible which can lead to distorted purchase prices. This research problem emerged as research question that is asked in this thesis. **What macroeconomic and company specific factors have been relevant in the determination of the long-term growth rate of US REITs?** In addition, I present evidence for the practitioner how the long-term growth rate has developed in the past. The thesis further identifies factors that can be considered in practice to determine the long-term growth rate. The macroeconomic and company specific key variables that could have an influence on the long-term growth rate are transferred to hypotheses that are tested with the scope of a panel regression analysis. This method is appropriate because a high number of US REITs are analyzed over a period of several years, an approach that greatly increases the probability of achieving significant results. The application of a panel regression analysis requires quantifiable data. Therefore, the methodology enables the testing of hypotheses of both macroeconomic and company specific variables. The selected variable is stated in a null hypothesis that is paired with an alternative hypothesis and compared with a statistical test. The null hypothesis corresponds to the researcher's assumption about the interdependencies on the long-term growth rate. The formulation of the researcher's assumptions for each independent research variable is negated because a hypothesis can only be rejected because of the concept of falsification within the philosophy of critical rationalism. The selected macroeconomic and company specific variables are all quantifiable and therefore testable.

The process or research starts with the definition of the key terms and research variables. Definitions present an important basis in the process of cognition. Before an independent variable can be tested the precise explanation and derivation of the term has to be provided. Definitions adopted by researchers are often not uniform. Therefore, the following list contributes to common understanding of the most important terms in the context of this research study.

US REITs:

US REITs are defined as US equity REITs that fulfill the qualifications of the Internal Revenue Code that lists the conditions a company must meet to qualify as a REIT. Source: http://www.sec.gov/answers/reits.htm.

The **input variables of the applied Gordon Growth Model**, which is used to calculate the long-term growth rate, are defined as follows:

Expected dividends:

Cash dividends D_1 declared per share of ordinary or common stock. This includes the amount of any dividends declared during the period, regardless of the payment or record dates. Source: SNL Database, key field definitions. In each period the expected dividend equals the dividend of the subsequent quarter.

Current share price:

Current share price represents company's market value per ordinary share at the end of the quarter. Source: SNL Database, key field definitions.

Long-term growth rate:

The long-term growth rate is the residual of the rewritten Gordon Growth formula and represents the market's expected long-term average growth rate in the firm's future dividends. The long-term growth rate reflects three major considerations: 1. Growth form assets in place (existing property cash flow growth as levered); 2. Growth from investment of retained earnings (that is cash flow from investments made with earnings plowed back into REIT; and future growth opportunities (Geltner, Miller, Clayton, Eichholtz, 2007).

Return on equity:

The determination of the return on equity is based on the Capital Asset Pricing Model (CAPM) developed by Sharpe (1964), Lintner (1965) and Mossin (1966) which is calculated with the following formula:

$$RoE = r_f + \beta(r_m - r_f)$$

With:

$RoE = Return\ on\ Equity$
$r_f = risk\ free\ rate$
$\beta = Beta\ factor$
$r_m = market\ return$

The variability in the rate of return on equity is taken into account by the application of dynamic betas, equity risk premiums and risk free rates.

Risk free rate:

The risk free rate is defined as the interest rate of a one month US Treasury bill.

Beta factor:

The beta factor is defined as a measure of systematic risk of a stock; the tendency of a stock's price to correlate with changes in a specific index (Ogier, Rugman, & Spicer, 2004).

The beta factor is dynamic and calculated for 60 months' time windows on monthly frequency data for each REIT in each period.

Market risk premium:

Market risk is defined as risk that cannot be diversified away because the risk is correlated across the market (Damodaran, 2003). Market risk premium reflects the market price for unsystematic risk. Examples of market risk are political risks, foreign exchange risks, cyclical fluctuations, tax reforms, wars and so forth.

The **independent variables** are categorized into company specific variables and macroeconomic variables. Macroeconomic factors that are tested as independent variables are defined in the following list.

Real GDP growth (*economic growth*):

Growth in the gross domestic product is defined as quarterly percent change from preceding period of the US gross domestic product recorded by the US Department of Commerce, Bureau of Economic Analysis. Source: http://www.bea.gov/national/index.htm#gdp.

Change of consumer price index (*inflation*):

Inflation is defined as the quarterly average percent change of the consumer price index for all urban consumers (CPI-U) recorded by the US Department of Labor, Bureau of Labor Statistics. With regard to expected *inflation*, the value of the following period is used. Source: ftp://ftp.bls.gov/pub/special. requests/cpi/cpiai.txt.

Company specific factors are defined as follows.

Return on Assets (*profitability*):

Return on Assets equals the ratio of net income divided by total asset. Net income is defined as net income after taxes, minority interest, and extraordinary and other after-tax items. Non-controlling interest may be included, per relevant accounting standards (for example, FAS 160 for U.S. GAAP which includes non-controlling interests for fiscal years starting after December 15, 2008). Source: SNL Database, key field definitions. Total assets are defined as all assets owned by the company as of the date indicated, as defined under Generally Accepted Accounting Principles. Source: SNL Database, key field definitions.

Market debt ratio (*capital structure*):

Market debt ratio is calculated by total liabilities divided by total liabilities and market capitalization. Total liabilities as carried on the balance sheet and defined by the indicated accounting principles excluding minority interests and other mezzanine-level financings. Source: SNL Database, key field definitions.

Book debt ratio (*capital structure*):

Book debt ratio is calculated by total liabilities divided by total liabilities and the book value of total equity. Book value of equity equals the reported book value of equity on the SNL Financial database. Total liabilities as carried on the balance sheet and defined by the indicated accounting principles excluding minority interests and other mezzanine-level financings. Source: SNL Database, key field definitions.

Market to book ratio (*valuation effects*):

The market to book ratio equals market capitalization divided by total equity. The market capitalization is defined as the aggregated market capitalization of all issues of ordinary or common equity whether traded or non-traded, including convertible ordinary or common stock on a one-to-one-basis until the conversion window opens, and then at the conversion rate. If pricing is not available for secondary classes, the price of the primary class is applied. Total equity is defined as the equity under the indicated principles including par value, paid in capital, earnings, and other adjustments to equity. Minority interests may be included, per relevant accounting standards (for example Financial Accounting Standard (FAS) 160 for US Generally Accepted Accounting Principles (GAAP) which includes minority interest for fiscal years starting after December 15, 2008. Source: SNL Database, key field definitions.

Tobin's Q (*valuation effects*):

Tobin's Q equals the definition of market to book ratio besides the respective addition of total liabilities to market capitalization and book value of equity in the numerator and denominator of the ratio.

Change in stock price (*performance*):

Change in stock price is defined as the quarterly changes of raw stock prices based on the SNL Financial database.

Market capitalization (*size*):

Aggregated market capitalization of all issues of ordinary or common equity whether traded or non-traded, including convertible ordinary or common stock on a one-to-one basis until the conversion window opens, and then at the conversion rate. If pricing is not available for secondary classes, the price of the primary class is applied. Source: SNL Database, key field definitions.

Based on the aforementioned explanations the hypotheses can be clearly defined. Within the scope of the hypotheses testing the long-term growth rate of US REITs represents the dependent variable. The selection of the independent variables is based on the literature review in which potential influencing variable are identified. The independent variables are in turn classified into macroeconomic variables and company specific variables. The calculation of the long-term growth rate gives descriptive evidence of its level in the last years. In addition, the testing of variables provides explanatory information about significant influences and whether the influence of variables assumed by other authors is valid for US REITs. In the following, the selected variables are stated and tested within the scope of the panel data model. In doing so, the falsification principle is applied according to the theory of critical rationalism, in which the alternative hypothesis expresses the researcher's assumption. The null hypothesis corresponds to the negated alternative hypotheses.

I. Hypothesis

H_0: *Economic growth* has no significant influence on the level of the long-term growth rate.

H_a: *Economic growth* has significant influence on the level of the long-term growth rate.

II. Hypothesis

H_0: *Inflation* has no significant influence on the level of the long-term growth rate.

H_a: *Inflation* has significant influence on the level of the long-term growth rate.

III. Hypothesis

H_0: *Profitability* has no significant influence on the level of the long-term growth rate.

H_a: *Profitability* has significant influence on the level of the long-term growth rate.

IV. Hypothesis

H_0: *Capital structure* has no significant influence on the level of the long-term growth rate.

H_a: *Capital structure* has significant influence on the level of the long-term growth rate.

V. Hypothesis

H_0: *Valuation effects* have no significant influence on the level of the long-term growth rate.

H_a: *Valuation effects* have significant influence on the level of the long-term growth rate.

VI. Hypothesis

H_0: *Performance* has no significant influence on the level of the long-term growth rate.

H_a: *Performance* has significant influence on the level of the long-term growth rate.

VII. Hypothesis

H_0: *Size* has no significant influence on the level of the long-term growth rate.

H_a: *Size* has significant influence on the level of the long-term growth rate.

5. Methods

A panel data analysis is a statistical method that combines cross-section data (units) with time-series data (periods). This means that a subject is analyzed over multiple sites and multiple periods. The panel data analysis combines the consideration of variations in time with the heterogeneity of observations at the same time. In a panel data analysis multivariate influences (independent variables) are tested. A panel data analysis states that certain independent variables are identical in its impact for all units and time periods. The error term varies over units and time periods and includes all unobservable factors that affect the dependent variable. The advantage of the panel data analysis is the availability of repeated observations on the same units that enables researchers to specify and estimate more complicated and more realistic models than a single cross-section or a single time series would do (Verbeek, 2008). On the other hand, the disadvantages refer more to the practical application because the repeated observations of the same units result in the assumption that the different observations are no longer independent. In addition, a panel data analysis often suffers from missing observations. A panel data set in which values are missing is called an unbalanced panel. If no values are missing the panel data set is called a balanced panel. Panel data analysis can be subdivided into three approaches, the pooled regression-model, the fixed effects model and the random-effects model. Basically the three models differ whether the coefficients are assumed to be constant, fixed or random.

- **Pooled-regression model**

The pooled-regression model assumes that there are no significant differences between the respective cross-section and times-series data, treating all observations for all of the time periods as a single sample. This means that the pooled-regression model has constant coefficients which imply that there are no significant cross-section or times-series effects. If it can be assumed that the data includes none of these effects an ordinary least squares regression model can be applied.

$$y_{it} = \alpha + \beta_1 x_{it} + u_{it}$$

- **Fixed effects model**

The starting point of a regression model is:

$$y_{it} = \beta_1 x_{it} + v_i + \epsilon_{it} \ (equation\ 1)$$

In this formula the error term (u_{it}) is subdivided into a unit specific error that is constant over time (v_i) and an idiosyncratic error (ϵ_{it}). This equation can be determined for each unit (i) over all periods and an arithmetic mean is calculated in such a way that the focus of the equation is only on the variance between the units.

$$\bar{y}_i = \beta_1 \bar{x}_i + v_i + \bar{\epsilon}_i \ (equation\ 2)$$

The fixed effects model results by subtraction of the second equation from the first equation.

$$y_{it} - \bar{y}_i = \beta_1 (x_{it} - \bar{x}_{it}) + \epsilon_{it} - \bar{\epsilon}_i \ (equation\ 3 = equation\ 1 - equation\ 2)$$

The fixed effects model assumes significant differences in the cross-section data, but not in the times-series data. In other words, the fixed effects model assumes time independent effects for each entity that are possibly correlated with the independent variables. This means that there are no temporal effects, but significant differences between the units in the cross-section. In this case, the respective units are treated as dummy variables. Therefore a fixed effects model is often called a least squares dummy variable model. There are other types of fixed effects models that are distinguished with respect to their differences in data.

Firstly, there are fixed effects models that have homogenous cross-section data, but temporal effects in their times-series data (for example autocorrelation). In this case the time-effects are also labeled with dummy variables.

Secondly, there are fixed effects models that have heterogeneous cross-section and times-series data. In this case, both the cross-section data and the times-series data are treated as dummy variables.

Fixed effects in the cross-section data are identified with an F-test. This significance test uses the pooled-regression model as a basis and compares changes in the coefficient of determination (R^2). A significant improvement in the coefficient of determination indicates that there are significant fixed effects in the cross-section data. Fixed effects in the time-series data are identified with an F-test. The significance test uses the first or last year in the time-series as reference and assumes that the sum of time effects is zero. A significant difference in the coefficient of determination indicates that there are significant fixed effects in the time-series data. The identification of fixed effects is widely discussed in contemporary econometric literature. For example the publications of MacKinnon (2008), Baltagi (2008) and Greene (2011) give detailed introductions to panel data analyses.

In summary, in a fixed effects model the intercept α varies systematically while the regression coefficients β are constant for all observations. Thus, the differences in cross-section data only concern the level of the intercept α. The influences of the independent variables are the same for each observation. The fixed effects model explains a deviation of the intercept from the mean within an individual observation but does not explain deviations between different individual observations.

- **Random-effects-model**

The random-effects model is:

$$y_{it} = \alpha + \beta_1 x_{it} + v_i + \epsilon_{it}$$

In comparison to the fixed effects model the equation includes a constant (with respect to time) unit-specific error term, and an idiosyncratic error (ϵ_{it}) that is variable over time and units. In contrast to the fixed effects model, the unit-specific error that is constant over time (v_i), can be determined. This is based on the assumption that v_i is a normally distributed variable. Therefore the random error v_i equals the variance of the unit-specific errors.

In summary, the random-effects model explains the deviation within an individual observation as well as deviations between individual observations. The random-effects model only works if irrelevant unit-specific heterogeneity exists and the unit-specific error does not correlate with the errors of the independent variables.

5.1. Selection of the panel data model

The pooled-regression model assumes that the error terms from periods are uncorrelated. In most cases this is unlikely to be realistic. As a result routinely computed standards errors for ordinary least squares based on the assumption of independent and identically distributed error terms, tend to be misleading in panel data applications. Moreover, the selection of the respective panel regression model depends on the nature of the data set. Observations on a fixed and relatively small set of units of interest presume the application of the fixed effects model (Cottrell, 2009). In a fixed effects model the units in the sample are similar and cannot be viewed as a random draw from some underlying population. This is probably appropriate for countries, large companies or industries or predications for a particular country, company or industry (Verbeek, 2008). On the other hand, observations on a large number of randomly selected individuals presume the application of the random-effects model (Cottrell, 2009). But even if a large number of observations exist the random-effects model ignores the correlation between α and the independent variables that leads to inconsistent estimators. Thus, a random-effects model is merely appropriate for the identification of certain characteristics of individuals and not in the particular value of some individual (Verbeek, 2008). From a statistical perspective the selection of the panel regression model is conducted with different tests like the Hausman test and the Breusch-Pagan test.

5.2. Testing panel data models

The choice between the fixed effects model and the random-effects model can be answered with the Hausman test. The Hausman test tests whether the fixed effects and random-effects estimators are significantly different. A null hypothesis is stated and tested with the F-test that the unobserved unit-specific random effects (error term) are not correlated with the independent variables. In case that no such correlation exists, the random-effects-model would be preferable (Cottrell, 2009). In case that a correlation exists, the random-effects would be inconsistently estimated and the fixed effects model has to be applied. In detail, the Hausman test compares the covariance matrix of the least squares dummy variable model with those in the random effects model. If there is no statistically significant difference between the covariance matrices of the two models, then the correlations of the random-effects with the independent variables are statistically insignificant which would justify the use of the random-effects model (Yaffee, 2003). With the help of computer-based statistical programs this calculation is relatively easy. Statistical programs for panel data models often include the Hausman test and the Breusch-Pagan test.

The Breusch-Pagan test is the counterpart of the Hausman test. The test is used to test the pooled- regression model against the random effects model. In general, the Breusch-Pagan test is applied to test heteroscedasticity in a linear regression model. In other words, the test computes whether the estimated variances of the residuals from a regression are dependent on the values of the independent variables. A null hypothesis of conditional heteroscedasticity is stated and tested with a chi-squared test. If the chi-squared-test confirms that the independent variable is jointly significant then the null hypothesis is rejected and the random effects model should be applied (Mitchell, 2010). If the hypothesis is not rejected the simple pooled model is adequate. The simplest variant of the Breusch-Pagan test calculates the number of observations multiplied by R^2 of a regression of the squared ordinary least squared residuals.

In practice, the selection of the appropriate panel data model is first of all conducted with the Breusch-Pagan test to decide between the pooled-regression model and the fixed effects model. If the pooled-regression model is not useful the Hausman test is used to identify whether the fixed effects model or the random-effects model has to be applied. In practice, the random-effects model is less relevant than the fixed effects model because the random effects model includes substantially more estimation problems than the fixed effects model (Von der Lippe, 2012).

5.3. Application of the panel data model

In the research project, I tested the pooled regression model against the random effects model with the Breusch-Pagan test.

Breusch and Pagan Lagrangian multiplier test for random effects

g [i,t] = Xb + u[i] + e[i,t]

Estimated results:

	Var	sd = sqrt (Var)
growth rate	0.0001695	0.0130210
e	0.0001152	0.0107325
u	0.0000802	0.0089541

Test: Var(u) = 0

chibar2(01)	6067.28
Prob > chibar2 =	0.0000

Table 9: Results of the Breusch-Pagan test

The test confirms at better than the one percent level, that the simple pooled regression is rejected relative to the random effects model. Afterwards, I tested the random effects model against the fixed effects model with the Hausman test. The Hausman test checks whether the estimators of two identical specifications that are calculated with different methods do have significant statistical differences. If the coefficients of the random effects model are significantly different from those of the fixed effects model then this result indicates that the coefficients of the random effects model are systematically biased and thus the fixed effects model should be used.

Hausman test

	Coefficients			
	(b) FE	(B) RE	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
Economic growth	-0.016	-0.017	0.001	0.000
Inflation	0.056	0.057	0.000	0.000
Profitability	-0.030	-0.033	0.002	0.000
Capital structure	-0.002	-0.002	-0.001	0.000
Valuation effects	0.003	0.003	0.000	0.000
Performance	0.005	0.005	0.000	0.000
Size	0.001	0.001	0.000	0.000

b = consisten under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic
Test: Ho: difference in coefficient s not systematic

chi2(7) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 71.61
Prob>chi2 = 0.000
(V_b-V_B is not positive definite)

Table 10: Results of the Hausman test

The random effects model is rejected in favor of the fixed effects model. Thus, the fixed effects model is selected as the thesis' method for the analysis of the long-term growth rate. For the panel data organization I used index variables for each of the 229 observed cross-sectional units (REITs). In addition I used time variables for each of the 80 time periods (quarters). As other multivariate regression models the fixed effects model is confronted with econometrical problems such as the selection of independent variables, perfect multicollinearity, autocorrelation, heteroscedasticity, (adjusted) coefficient of determination and stationarity.

The **selection of independent variables** is of particular importance for the determination of the regression model. In case of missing relevant variables the point and interval estimators are biased which results in poor hypotheses tests. The consideration of irrelevant variables leads to unbiased but inefficient point and interval estimators and usable but imprecise hypotheses tests. Therefore, the selection of the independent variables has to be balanced between the risk of bias and the variance of estimation. Every additional independent variable decreases the risk of bias but increases the variance of the estimators and vice versa. There are some ratios that analyze this discrepancy: the adjusted coefficient of determination, the Akaike-criterion, the Schwarz-criterion, Bayesian information criterion and the Hannan-Quinn-criterion. Furthermore, there are tests to select the independent variables: t-test, F-test, unnested F-test and J-test. The selection of independent variables is based on the literature review. In the thesis, I tested various models with different variables. In the selection of the final model I calculated the Akaike criterion for all regressions to identify the best specification which exhibits the lowest respectively most negative value. In addition, I controlled the selected independent variables with the adjusted coefficient of determination. I lag all independent variables by one period to reduce endogeneity and improving the ability to draw causal inferences. Lagging the independents avoids the risk of contemporaneous relationships and reverse causality issues. For example, if the variable *performance* impacts the *growth rate* and simultaneously the *growth rate* impacts *performance* I would obtain spurious results from the regressions. Such a contemporaneous relationship does not affect the results when lagging *performance* (and the other independent variables), because with this specification the *growth rate* in period t cannot impact *performance* in period t-1.

Perfect multicollinearity describes a perfect linear correlation between the independent variables. In this case an ordinary least squares-estimation is impossible. Normally, perfect multicollinearity is not the case and as a rule imperfect multicollinearity is perceived. The degree of multicollinearity can be measured with the coefficient of determination. The higher the multicollinearity the greater the variance of the individual estimators. A high variance of the estimators often leads to low t-values. The combination of low t-values and high F-values indicate high multicollinearity. Multicollinearity can be decreased by reducing irrelevant independent variables from the regression model. Multicollinearity is in conflict with autocorrelation depending on the selection of the independent variables. I controlled for multicollinearity by focusing on t-values and the coefficient of determination. In addition, autocorrelation is controlled by the use of clustered robust standard errors.

I computed uncentered variance inflation factors (VIF) for the independent variables to check for potential multicollinearity. Variance *inflation* factors are often used to detect collinearity of regressors with the constant. VIF values greater than 10 would warrant further examination. VIF shows how much the variance of the coefficient estimate is being inflated by multicollinearity. For example, if the VIF for a variable were 9, its standard error would be three times as large as it would be if its VIF was 1. In such a case, the coefficient would have to be 3 times as large to be statistically significant (Williams, 2011).

Measure	VIF	1/VIF
Economic growth	1.09	0.916
Inflation	1.04	0.958
Profitability	1.08	0.924
Capital structure	1.18	0.848
Valuation effects	1.07	0.938
Performance	1.04	0.959
Size	1.14	0.879
Mean VIF	1.09	

Table 11: Results of variance inflation factors

Autocorrelation or serial correlation occurs in data when the error terms of a regression model are correlated and therefore dependent on each other (Von Auer, 2011). Autocorrelation affects the precision but not the accuracy of the estimation of the independent variables in a multiple regression model. When autocorrelation is present the independent variables have unbiased estimates but biased variances. As a result, the sum of squared errors may seriously underestimate the true unexplained variation, causing unjustified large t-values. This situation can lead to the conclusion that certain independent variables are statistically significant when they actually are not. Thus, the effect of autocorrelation is the opposite to the effect of multicollinearity. A widely used test for autocorrelation is the Durbin-Watson test.

Heteroscedasticity describes the occurrence of different variances of the random error term of the recorded dependent variables. A heteroscedastic regression model can be transformed into a homoscedastic model by a weighted least squares estimation method or heteroscedasticity-consistent standard errors. The occurrence of heteroscedasticity can be tested with the Goldfeld-Quandt-test or the White test. In the econometric literature the majority of authors argue that autocorrelation and heteroscedasticity can be controlled with clustered robust standard errors. Clustered robust standard errors improve the consistent estimation of standard errors by a simple computation proposed by White (1980). Petersen (2009) analyzed different solutions that are recommended in the literature to take into account autocorrelation and heteroscedasticity. The author states that clustered robust standard errors are appropriate to calculate consistent t-statistics and p-values under heteroscedasticity and autocorrelation for panel data sets.

Consequently, in the thesis I addressed the potential for heteroscedasticity and autocorrelation by clustered standard errors at the firm level as suggested by Petersen (2009). The typical way to account for heteroscedasticity would be to use the White standard errors, but this is not appropriate for my panel data structure. A common method for accounting for both heteroscedasticity and autocorrelation would be the Newey-West approach to correct standard errors. However, Petersen (2009) criticizes the Newey-West standard errors if applied for a fixed effects regression setting, because Newey-West standard errors would be underestimated when firm effects are fixed. Petersen (2009) suggests using cluster robust standard errors to avoid a bias induced by the Newey-West approach.

Stationarity describes a process in which data has a constant mean, variance and covariance over time. In case of a stationary process, the analysis of data in different time periods can be neglected since the statistical properties are indifferent. Stationarity is one of the most important properties in times series analyses. In the literature, various tests were developed to measure stationarity in panel datasets such as Harris-Tzavalis (1999), Hadri (2000), Breitung (2000), Fisher-type (Choi 2001), Levin-Lin-Chu (2002), and Im-Pesaran-Shin (2003). The tests state the null hypothesis that the panel data contain a unit root. With the exception of Im-Pesaran-Shin (2003) and Choi (2001) all tests have the important requirement that the panel data is strongly balanced. Im-Pesaran-Shin (2003) does not require strongly balanced data but the test does not allow gaps in the each unit's time series. The Fisher-type test of Choi (2001) does not require strongly balanced data and the respective unit's time series may have gaps.

The testing for stationarity is particularly important with panels with a long-time-series. In the thesis I applied the Fisher-type test (Perron procedure) to test for stationarity of my unbalanced panels with gaps. The results show at the one percent confidence interval that not all time-series in the panel contain unit roots; in other words, at least one time-series is stationary. The alternative augmented Dickey Fuller procedure does not work properly for the sample because the time series of the panel are not long enough. A procedure that tests if all time-series in the panel are stationary is the Hadri Lagrange multiplier, which unfortunately is not applicable to an unbalanced panel. In summary, the small number of time period (T) compared to the number of cross sections (N) should limit the risk of non-stationarity affecting my results; most non-stationarity tests for panel models are designed for long panels because non-stationarity problems arise in longer panels with large T. The alternative tests for stationarity such as LevlinChu, etc. are not applicable because they either require strongly balanced panels or no time series gaps. If I wanted to account for possible non-stationarity in the sample I could first-difference my data before running the regression or to account for a drift include a time trend. However, the loss of information through first-differencing the data would limit the inferences I can draw from my results since long-term changes over time would be eliminated. In this case, the cure to the problem of non-stationarity, such as the loss of information, would be worse than the problem of occasional non-stationarity form some time-series in the panel. Nevertheless, first differencing is inherently applied for the independent variables. Since the dependent variable is defined as return on equity minus dividend yield, the growth rate functions effectively as a first difference. In particular, I am interested in levels of the growth rate over time and not in the change respectively the first-difference of the growth rate, because growth rates adjust slowly and do not react to information as stock prices do.

5.4. Panel data analysis with the statistical computer software Stata

The panel data analysis is conducted with the computer software Stata 11. Stata is one of the most frequently used statistical software for econometrics. The software is in particular useful for the analysis of large panel dataset since the Stata provides a wide range of applications such as fixed and random effects models, post estimation tests, specification tests, linear dynamic panel data estimators, panel data unit root tests, summary statistics and tabulations or panel data line plots.

Stata summarizes the results in a table at the end of the panel data analysis. The most important parameters are described in the following. The panel regression coefficient of each independent variable indicates how much of the dependent variable changes when the independent variable increases by one unit. In a multivariate analysis one general constant coefficient is estimated that represents the intercept. In addition, the other coefficients represent the slope and therefore the impact of each independent variable. The estimated coefficients are constant for each independent variable. The quantification of the influence of each independent variable equals the multiplication of the estimated coefficient with the respective observed independent variable.

In Stata the p-value is listed in brackets below the respective coefficient. The p-value tests the hypothesis that each coefficient is different from zero. To reject this, the p-value has to be lower than 0.05 (for a 95% confidence). In this case the independent variable has a significant influence on the dependent variable. In the table of the panel data analysis the levels of significance are illustrated by stars. Three stars (***) indicates significant test results at the 1% level, two stars (**) indicates significant test results at the 5% level and one star (*) indicates significant test results at the 10% level.

The bottom of the table shows statistical measurements such as the adjusted coefficient of determination (R^2) and the Akaike information criterion. The adjusted coefficient of determination (R^2) measures the proportion of the variability in the dependent variable that is explained by the independent variables (Black, 2009). The remainder is explained by the omission of important information-contributing variables from the model, an incorrect formulation of the model, and experimental error. The multiple coefficient of determination takes a value in the range of $0 \leq R^2 \leq 1$. The Akaike information criterion supports the selection of the model. The additional of independent variables increases the coefficient of determination regardless of the quality of these variables in their function to predict the dependent variable. The Akaike information criterion takes this problem into account by introducing a penalty term for the number of parameters in the model. The model is so much the better, the lower the value of information criterion. The number of observations show the number of long-term growth rates in the model. The number of units show the number of REITs considered in the model.

5.5. Generating and analyzing data for the long-term growth rate

I conducted the following necessary steps to generate and analyze the dataset. The dataset comprises information of 229 US REITs for the period of 1992Q1 to 2011Q4 and resulted in 7,140 observations.

Firstly, the data of the independent variables was recorded on a quarterly basis from the SNL Financial database.

Secondly, the components of the long-term growth namely shares price, dividends and the return on equity were recorded on a quarterly basis. Shares prices and dividends are generated as well from the SNL Financial database. The return on equity consists of the components risk free rate, adjusted beta factor and market risk premium. The data of the risk free rate and the beta calculation (measured against S&P 500) was generated from the webpage of French (2012). The market risk premium was taken from Ibbotson Associates (2012).

Thirdly, I adjusted the data for extreme outliers for the growth rate and market to book ratio by winsorizing at the 1% and 99% percentile. In rare exceptions of large price drops, the dividend yield, which is part of the growth rate, may show unusually high spikes, which can be adjusted through replacing outliers by the lowest or highest value of the 1% or 99% percentile range.

Also, the statistical computer software Stata was used to conduct the panel regression analysis with firm fixed effects. Firm fixed effects take unobserved heterogeneity, which includes differences in management style, corporate culture, organizational structure, property type, legal structure and others, between firms into account. This is especially important for datasets with large number of cross sections. This procedure eliminates unobserved heterogeneity between firms from the sample. I implemented the firm fixed effect estimator through mean-differencing, which means that I calculate means for the time series of each cross sectional unit (REIT) and subtract the actual values. To save degrees of freedom, I choose the within estimator that uses mean-differencing instead of the least-squares dummy variable estimator that uses dummy variables to capture firm fixed effects.

Furthermore, based on the literature review I selected known determinants of the growth rate. My base model is model 1 that includes the natural logarithm of market capitalization to proxy for firm *size*, return on assets to proxy for *profitability*, market leverage for *capital structure*, market to book ratio for *valuation effects* and market valuation, stock *performance* for *performance* respectively momentum effects, real US GDP growth to proxy for *economic growth* and change in the consumer price index to measure *inflation*. I tested alternative specifications to test whether I can improve the model to alterations in the parameters. For example, in model 2 I used book leverage instead of market leverage and in model 3 I applied Tobin's Q instead of market to book ratio: (a) Book leverage captures effects more from historical data whereas market leverage is more forward-looking and (b) market to book ratio and Tobin's Q are similar metrics that are applied for measuring over- and undervaluation of firms at the stock market. Comparing the Akaike information criterion of each model I choose the model with the lowest respectively most negative value. The adjusted R^2 is 32.1% for my base model, which means that it is able to explain 32.1% of the variation of the growth rate. One has to note that the between variation explained through firm fixed effects is accounted to the explained variance, which leads to a higher adjusted R^2.

6. Results

In this section, the results of the data analysis are presented and analyzed for their relevance to the hypotheses. I calculated the implied long-term growth rate based on the SNL Financial database and other sources which resulted in overall homogenous results. The calculation comprised 229 US REITs in the period of 1992Q1 to 2011Q4 with 7,140 observations. In the following, summary statistics are described with regard to the components determining long-term growth as well as the independent variables. The long-term growth rate is further analyzed by property type to identify differences reasoned by the different risk profiles of the respective US REITS sub sector. Furthermore, the results of the panel regression analysis are shown and discussed for each independent variable. In addition, I have analyzed covariance by variance decomposition to compare the impact of each independent variable on the dependent variable. Finally, practical implications are mentioned that can be used by an appraiser for the valuation of US REITs. The thesis closes with suggestions for further research.

6.1. Summary statistics

The summary statistics show the parameters to calculate the long-term growth on the left-hand side of the regression as well as the independent variables. The data set covers 229 publicly listed US equity REITs. The data was generated on quarterly basis in the period of the years 1992Q1 to 2011Q4. I avoided survivorship bias through the consideration of defunct REITs that do not exist until the end of the sample because of mergers or acquisitions. Other REITs joined the sample after the year 2000 reasoned by later initial public offerings. The following table lists basis statistics and the corresponding variable definitions.

Measure	Obs.	Mean	SD	Min	Max
			Quarterly		
Growth rate	7,140	0.004	0.013	-0.034	0.044
Return on equity	7,140	0.020	0.008	-0.013	0.064
Dividend yield	7,140	0.017	0.040	0.000	2.054
Beta factor	7,140	0.539	0.391	-1.069	2.714
Risk free rate	7,140	0.007	0.005	0.000	0.016
Equity risk premium	7,140	0.024	0.001	0.022	0.025
Price	7,140	25.463	27.137	0.160	419.650
Economic growth	7,140	0.025	0.026	-0.089	0.080
Inflation	7,140	0.007	0.008	-0.040	0.025
Profitability	7,115	0.008	0.026	-0.295	0.996
Capital structure	7,136	0.480	0.194	0.001	0.993
Valuation effects	7,126	1.865	1.799	0.186	14.755
Performance	7,140	0.022	0.182	-0.915	4.645
Size	7,136	13.104	1.796	6.545	17.450

Measure	Description
Growth rate	Implied long-term growth rate
Return on equity	risk free rate + beta x equity risk premium
Dividend yield	Dividend / share price
Beta factor	Covariance (ri, rm) / Variance (rm), adjusted
Risk free rate	One month US treasury bill
Equity risk premium	Stock total return minus risk free rate
Price	Stock price
Economic growth	Real US GDP growth
Inflation	Change in consumer price index
Profitability	Return on assets
Capital structure	Market debt ratio
Valuation effects	Market to book ratio
Performance	Change in stock price
Size	Market capitalization

Table 12: Summary statistics

The summary statistics show a **growth rate** of 0.4% which equals an annualized growth rate of 1.6%. In comparison, economic growth was measured with a rate of 2.5% per quarter which confirms the argument of several authors that a company's long-term growth cannot be higher than the economic growth rate; otherwise the company would be larger than the economy itself in the long-term. Firstly, the statistics corroborate the determination of the long-term growth with an implied approach by solving the Gordon Growth formula to growth. Secondly, the level of ***economic growth*** and the long-term growth rate indicates that the market's determination of the long-term growth includes rationale with regard to the macroeconomic environment. Interestingly, ***inflation*** with 2.1% is on average higher than the long-term growth rate. In the literature, some authors assume that the long-term growth rate has at least the level of the long-term growth rate. Since the summary statistics show only average values of the respective measures the direct comparison of the growth rate and inflation has to be considered carefully. **Return on equity** is measured with an average annualized rate of 8%. In comparison, the **dividend yield** amounts to 6.8% which results in positive growth rates on average. Therefore, the summary statistics show that the debt ratio used to the measure the impact of the ***capital structure*** was on average 48% in the years 1992 to 2011. In comparison, Murray & Goyal (2007) present empirically evidence of debt ratios for industrial firms in the United States. The authors derive average debt ratio of 37% (years 1950 to 1959), 45% (years 1960 to 1969), 54% (years 1970 to 1979), 60% (years 1980 to 1989), 62% (years 1990 to 1999) and 76% (years 2000 to 2003). As a result, the average debt ratio of US REITs tends to be lower than that of industrial companies. Feng, McKay Price & Sirmans (2011) calculate the debt ratio for US equity REITs in the period of 1993 to 2009 on average of 44% which is consistent with the result in this study. Furthermore, Feng, McKay Price & Sirmans (2011) calculate an average return on assets of 3.33% as a measurement of ***profitability*** which is, in turn, consistent with the annualized average return on assets of 3.20% in this study. In addition, ***valuation effects*** measured by the market to book ratio equals on average 187% which shows that the market tend to include growth assumption in their valuation of REITs. Striewe, Rottke & Zietz (2010) calculated an average market to book ratio of 150% for US REITs in the period of 1994 to 2010. Feng, McKay Price & Sirmans (2011) calculated Tobin's Q for US equity REITs in the period of 1993 to 2009, showing an average of 124% which supports the result of the market to book ratio. The average ***size*** of an US REIT equals a market capitalization of approximately $ 3 billion over the period under observation. Although there are REITs with market capitalizations of several billion the average value show that the majority of REITs are traded as small caps.

The regression is specified with lagged independent variables to alleviate potential problems of endogeneity. Therefore, the values of the long-term growth rate on the left-hand side for Q1 are matched with the values of the independent variables for Q4 of the year before, which gives a one-quarter lag. The table shows an averaged adjusted beta of 0.539 which is line with the results of other authors for example Cotter & Roll (2011) who calculated an average beta for US equity REITs of 0.640 in the period of 1980 to 2009. I adjusted the raw beta to control for measurement error and extreme values. In the literature, Blume (1971) and Vasciek (1973) introduced adjustment techniques to consider biases and inefficiency in the determination of beta. Since Blume (1971) is the most common beta correction technique used by information services providers such as Bloomberg, I assumed that this technique is used by the majority of market participants. Analogous to Blume (1971) I adjust betas for mean reversion. As the reference mean to which REIT betas should revert, I applied the average REIT beta across all REITs and time periods which is 0.539. A mean beta for REITs below 1 is also confirmed in the literature. If I would adjust REIT betas with a reference beta of 1 I would move the distribution closer to 1 which would bias my particularly low REIT betas upwards even though REIT betas have a naturally lower correlation to the general stock market. This would fail to achieve the purpose of the adjustment concept, which is to adjust for extreme betas. My application of Blume's concept to the REIT market takes the especially low beta range of the REIT market into consideration.

Furthermore, I tested the equity risk premium of Ibbotson (2012) through the simultaneous calculation of a forward equity risk premium which equals an implied equity risk premium using the present value formula. The used forward equity risk premium is a practical-oriented approach that is often used in applied corporate finance. Thus, I calculated the annual dividend yield of the S&P 500. Then I considered expected real GDP growth and expected inflation for the next five years based on the Livingstone survey (2012) which is the oldest continuous survey of economists' expectations published by the Federal Reserve Bank of Philadelphia. I further calculated the index value based upon the expected rates of return which was in turn equalized with the current index value. As a result, the implied market return was identified that was subtracted by the risk free rate respectively one month US Treasury bill to receive the implied equity risk premium. I applied the implied equity risk premium in the determination of the return on equity and thus the long-term growth rate. I run the regression to test for any relevant changes. In conclusion, the regression results were robust which corroborate the use of the equity risk premium of Ibbotson (2012).

6.2. Analysis of the long-term growth rate

In the following the long-term growth rate and its components are analyzed over the period under consideration.

The long-term growth rate is derived with: $g = r - \frac{D_1}{P}$

$P = share\ price$

$D_1 = expected\ dividend$

$r = rate\ of\ return\ on\ equity$

$g = long - term\ growth\ rate$

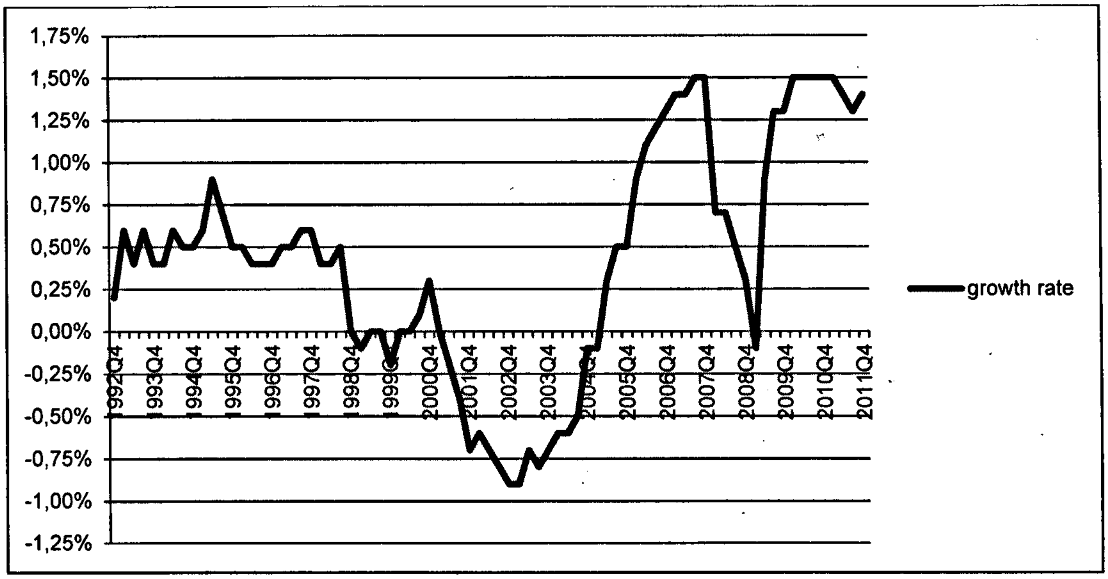

Figure 7: Long-term growth of US equity REITs in period under observation

In the median's time series of the long-term growth rate I included as well negative growth rates in the sample. Ryan (2006) states, that the growth rate can be assumed to be zero or even negative without doing violence to the underlying integrity of the model. The negative growth rates in the period 2001Q1 to 2005Q2 are reasoned by the REITs crash in 1998 and the burst of the new economy stocks bubble. In general, a negative growth rate may originate through the decrease of stock price in combination with constant dividends which results in a higher dividend yield and in turn to lower a growth rate. In turbulent economic times, an increase of the rate of return on equity is not expected since interests rates are normally on a low level and the increase of beta does not compensate the effect of a lower stock price.

The graph of long-term growth rate has to be considered in the context with the historical development of the capital markets and US REITs. The year 1992 is often described as the start of the modern REIT area, meaning the successive dominance of equity REITs and the squeeze out of mortgage and hybrid REITs of the market. In the years 1992 to 1997 equity REITs showed tremendous growth in the number and market capitalization (1992: $ 9 billion, 1997: $ 128 billion). This increase was driven by various legislative changes (for example introduction of UPREIT structure) and important events (Initial Public Offerings boom in 1993 to 1994 and secondary offerings boom in 1997 to 1998) that made REITs an attractive investment vehicle. In the year 1997, US equity REITs were traded with a 30% premium on net asset value. In the years 1992 to 1998, the long-term growth rate of US REITs was determined by the market in a corridor of 0% to 0.75% with a peak in 1995 Q2 of 0.9%. Despite the impressive development of the sector during this period, the long-term growth rate was relatively constant.

In the year 1998, the US REIT boom was terminated with sharp decreases in share prices. The NAREIT index collapsed by 22% and at the end of the year 1999 REITs were traded with approximately 18% discount on net asset value. Clayton & MacKinnon (2009) argue that the REIT market crash was caused by concerns about the pricing of REITs in comparison to private real estate fundamentals, concerns about the misuse of cheap capital through REIT Initial Public Offerings to overpay for properties and the new economy stock phenomenon. The REIT collapse was further accelerated as capital of REITs was pulled out and put into new economy stocks. In the period 1998 to 2005, US equity REITs showed negative growth rates which was reasoned by two impacts: Firstly, the REITs crash in 1998; secondly, the new economy stocks crash in 2000. Interestingly, long-term growth rates recovered shortly after the REIT crash to positive values. As a result of the new economy crash, worldwide stock markets have fallen in a bear market in the period of 2000 to 2003. The graph shows that the long-term growth rate could not withdraw this trend. In the year 2002Q4 US REITs reached their lowest growth assumptions determined by the market with -0.9% before the great recovery started analogical to the upturn of worldwide stock markets. As a result, long-term growth rates were calculated in the non-negative area with 0% in 2005Q2.

After the burst of the new economy bubble a situation was created in which investors searched for safe and profitable investment opportunities. In parallel, the Federal Reserve started a low-interest policy to support the national economy. The financial industry designed in this environment new capital market instruments such as mortgage backed securities or collateralized debt obligations that are derived from mortgage payments. Consequently, a credit boom started in which investors could participate from the booming US housing market. Until the year 2007 the amount of such financial innovations increased massively until the outbreak of the financial crisis. The graph shows a continuous increase of the long-term growth from 2005 to 2007 along with the development of the S&P 500 induced by the situation after the new economy crash. In its peak in 2007Q4, the averaged long-term growth rate of US equity REITs was traded with 1.5%.

The financial crisis has manifold reasons that include in general the underestimating of risk and the exaggerations in the US housing and mortgage market. The crisis culminated in September 2008 when several financial institutions became insolvent or were rescued by the government. As a consequence, the access to credit and financial markets were severely limited with gloomy economic prospects worldwide until the year 2009. The long-term growth rates in the years decreased in the years 2008 to 2009. Interestingly, growth rates were not determined with negatively signs. While the S&P 500 exceeded its low of the year 2003, REITs' growth rates decreased until the average level of 2004Q4. This comparison shows the low volatility of REITs measured by a mean beta of 0.539 with the S&P 500 and the tendency of market participants to perceive REITs as a countercyclical investment vehicle.

Furthermore, the financial crisis resulted in an increase of the state indebtedness in Europe and the United States including rescues of national economies in continental Europe and discussions about the common currency Euro. The FTSE NAREIT all equity REITs index performed (based on total returns) by 89.5% (3 year horizon) and 18.3% (5 years horizon) as of August 2012. In the United States the current situation of the economy can be described by historical low interest rates of the Federal Reserve, a high national deficit, fears about *inflation*, continued high unemployment and low GDP growth expectations. The graph of the growth rate shows long-term growth rates on a historical high in the years 2010 to 2011 while in comparison the S&P 500 has not reached its high levels of the years 2000 and 2007. This underlines the tendency that market participants invest in REITs as countercyclical investment vehicle when GDP growth rates are low.

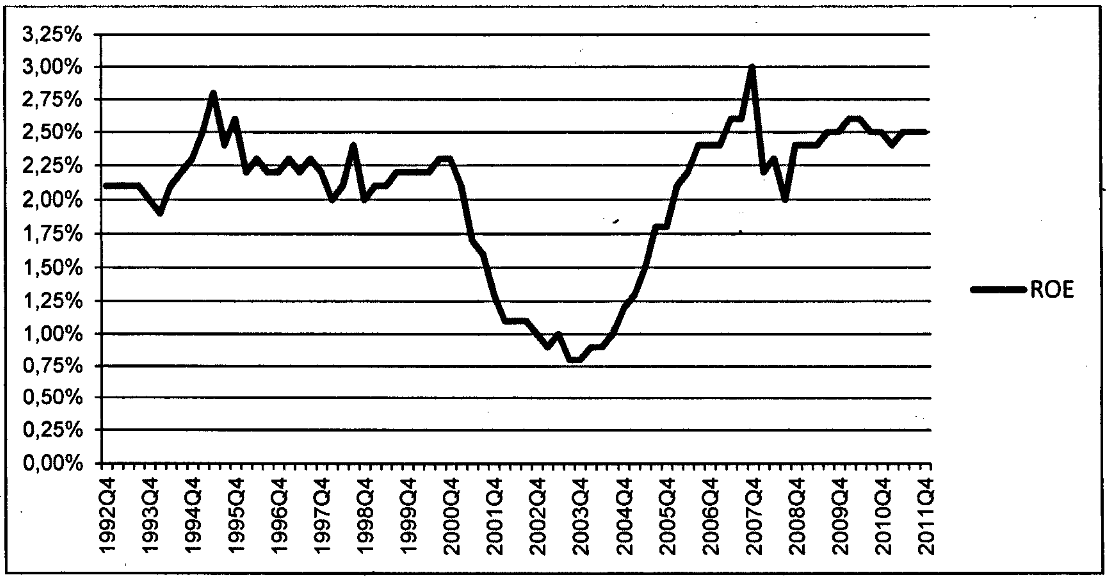

Figure 8: Return on equity of US equity REITs in period under observation

The graph shows the first component of the adjusted Gordon Growth formula to calculate the long-term growth rate. The rate of return on equity equals the mean of the rates of all REITs in the sample in the respective quarter. The graph shows relatively constant rates of return on equity in the period of the 1992 to 2000. The increase since the year 2004 is based on increased beta factors in years with high uncertainty and volatility. Nevertheless, the rate of return on equity has turned into a constant level of 2.5% since the year 2008Q4 which is influenced by the low interest policy of the Federal Reserve and steady levels of betas and market risk premiums.

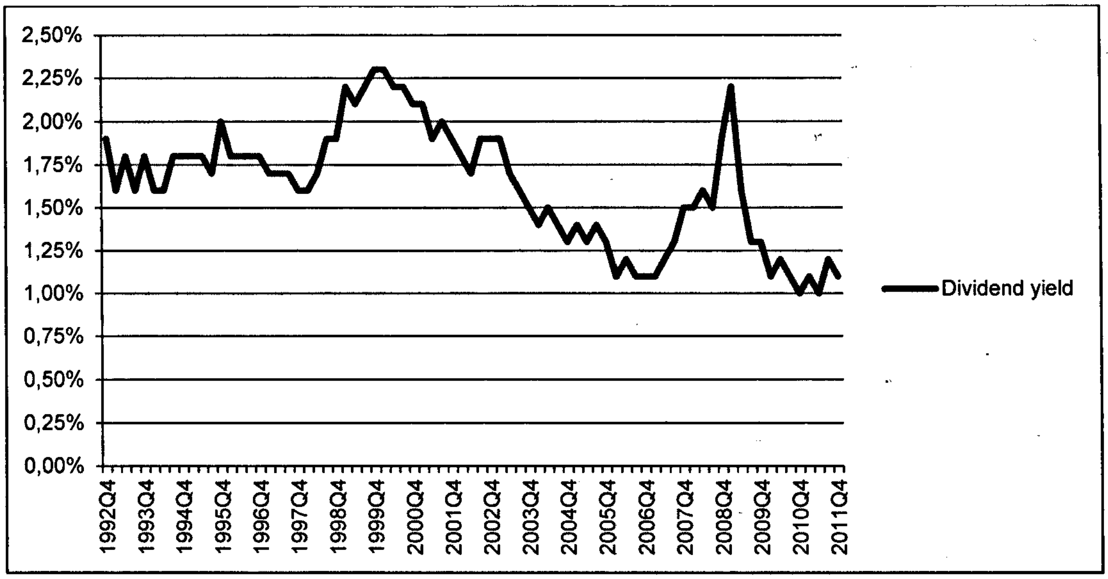

Figure 9: Dividend yield of US equity REITs in period under observation

The median's time series data of the dividend yield is of particular interest since the ratio is subtracted from the rate of return on equity to calculate the growth rate. The time series data shows that the level of REITs dividend yield did not recover from the sharp decrease in the year 2007. Today, REITs dividends yield is on a lower level than in the year 1992. The peaks in the years 1999 and 2009 can be explained with decreasing stock prices because REITs pay-out relatively constant dividends, the major impact on the dividend yield is the stock price. In contrast, the low in 2011Q4 is explained by a 20 year high of REITs stock prices according to the FTSE NAREIT All Equity REITs Total Return Index. Hence, the dividend yield of REITs serves as a contrary indicator for the development of stock prices.

In summary, the current high level of growth rates is driven by increased rate of returns on equity which is in turn influenced by increased beta factors because of fluctuating markets in times with great economic uncertainty. In addition, the low level of dividend yields is induced by the high level of stock prices. The combination of high rates of return on equity and low dividend yields results in the current high level of the long-term growth rate.

I analyzed the long-term growth rate on a sub sector basis to identify whether the market considers the REITs' underlying property type in the determination of the long-term growth rate. Therefore, I clustered the different REITs into the categories diversified, hotel, industrial (industrial and self-storage), office, other (health care, specialty), residential (manufactured homes, multifamily houses) and hotels.

	Observations	Units	Growth rate (median)
Diversified	986	25	0.600%
Hotel	542	19	1.200%
Industrial	527	29	0.300%
Office	968	31	0.300%
Other	902	32	0.300%
Residential	1,287	38	0.200%
Retail	1,928	55	0.200%
Total	7,140	229	0.300%

Notes: The data covers 229 publicly traded US REITs from 1992Q1 to 2011Q4

Table 13: Long-term growth rates of US equity REITs by property type

As a result the different property types showed growth rates in a range of 0.2% for residential REITs to 1.2% for hotel REITs on a quarterly basis. Residential REITs are typically stable investments that are less dependent on the economy with constant yields and predictable cash flows. They offer at the same time limited growth opportunities and, hence, exhibit the lowest average growth rate compared with other REIT property types. In contrast, the hotel sector is highly dependent on the economy and is typically more unstable. Hence, hotel REITs have the highest average growth rates. My average benchmark value for all REITs of 0.4 % approximates the average value of diversified and other REITs and can be interpreted as the most representative growth rate of the REITs sector. In conclusion, the analysis shows that the higher the risk and return profile the higher the growth rate of the respective REITs sub sector.

Subsequently, I applied the analyzed dataset for the panel regression analysis to identify macroeconomic and company specific variables that have a significant influence on the long-term growth rate. The results are shown in model 3 in the following table.

	Model 1	Model 2	Model 3
Economic growth	-0.014**	-0.014**	-0.016**
	(0.045)	(0.046)	(0.030)
Inflation	0.054***	0.056***	0.055***
	(0.001)	(0.000)	(0.001)
Profitability	-0.029**	-0.028**	-0.031**
	(0.045)	(0.048)	(0.036)
Capital structure	-0.000	0.002	
(market debt ratio)	(0.904)	(0.558)	
Capital structure			-0.005
(book debt ratio)			(0.144)
Valuation effects	0.001***		0.001***
(market to book value)	(0.002)		(0.000)
Valuation effects		0.003**	
(Tobin's Q)		(0.016)	
Performance	0.005***	0.005***	0.005***
	(0.000)	(0.000)	(0.000)
Size	0.001**	0.001**	0.001**
	(0.014)	(0.030)	(0.015)
Constant	-0.014**	-0.017**	-0.013*
	(0.043)	(0.020)	(0.072)
Adjusted R squared	0.321	0.321	0.322
AIC	-44,719	-44,715	-44,733

Notes: Observations are fixed with 7,140 for all regressions and 229 units
* indicates significance at the 10% level,
** indicates significance at the 5% level,
*** indicates significance at the 1% level,

Table 14: Fixed effects regressions explaining long-term growth

The determination of the long-term growth rate of US REITs depends on both macroeconomic and company specific factors. Among the macroeconomic factors *economic growth* and *inflation* drive the growth rate of REITs. In particular, long-term growth is positively related to *inflation* and negatively related to *economic growth*. Among the company specific factors *valuation effects*, *performance* and *size* have a positive relation to the growth rate while *profitability* is negatively related to the growth rate. The *capital structure* has no significant influence on the growth rate of REITs.

In this analysis also variance decomposition is of particular interest to show how the influencing factors compare to each other.

Measure	Partial SS
Economic growth	0.213
Inflation	0.018
Profitability	0.131
Capital structure	0.020
Valuation effects	0.043
Performance	0.188
Size	0.387
Adjusted R squared	0.322

Notes: The table shows the quotients of each effect's partial sum of squares divided by the total sum of squares of all factors (except the fixed effects). The column results to the sum of one.

Table 15: Variance decomposition – Analysis of Covariance

The variance decomposition presents the fraction of sum of squares that are attributable to one particular impact. Among the examined factors, *size* is the most important driver of the long-term growth rate with 38.7% of the regression's explained variance. Secondly, *economic growth* (21.3%) drives the growth rate more than the *inflation* rate (1.80%) within the macroeconomic factors. In addition, *performance* (18.8%) and *profitability* (13.1%) show relatively strong influence on the long-term growth rate. The table shows that company specific factors are generally more important than macroeconomic factors for the growth rate. Interestingly, inflation has a relatively weak impact although REITs are recognized as a hedge against inflation.

In summary, the market determines a higher growth rate in an environment of decreasing *economic growth* and *inflation*. Therein, the market focuses on larger REITs that have potential to add value indicated by decreasing *profitability* but simultaneously performed well in the last period. In essence, large REITs are used in uncertain economic times as safe harbors to protect against negative macroeconomic influences. In the following the influencing factors are discussed in detail.

6.3. Discussion

The discussion of the research results is conducted for each tested research factor. For the sake of an accurate classification in the existing body of knowledge, the research results are appreciated critically. Generally, the results of the empirical study contribute to theory and practice by identifying the influencing factors on the growth rate and how the market has determined the growth rate in the past.

6.3.1. Discussion of the independent variable - *Economic growth*

The first hypothesis tested the influence *economic growth* measured by the US real GDP growth rate and showed that the macroeconomic variable is highly significant to determine the long-term growth rate. The independent variable to be tested is negatively correlated with the dependent variable with a highly significant p-value at the 5% level. Thus, the null-hypothesis which states "*economic growth* has no significant influence on the level of the long-term growth rate" is falsified. *Economic growth* is highly significant for the level of the long-term growth rate.

The negative relation of real GDP growth with the dependent variable is explained by the nature of REITs. *Economic growth* empirically leads to higher dividend yields, which is associated with lower growth rates. Intuitively, firms tend to exhibit higher dividend performance in stable economic times and underperform in terms of dividend yield in recession times. But, GDP growth is usually lagged and in case of growth the actual market are already approaching the peak of dividend yields and do not expect much further growth. Hence, the negative relation of real GDP growth and the long-term growth rate of REITs, identify REITs as a counter cyclical investment vehicle. A weaker economy in terms of GDP growth seems to be a motivation of market participants to invest in REITs as opposed to industrial firms. The market tends to prefer REITs in such environment and thus allocates higher growth rates to the sector which are derived by lower dividend yields because of higher stock prices. Furthermore, this counter cyclical investment behavior is supported by the low correlation of REITs with the general stock market and the high correlation with real estate in the long-term.

In the literature, the influence of *economic growth* on the long-term growth rate confirms the works of authors such as Booth (1998), Copeland, Koller & Murrin (2002), Schultze (2003), Albrecht (2004), Foerster & Sapp (2005), Baetge, Niemeyer & Kümmel (2005), Copeland, Weston & Shastri (2005), Stellbrink (2005), Koller, Goedhardt & Wessels (2005) and Lally (2008) who apply *economic growth* is their estimates of the long-term growth rate. Although in case of REITs the relation is negative, this proposition is consistent with the finding for REITs. While the aforementioned authors assume a positive relation of *economic growth* and long-term growth of a company, my results differ in the negative relation which is reasoned by lower stock price performance and higher dividend payments of REITs in comparison to companies of other industries. The results contribute to the literature by demonstrating that the economic growth has as well an influence on the long-term growth rate of US REITs. In particular, the negative relation shows evidence that REITs are used as a counter cyclical investment vehicle. Thus, Raudszus (2012) is also confirmed who analyzed the behavior of US REITs compared to common stocks in terms of risk and return in the periods of external shocks and bank failures. In conclusion, the author's findings are further confirmed by the identification of REITs as a counter cyclical investment vehicle which was not yet examined through the analysis of the long-term growth rate. Furthermore, the use of *economic growth* as a benchmark for the long-term growth rate which is stated by Copeland, Koller & Murrin (2002), Schultze (2003), Albrecht (2004), Foerster & Sapp (2005), Baetge, Niemeyer & Kümmel (2005), Copeland, Weston & Shastri (2005), Stellbrink (2005), Koller, Goedhardt & Wessels (2005) is not confirmed for US REITs because of their counter cyclical character. In times of increasing *economic growth* rates this assumption may hold but in times of negative *economic growth*, the growth rates of REITs can be positive.

6.3.2. Discussion of the independent variable – *Inflation*

The second hypothesis examined the influence of the US *inflation* rate measured by the change of the consumer price index and identified that the macroeconomic variable is highly significant for the level of the long-term growth rate of US REITs. In the panel data analysis, the US *inflation* rate presents a highly significant p-value at the 1% level. The null-hypothesis "*inflation* has no significant influence on the level of the long-term growth rate" is rejected. The US *inflation* rate has a significant positive influence on the estimation of the long-term growth rate.

The positive influence of the *inflation* rate on long-term growth rate of US REITs suggests that when consumer prices rise US REITs are considered an *inflation* hedge. The market participants are interested in diversifying their portfolio with REITs to hedge the risk of *inflation*. US REITs are appropriate as an *inflation* hedging tool since they offer substantially higher returns than Treasury inflation protected securities (TIPS). However, REITs are not equally effective to hedge against *inflation* than TIPS. The better hedging of TIPS against *inflation* is at the costs of lower returns. As a rule, rents of REITs are typically indexed to the consumer price index and provide a safe harbor for investors in inflationary times. The special attention and interest towards REITs in such times may lead to increased expected growth. Expected increases of rents in the future first materialize in the form of higher stock price in anticipation of higher future rents, which reduces the dividend yield portion of the growth rate. Dividends adjust typically lagged because rents can only be adjusted after *inflation* has increased over some time. The phenomenon of decreasing yields in times of increasing prices is called yield compression. The dividend yield shows this effect in the beginning of inflationary times. As result, in periods of increasing *inflation*, the market considers REITs as a hedge against *inflation* besides other asset classes such as commodities or TIPS.

In the literature, the positive relation between *inflation* and the long-term growth rate confirms the incorporation of *inflation* in the growth rate models of Bradley & Jarrell (2003), Albrecht (2004), Koeller, Goedhardt & Wessels (2005) and Lally (2008). Furthermore, the assumptions of Booth (1998) and Foerster & Sapp (2005) are confirmed who apply the *inflation* rate as an estimator for the long-term growth rate. The claim of Widman, Schieszl & Jeromin (2003) who identified a statistical correlation between the *inflation* rate and long-term growth tends to be confirmed for US REITs as well. The results of my thesis contribute to existing literature by demonstrating for the first time that the influence of inflation on the long-term growth holds as well for US REITs. Furthermore, the influence of *inflation* on the growth rate confirms authors such as Glascock (2002) who argue that REITs can be considered an *inflation* hedge. In addition, the findings of Case, Wachter and Worley (2012) are confirmed who argue that real estate can be a perfect hedge against *inflation* under the assumption that rental agreements are linked to the *inflation* rate or include step-up rent clauses.

6.3.3. Discussion of the independent variable - *Profitability*

The third hypothesis tested the influence of *profitability* measured by return on assets on the long-term growth rate. The result showed a significant influence of ROA on the long-term growth rate with a p-value at the 5% level. The null-hypothesis "*profitability* has no significant influence on the level of the long-term growth rate" is rejected. ROA has a significant influence that is negatively related to the dependent variable.

As general rule unprofitable companies are usually younger, smaller and growing firms that need to expand restructuring and find break even until they can realize their future growth potential. Unprofitable firms also distribute few or no dividends, which leads to higher growth rates. In contrast, profitable companies are typically grown and established. These companies are rather reluctant to expand and grow, but prefer to maintain their current profitable business operations. In practice, analysts can identify growth REITs through lower *profitability* which is usually associated with lower dividend yields and thus higher growth rates. Consequently, the results show that the market observes REITs as small and young companies with growth opportunities.

The findings of my research confirm Glascock, Hughes & Varshney (1998) who describe REITs as typical younger and smaller firms in comparison to common stock companies. *Profitability* is considered an influencing factor on long-term growth by Nekrasov & Ogneva (2011), Damodaran (2008, 2011), Higgins (2007) and Ross, Westerfield & Bradford (2002). In those research studies, *profitability* is incorporated in the respective growth formula. Despite the negative relation of profitability with the long-term growth rate of REITs the consideration of *profitability* by the aforementioned authors are confirmed. The reason for the difference in the sign (negative versus positive) relation is reasoned by the nature of US REITs which are often younger and smaller companies with low dividend yields and profitability. My research results contribute to the literature by identifying that the market considers *profitability* to determine the long-term growth for US REITs as well. This finding was identified the first time for the long-term growth rate of US REITs. Based on this finding one can argue that the market accompanies with the idea of shareholder value since *profitability* measured by the return on invested capital (ROIC) is applied in calculating a company's economic value added which presents a concept of the shareholder value theory. Economic value added is generated if the ROIC exceeds the company's cost of capital. The excess return is multiplied with the amount of invested capital and shows the increase or decrease in the company's value. If the market consider *profitability* in the determination of the long-term growth rate than the market tends to consider the concept of shareholder value in the valuation of an REIT.

6.3.4. Discussion of the independent variable – *Capital structure*

The next hypothesis examines the influence of the *capital structure* measured by the book debt ratio on the long-term growth rate of US REITs. The analysis showed insignificant statistical results. The null-hypothesis "the leverage ratio has no significant influence on the level of the long-term growth rate" is not rejected.

The debt ratio was included as an independent variable in the regression model based on the literature review. Higgins (1981) considers the debt ratio an influencing variable on the long-term growth rate. The model of Higgins (2007) includes the target total debt to equity ratio in estimating the sustainable growth rate of sales. The debt ratio shows the dependence of a company on external financing. In conjunction with the return on equity, return on total capital and the cost of debt the leverage effect of a company can be calculated. In case of REITs the influence of *capital structure* on the long-term growth rate has to be called into question. The fixed effects model shows no impact of leverage on the growth rate. Therefore, the aforementioned positions in literature are not confirmed for determining the long-growth rate of REITs. Possible reasons of the insignificance of leverage might be that in the case of US REITs, market participants consider other influencing factors more important in their determination of the long-term growth rate since the significance of the variable is clearly declined through the high p-value. In case of Higgins (2007) the author's approach differs from that of the thesis that Higgins (2007) included leverage to determine the sustainable growth rate of sales and not dividends. This difference shows at least for leverage that variables of sales growth concepts are not transferable to determine dividend growth. Despite the insignificant relation in thesis, my finding contributes to the research question and the literature because it shows that leverage has no influence on the long-term growth rate of US REITs which was not identified before.

6.3.5. Discussion of the independent variable – *Valuation effects*

The fifth hypothesis tested the influence of *valuation effects* measured by the market to book ratio and showed that the independent variable is significant in the market's determination of the long-term growth rate. The independent variable correlates positively with the dependent variable with a p-value at the 1% level. Consequently, the null-hypothesis "the market to book ratio has no significant influence on the level of the implied growth rate" is falsified.

Valuation effects are captured by the market to book ratio. Since market to book ratio is a common indicator of growth opportunities it positively impacts the growth rate of US REITs as expected. The result shows that the relation of market to book value is apparently also associated with the relation of dividends to market price in the growth rate. The market apparently trusts the market to book ratio in determining the growth rate. The market to book ratio is often used to measure the growth opportunities of firms. The ratio takes the market valuation of a firm into account whether REITs are over or undervalued and therefore can be considered a proxy the market timing behavior of market participants.

In the literature, the market to book ratio has been highlighted as a predictor of the company's long-term growth rate. Based on the research of Tobin (1969) the market to book ratio was discussed as a proxy for a company's growth opportunities. Frank & Goyal (2009) emphasized the importance of the market to book ratio as a commonly used and reliable measure for growth opportunities. As a result, both sources are confirmed for the US REITs sector. My research contributes to the literature by identifying the relation of *valuation effects* and long-term growth of US REITs for the first time. The results answer the research question by showing that the market uses the market to book ratio to determine the long-growth rate of US REITs.

Other authors argue that the market to book ratio is limited in its capability to predict growth. Firstly, Erickson & Whited (2000) presented empirical evidence that the market to book ratio is a weak measure of growth opportunities. Secondly, Chan, Karceski & Lakonishok (2003) argue that the market to book ratio does not reliably predict future growth. In the case of US REITs, these authors are not confirmed since my finding is highly significant with a low p-value. The difference between the research of the aforementioned authors and this research are reasoned most probably by the different company's industries. Thus, the market seems to rely more on the market to book ratio in case of US REITs.

6.3.6. Discussion of the independent variable – *Performance*

The next hypothesis tested the influence of *performance* measured by change in raw stock price. The result showed a significant influence of *performance* on the long-term growth rate with a p-value at the 1% level. The null-hypothesis "*performance* has no significant influence on the level of the long-term growth rate" is rejected. *Performance* has a positive influence on the long-term growth of REITs.

The positive impact of *performance* results from positive changes in share prices leading to higher stock prices, which decreases the dividend yield portion of the growth rate, which in turn, leads to higher growth rates. In general, better performing REITs are typically REITs that bear growth opportunities and are valued with higher growth rates. I measure *performance* as the change in stock prices without accounting for dividends. This isolates the fraction of the *performance* that is attributable to future expected growth, which is the focus of the study, rather than distributed profits. The alternative would be to use total returns, but this would include dividends, which do not give indication about future expected growth because of their backward looking character. The result shows that the market's determination of the long-term growth is influenced by momentum phenomenon of short-termed stock price increases.

Such stock market behavior can as well inveigle REIT managers to exploit market timing. For example, managers can time the initial or secondary issuance of equity to take advantage of favorable growth expectations. Such behavior can lead to market exaggerations such as booms in initial public and secondary offerings. In addition, managers can time the issuance of debt in times of high growth rate to present a higher market capitalization and thus financial strength. Furthermore, mergers and acquisitions that are paid with stocks are easier to accomplish in times of high growth expectations. In summary, the results shows that influence of market timing on management and financing decisions can potentially result in wrong decisions and negative impacts on the REIT. On the other hand, the market uses short-term *performance* as an indicator to determine the long-term growth rate. Since the relation is positive the finding shows that market participants are influenced by a momentum effect which assumes rising stock prices to rise further based on a higher growth rate.

In the literature, Sornette (2000) mentions the relation of growth rate and share price and argues that low growth rate phases are in line with the firm foundation theory while large growth rate phases are driven by speculation and crowd behavior. The significant relation of stock price changes confirms the author's argument on the relation of stock price and growth rate and indicates potential momentum effects. The author does not state how market irrationalities can be differentiated from fundamentally justifiable growth rates. But for all that, changes in stock prices have to be reflected to control for the market's behavior to determine rational expectations. Li, Ibrahim, Ong & Ooi (2007) are confirmed in their statement that REITs are as well influenced by market timing effects. Simultaneously, the authors state that market timing effects are less pronounced than for common stocks because of the inherent characteristics of REITs. The finding of my research does not only confirm both aforementioned authors but also contribute to literature through identifying for the first time a momentum effect with regard to the long-term growth rate.

6.3.7. Discussion of the independent variable – *Size*

The final hypothesis tested the influence of *size* measured by market capitalization. The result showed a significant influence of *size* on the long-term growth rate with a p-value at the 5% level. The null-hypothesis "*size* has no significant influence on the level of the long-term growth rate" is rejected. *Size* has a positive influence on the long-term growth of REITs.

Firm *size* has a positive impact on the growth rate, which means that *size* apparently is perceived by markets with higher future growth. This relationship is well explained by large firms typically having a higher market valuation respectively higher stock price, which is associated with a lower dividend yield when dividends are constant. The result is a higher growth rate.

In the literature, the "bigger is better" hypothesis is confirmed since market participants consider *size* in their decision to determine the long-term growth rate. Ambrose, Highfield and Linneman (2005) provided empirical evidence that market participants look favorably at the positive effects of economies of scale which is possible in the management of general and administrative expenses in relatively bigger firms. In addition, Ciochetti, Craft & Shilling (2002) are confirmed who present evidence that institutional investors have a preference to invest in more tradable (liquid) REITs, which are generally larger REITs. This preference is indirectly confirmed through the positive relation of *size* and long-term growth. My results confirm both authors because of the high significance. The finding contributes to the literature because this impact was tested on the long-term growth rate of US REITs for the first time. The result show that the bigger is better hypothesis is valid for the US REIT market as well since the market considers *size* as an influencing variable. The results further confirm Yang (2001) who mentions the contradiction of diseconomies of scale to economies of scale in the major fixed expenses of REITs. Since *size* is positively related to the long-term growth rate the relation of diseconomies versus economies of scale tends to be in favor of economies of scale. Furthermore, with regard to Block (2006) my finding shows that the market predicts a positive *size* effect for most of the REITs' investment focus and business model and the reconcilability between the management's local market competencies and efficiency to manage a multi-market and expansion oriented REIT organization.

The **generalizability of the results for international REITs** depends on the structural differences and similarities of the respective national REIT market. Therefore, I have presented a qualitative analysis of the most relevant characteristics of the most important REIT market worldwide in the introduction. Nevertheless, the generalizability of the results can only be profoundly reasoned through the quantitative analysis and testing of the long-term growth and its impacts in separate regression models. The quantitative testing of the result's generalizability is not the intention of this thesis. Nevertheless, the qualitative comparison of international REIT markets gives an indication whether the US REIT market presents a proxy for the behavior of market participants in other REIT markets. The quantitative testing through regression models is open for further research in which the thesis provides guidance how the analysis can be conducted. Since in most countries, REITs were enacted and established in the years from 2000 onwards, the times series data is limited.

The US REIT market is the largest and most efficient listed real estate market in the world. According to market capitalization and number of REITs, the US REIT market is by far larger than other REIT markets worldwide. In the year 1961, the REIT concept was introduced earlier than in any other country. In comparison, Australia enacted the REIT status in the year 1971, Japan in 2001, France in 2003 and the United Kingdom in 2007. The listed countries adopted REIT structures that are similar to the established US REIT model. All REIT structures have in common that they are tax exempt pass through investment vehicles with a broad base of shareholders that distribute most the earnings and capital gains to investors. In the following, the results of the regression analysis for the US REIT market are discussed in international context for its generalizability. However, the findings of this study are unique to the US REITs but highlight relevant variables that impacted the long-term growth rate in the relevant period. Similar studies in different jurisdictions will have to be conducted because of differences in regulatory environments.

The impact of ***economic growth*** has a significant negative relation to the long-term growth in the US market. The negative relation of real GDP growth identifies REITs a counter cyclical investment vehicle that is used in cyclical downturns of the economic environment. The market implies higher long-term growth as a result of higher share prices and lower dividend yields. It is likely that REITs in Australia, France, Japan and the United Kingdom are used in the same way as in the United States since they are identically structured as US REITs and are able to offer as well a safe harbor in times of cyclical downturns. The asset and income rules of the selected countries require that REITs have to invest in properties and generate most of their income from rents. The international market participants do most probably reflect these characteristics in the same way as in the United States. This indication is open to be tested in further research.

Inflation has a significant positive relation to the long-term growth rate in the United States. The result shows that the market uses US REITs as an inflation hedge. This investment behavior is reasoned because the rental income is in general index to the consumer price index. Hence, US REITs are at least secured from *inflation* in their revenues. In inflationary times, the market participants use this characteristic to protect their investments from *inflation* and earn better yields than for investments in TIPS. In international comparison, the asset and income rules in the countries Australia, France, Japan and United Kingdom ensure that REITs invest in real estate and generate their earnings from rents. Nevertheless, in Australia and United Kingdom, REITs are more exposed to investments in property development activities and are not only rent collectors. Since the impact of *inflation* is linked to the indexation of rents, a higher exposure in property developments that income streams are usually not *inflation* protected may result in a less pronounced impact of *inflation* on the long-term growth rate in these countries. In general, I assume a stable influence of inflation on the long-term growth in other countries as well if the respective REITs are rent collectors that focus their investments on existing properties. This assumption is open for further research.

In the US market, ***profitability*** has a significant negative relation to the long-term growth rate. This relation is reasoned by the general characteristics of REITs which are usually smaller and younger than companies in other industries. Thus, REITs are generally classified as small cap stocks. In general, less profitable companies have higher growth rates since these companies distribute few or no dividends. The market considers this relation with low dividend yields and thus high growth rates. I assume that this principle is applied in the international REIT markets as well. In the respective countries the organization rules do not restrict the establishment of REITs with small capital resources. In Australia, France, Japan and the United Kingdom no rules exist that are more restrictive than those in the United States. In France the share capital has to be at least $ 18 million which represents the highest market entry rule in comparison to the other countries. On the other hand different national accounting laws can influence the comparability of ROA. In particular, net income can be distorted by accounting policies for example for depreciation and interest expenses. Nevertheless, ROA is an established indicator for a REIT's *profitability* and performance in the long-term that is internationally applicable. In conclusion, I assume that the *profitability* ratio is considered as well for the growth of REITs in other markets which has to be tested in further research.

Capital structure was tested insignificant on its relation to the long-term growth rate in the United States. The levels of leverage are generally low for firms with high growth rates. In contrast, stable growth firms with moderate growth have generally higher levels of leverage. In contrast to the literature, market participants do not consider leverage in the determination of the long-term growth rate in the US REIT market. In the REIT markets of Australia, France, Japan and United Kingdom there are no relevant differences in the leverage rules in comparison to the United States that could influence the market's behavior. Therefore, I assume that the influence of leverage ratio is as well insignificant in other REIT markets. This assumption has to be tested in further research.

The impact of ***valuation effects*** has a significant positive relation to the long-term growth rate of US REITs. *Valuation effects* are measured by the REIT's market to book ratio. Since the selected countries Australia, France, Japan and United Kingdom have different accounting laws, the determination of the equity's book value can be different. For example, some national accounting standards allow goodwill to be offset against equity. In general, the international comparison of balance sheet measures has to be considered carefully because of the given inconsistencies in accounting standards. Nevertheless, it can be assumed that market participants in the respective country are able to consider the respective determination of book value of equity in their decision to interpret the market to book ratio as an indicator for long-term growth. The market to book ratio is internationally used to identify growth opportunities and mispricing of firms that are under or overvalued. I assume a significant influence of the market to book ratio on the long-term growth as well in other REIT markets which has to be tested in further research.

The study shows that ***performance*** has a significant positive influence on the long-term growth rate of US REITs. *Performance* is used to identify market timing and momentum effects. Both effects are observable market behavior on stock markets worldwide. *Performance* is based on the changes of the REIT's stock price. Since the stock price is not influenced by national accounting standards or national REIT legislation the impact is applicable in other REIT markets as well. As a result, the impact of *performance* on the long-term growth rate can be generally assumed for REIT markets in Australia, France, Japan and United Kingdom. Further research can contribute to test this assumption for other markets.

In the REIT market of the United States, ***size*** has a significant positive influence on the long-term growth rate. The study identified that *size* is the most important impact on the long-term growth rate. The results show that the market confirms the "bigger is better" hypothesis and implicitly assumes the realization of economies of scale. Since size is measured with market capitalization the variable to be tested is not influenced by national accounting standards or legislation. The national organizational rules that determine the minimum required capital resources are different but not relevant in the measurement of market capitalization. As a result, the impact of *size* on the long-term growth rate can be also assumed for the REIT markets in Australia, France, Japan and the United Kingdom which has to be tested in further research.

In summary, the research of the long-term growth rate of the US REITs has identified novel observations about the significance of macroeconomic and company specific impacts on the long-term growth rate determined by the market. These results are of importance in the valuation of REITs. The qualitative analysis of the country specific REIT structures with regard to organizational, asset, income and distribution rules as well as leverage restrictions show that international REITs generally follow the US REIT model. The analysis identifies that the selected countries have similar REIT structures with regard to the research question. Differences between the REIT markets appear through different accounting standards that hinder the comparison of performance and balance sheet measures. Since the independent variables are in the majority independent from accounting standards the research results of the US REIT market indicate that they are generally transferable to other REIT market. However, further research has to be conducted to confirm these assumptions because of the differences in regulatory environment.

7. Conclusion

The determination of the long-term growth rate within the valuation of US REITs is a complex and under-researched area. Therefore, a conceptual framework was developed that clearly defined measureable and empirically testable variables. In the research a fixed effects estimation methodology that accounts for unobserved heterogeneity was applied that tested the impact of macroeconomic and company specific factors on the long-term growth rate of US REITs. The study employed quarterly panel data of US REITs for the period of 1992Q1 to 2011Q4 which resulted in 7,140 observations and 229 units.

The Gordon Growth Model performed well at explaining the long-term growth rate of US REITs through retrograde calculations. Consequently, I identified that the US REITs industry is a competitive market based on the Herfindahl-Hirschman Index. In the period of observation the quarterly US REITs' long-term growth was 0.4% on average. Further analysis of the US REITs' growth rate by property type showed that hotel REITs have the highest average growth rate with 1.2% and residential REITs have the lowest average growth rate with 0.2%. The growth rate of diversified REITs of 0.6% is higher than the cross-property type growth rate of 0.4%. The analysis presents evidence that the long-term growth rate of US REITs are currently traded on a historic high level which is mainly driven by historic low dividend yields and relatively high rates of return on equity reasoned my market volatility and uncertain economic expectations. Furthermore, the study identified a beta factor of US REITs of 0.54 on average which is in the range of the results of other studies. The average debt ratio of US REITs is 48% which corresponds as well to the findings of other studies. REITs are generally highly leveraged to increase the *profitability* of investment through the leverage effect. Therefore, the *profitability* of a REIT depends significantly on the financing conditions. In the period of observation the average *profitability* measured by ROA is 0.8% on a quarterly basis.

Furthermore, the high level of growth rates of US REITs indicates that from a market perspective US REITs are not only categorized as income stocks with high dividends but also as growth stocks that concentrate on internal growth and expansion. This finding suggests that the market pricing of US REITs is not as conservative and cautious as assumed but rather is subject to volatile economic expectations. Consequently, the categorization of US REITs into growth stocks or income stocks is vague and suggests that the market assumes that growth is not only generated by expansion or investments in raw land or development projects but also through other sources such as value-added or opportunistic real estate investments. In addition, REITs tend to be used as a safe harbor investment vehicle in times of economic uncertainty and volatility. With regard to this finding it follows that US REITs can be subject to stock market exaggerations independent of their business model.

The research question asked what macroeconomic and company specific factors have been relevant in the determination of the long-term growth rate of US REITs? The testing of different independent variables in the fixed effects model evaluated this complex question and identified relevant findings for theory and practice. In the study, I identified factors such as *inflation*, *valuation effects*, *performance* and *size* that have a positive correlation and significant impact on the long-term growth rate of US REITs. In addition, the factors *economic growth* and *profitability* have a significant influence and negative correlation with the growth rate. *Capital structure* is the only factor that is not significant. Subsequently, I applied a variance decomposition to compare the strength of the influencing factors. Among the REIT characteristics, *size* is the most important factor influencing the growth rate. The factors *economic growth*, *performance* and *profitability* have also important influence. Within the macroeconomic variables *economic growth* has a greater impact than *inflation*. The most import company specific influence is the *size* of the REIT. In summary, all tested macroeconomic variables have either a positive or negative relationship to the long-term growth rate, whereas one of the company specific variables has no relation at all.

The fixed effects model shows an adjusted R^2 of 32.2%. In the research model I considered all relevant influencing variables on the long-term growth rate that are mentioned in the literature. Even if the research model does not identify all influencing factors, the results of my research contribute positively to the literature by testing these variables and identifying particular correlations for US REITs. The relatively low adjusted R^2 can be explained by the existence of factors that are not quantifiable and that were not identified by the method of panel data analysis. Alternative methods of research such as case studies could be used to identify through interviews, questionnaires or voluntary disclosures further influencing factors that are considered by market participants to determine the long-growth rate. In addition, the analysis of a high number of valuation reports of US REITs could contribute to the identification of the level of the long-term growth rate by valuation experts. At the same time, the relevance of value on price which is determined by the market has to be considered. Such research could contribute to practitioners that have to determine the long-term growth by simplified assumptions. Since the approximation of the long-term growth rate seems to be complex, my research supports the practitioner through the historical analysis of the long-term growth rate. Furthermore, the low adjusted R^2 can be explained by market inefficiencies. If the relatively rigorous theoretical assumptions of rationality of market participants, perfect markets and full information are not completely fulfilled, even high quality financial data will be restricted in its explanatory power.

In essence, the thesis shows that REITs are used as counter cycle investment vehicles and safe harbor in times of economic downturns and uncertainty. This evidence is as well presented through descriptive statistics, showing historical high growth rates with simultaneous low dividend yields. REITs are further used to hedge against inflation since their rental incomes are linked to the inflation rate. The study further shows that the market allocates higher growth rates to less profitable REITs that are typically younger and categorized as small caps. In addition, the market apparently trusts the market to book ratio to identify growth opportunities while it ignores the level of leverage. Furthermore, the study identifies that the determination of the long-term growth is influenced by market timing and momentum effects. Finally, a *size* effect is identified that indicates the market's mechanism to allocate higher growth rates to larger REITs which confirms the "bigger is better" hypothesis. The qualitative analysis of the identified factors indicates that the study's results are generalizable to REIT markets in Australia, France, Japan and the United Kingdom but are subject to further research.

Furthermore, the analysis falsified and confirmed various research findings of the literature. In conclusion, the results show a tendency to confirm concepts based on macroeconomic variables such as Lally (1998), Widman, Schieszl & Jeromin (2003), Albrecht (2004) or Tschöpel, Wiese & Willershausen (2010). In contrast, concepts exclusively based on company specific variables such as Higgins (2007) are falsified in some components. In addition, the research findings with regard to Higgins (2007) show that the concept of a sustainable growth rate for sales is not transferable for growth in earnings or dividends. On the other hand the research findings do not confirm the statements of authors who argued in favor of macroeconomic variables as a benchmark such as Schultze (2003), Copeland, Koller & Murrin (2002), Albrecht (2004), Baetge, Niemeyer & Kümmel (2005), Copeland, Weston & Shastri (2005), Stellbrink (2005) and Koller, Goedhardt & Wessels (2005). Since *economic growth* is negatively related to the growth rate a comparison of both rates is not applicable. In the case of *inflation* the growth rate was on average lower than the *inflation* rate.

The results of the thesis provide a guide for **future research** on the complex question how the market determines the long-term growth rate of US REITs. The work offers novel observations on the significance of macroeconomic and company specific factors for the long-term growth rate which are of potential significance given to the importance of US REITs as an investment vehicle particular as a hedge against inflation or for diversification purposes. Nevertheless, further research could focus on the identification of further quantifiable factors that are not mentioned in the literature. On the other hand not quantifiable factors could be identified with other methods of research.

The research result of the US REIT market provides evidence that can be applied to international REIT markets despite the individual differences in these countries. I choose the US REIT market because it provides the largest cross-section and longest time-series in the world to allow robust inferences of my analysis. Hence, I aim at drawing general conclusion to give other markets guidance on how the growth rate is determined. To remain a homogeneous sample I did not include REITs from other countries or non-REIT real estate firms. Future studies could conduct similar empirical analysis to identify whether there are different impacts of my determinants on the growth rates for other markets and non-REITs. Non-REITs could be for example property companies or properties themselves. In addition, further research could focus on different property types and their associated specific influencing factors. A detailed analysis of growth rates by property type could ask which property types are preferred by the market in different states of the business cycle. In addition, one can analyze whether the different levels of growth rates by property type and investment preferences by the market in conjunction with different market cycles are consistent in other REIT markets. Furthermore, the long-term growth could be analyzed not only for REITs but also for direct real estate. The analysis of valuation reports on a large scale could provide knowledge about the determination of the long-term growth by appraisers in practice. Subsequently, an analysis of the identified influencing variables could be applied. As well, this research could identify variations as a result of different property types or valuation purposes. Further information of direct property values and performance of investment properties can be taken from information service providers such as the Investment Property Databank (IPD). In addition, the analysis of international REIT markets has potential to provide a global comparison of long-term growth rates and their influences. In summary, the research findings of this thesis are largely open to future research. The theory-building research showed that the issue of the long-term growth rate is more complex than the literature suggests and set a foundation for further research about the long-term growth rate for US REITs and companies in other industries.

Furthermore, the results of the thesis give **practical implications** for the determination of the long-term growth of REITs. The research question was feasibly tested and resulted in significant knowledge about the market's behavior and expectations. In practice, an appraiser or investor who values a REIT has to consider not his subjective estimation of the respective input parameter but rather what the market as a whole expects to happen. Thus, the results of this thesis provide important information of the long-term growth of REITs. In detail, an appraiser has to consider the identified influencing factors such as *economic growth*, *inflation*, *profitability*, *valuation effects*, *performance* and *size* to determine the long-term growth rate of REITs. The identified relationships should provide analysts of REITs a usual guidance about the influencing factors of growth rates, in terms of direction and magnitude. For simplicity, an appraiser can take my historically calculated average value of the growth rate for the REIT market, which is 0.4%. Furthermore, the appraiser has the option to adjust this benchmark for the REIT market by the identified factors. For example, if the appraiser analyzes a particularly historically well-performing REIT in weak economic times he is advised to adjust the benchmark growth rate of 0.4 % by a premium. The growth rates by property type gives further information for the appraiser how different property types are considered with regard to their risk and return profile by the market. The knowledge of historic growth rates provides basic information for appraisers and investors how to determine the growth rate of US REITs for valuation and investments purposes. From an investment perspective the calculated benchmark growth rates can be used to identify over and undervalued REITs on the basis of anomalous growth rates in comparison to the benchmark rates. Thus, the results of the thesis give theory and practice interesting insights into the way real markets may work.

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Appendix

	Model 1	Model 2	Model 3
Economic growth	-0.030***	-0.029***	-0.032***
	(0.000)	(0.000)	(0.000)
Inflation	0.055***	0.056***	0.055***
	(0.000)	(0.000)	(0.000)
Profitability	-0.027**	-0.026**	-0.029**
	(0.044)	(0.047)	(0.034)
Capital structure	0.002	0.004	
(market debt ratio)	(0.555)	(0.226)	
Capital structure			-0.002
(book debt ratio)			(0.421)
Valuation effects	0.001**		0.001**
(market to book value)	(0.013)		(0.011)
Valuation effects		0.003**	
(Tobin's Q)		(0.011)	
Performance	0.006***	0.006***	0.006***
	(0.000)	(0.000)	(0.000)
Size	0.001***	0.001**	0.001**
	(0.010)	(0.024)	(0.015)
Constant	-0.019***	-0.021***	-0.017***
	(0.002)	(0.001)	(0.006)
Adjusted R squared	0.327	0.328	0.327
AIC	-46,643	-46,651	-46,645

Notes: Observations are fixed with 7,140 for all regressions and 229 units
* indicates significance at the 10% level,
** indicates significance at the 5% level,
*** indicates significance at the 1% level,

Table 16: Fixed effects regression calculated with ROE based on forward ERP