LUND UNIVERSITY
School of Economics and Management

Firm-Specific Variables and Expected Stock Returns

- A study on the German Market -

by

Viktoria Knittel & Dylan Remmits

May 2015

Master's Programme in Finance [1 year]

Supervisor: Maria Gårdängen

Abstract

Title:	Firm-Specific Variables and Expected Stock Returns - A study on the German Market
Seminar Date:	3rd and 4th June 2015
Course:	BUSN88 Degree Project in Finance, Master Level in Finance, 15 ECTS
Authors:	Dylan Remmits, Viktoria Knittel
Advisor:	Maria Gårdängen
Key Words:	Expected Stock Returns, Fama-MacBeth Cross-Sectional Regression, Risk Premia, German Market, Value Investing, Factor Investing, Portfolio Approach, Conditional Beta, Firm-Specific Variables
Purpose:	The purpose of this thesis is to investigate which firm-specific variables can explain the cross-section of expected stock returns in the German market. The tested explanatory variables are market beta, firm size, the book-to-market ratio, the earnings-to-price ratio, leverage, the dividend yield, the cash flow-to-price ratio and sales growth. Furthermore, the thesis also examines the conditional version of the beta.
Methodology:	This thesis uses the cross-sectional regression approach by Fama and MacBeth (1973) along with the portfolio approach of Fama and French (1992). Furthermore, it makes use of the conditional beta approach developed by Pettengill, Sundaram and Mathur (1995) and adjusts its estimated betas for non-synchronous trading using the Aggregate Coefficients Method of Dimson (1979).
Empirical Foundation:	This thesis uses 300 non-financial firms listed in Prime and General Standard of the Frankfurt Stock Exchange. The data from 2004 - 2014 was gathered through Datastream. The testing period is the post-crisis period, reaching from July 2009 to June 2014.
Conclusion:	This thesis comes to the conclusion that value investing pays out in the German market. More specifically, investors should pay attention to the book-to-market, the earnings-to-price as well as the cash-flow-to price ratio. A model containing beta, the book-to-market ratio and the cash flow-to-price ratio proves to be the best one to explain expected returns. Also beta should be looked at when making one's investment decision since the conditional beta coefficient proves to be positive and significant in up markets and negative and significant in down markets. Size, leverage, the dividend yield and sales growth are not significant and therefore are not considered to be proxies for risk in the German market.

Acknowledgements

The authors of this thesis would like to thank all the people who contributed with useful comments and support to the completion of this thesis. Within this context a special thanks goes to Maria Gårdängen, who supported the authors of this thesis with helpful comments and guidance throughout the process. Furthermore the authors would like to thank their families and friends for the moral support.

Lund, 27th May 2015

Viktoria Knittel & Dylan Remmits

Table of Contents

Tables

Figures

Equations

Abbreviations

BE	Book Equity
CAPM	Capital Asset Pricing Model
CDAX	Composite Deutscher Aktienindex, German Performance Index
CF	Cash Flow
CMA	Conservative Minus Aggressive
Cond.	Conditional
CSR	Cross-Sectional Regression
DCF	Discounted Cash Flow
DDM	Dividend Discount Model
D	Dividend
E	Earnings
EBIT	Earnings Before Interest and Taxes
Et al.	Et alia = and others
GARCH	Generalized Autoregressive Conditional Heteroskedasticity
HML	High Minus Low
H	Hypothesis
Ln	Natural Logarithm
Log	Logarithm
LSPD	London Share Price Database
Market Cap	Market Capitalization
Med.	Median
ME	Market Equity
OLS	Ordinary Least Squares
P	Price, Market Equity
P-Value	Probability Value
RMW	Robust Minus Weak
SG	Sales Growth
St. Dev.	Standard Deviation
SMB	Small Minus Big
TA	Total Assets
UK	United Kingdom
US	United States
UMD	Up Minus Down
WACC	Weighted Average Cost of Capital

1 Introduction

The first chapter of this thesis gives a short background to the research area of focus. This is followed by a problem discussion. Next, the research questions to be investigated are introduced and the purpose of the thesis is explained. Subsequently, the target group of this thesis is addressed. A short description of the outline of this thesis concludes this section.

1.1 Background

For many years researchers and practitioners have been investigating what factors explain the cross-sectional variation of expected stock returns, thereby trying to determine factor risk premia. These insights are important since they help investors, analysts and portfolio managers identify the relation between certain risk factors and their return, which should form the basis for their investment decisions and the respective evaluation of the performance of their investments.

According to Eugene Podkaminer, Senior Vice President of Capital Markets Research, most investors, analysts and portfolio managers have, for the past decades, used a concept known as "asset classes" as the main component for building their investment portfolios. In the search for the best diversified portfolio, investors traditionally focused on having the right combination of perceptibly uncorrelated asset classes such as equities, fixed income, commodities, real estate and private equity. Portfolio diversification, for a long time, has been based on the idea that for example stock and bond prices tend to behave inversely, when one is decreasing the other one is increasing. However, when these seemingly uncorrelated assets moved into the same direction during the most recent financial crisis, a new debate about the extent that these perceived diversified portfolios are really diversified originated. Recently researchers and practitioners have come up with a totally new way of looking at diversification and named it "Factor Investing" (Yale Insights, 2014).

Factor Investing is different from traditional diversification strategy in the sense that it recognizes that the returns from certain asset classes can be correlated when they are affected by the same risk factors. According to Factor Investing it is possible to break down asset classes into building blocks, or factors that explain the majority of their return. Factor Investing states that risk factors, also referred to as risk premia, can be grouped into three different buckets; the macroeconomic one that includes exposure to for example inflation,

GDP growth and productivity, the regional bucket, which comprises for example currency fluctuations and sovereign exposure, and the equity specific bucket which deals among other things with firm size and value (Yale Insights, 2014).

Mostly focusing on equity specific factors, the academic world has already for a long time been investigating what factors explain the cross-section of expected stock returns. For this purpose the studies also test the beta of the traditional Capital Asset Pricing model developed by Sharpe (1964), Lintner (1965), Black (1972), Treynor (1962) and Mossin (1966), referred to as CAPM. However, they often find no supporting evidence for beta and identify instead other factors that can explain the cross-section of stock returns and thus propose multiple factor risk premia.

1.2 Problem Discussion

The 2008 financial crisis, by many perceived to be the worst since the great depression, and the recovery period, which was fostered by central banks maintaining low interest rates, both seem to have something in common. The prices for stocks, bonds and even so-called "alternative investments" like hedge funds moved in the same direction during these two periods. Where during the crisis, the prices and thus the value of these asset classes fell, in the recovery period their value rose. The traditional diversification and portfolio construction approach based on asset classes was clearly not working anymore. Factor Investing could prove to be a solution to this problem (Franklin Templeton Investments, 2015). However, the concept of Factor Investing does not offer a clear answer to the question which specific factors, especially which equity specific factors, one should take into account when making the investment decision and constructing portfolios. This is where extant and future studies by academic researchers could prove to be very useful.

One of the earlier studies that investigated the relation between risk factors and returns was a paper by Banz (1981), who documented a size effect, namely that size (measured by the log of market equity) can explain the cross-section of average returns when included in addition to the CAPM beta as an explanatory variable in the model. The findings of this study claim that small firms on average get higher risk-adjusted returns compared to large firms (Banz, 1981). Some other studies that look at firm specific variables are that of Basu (1983), who demonstrates that the earnings-to-price ratio plays an important role and Bhandari (1988), who shows that leverage has significant explanatory power when included in addition to size

and beta in the model. A very important contribution to the research topic was made by Fama and French (1992). They study the US market and find that size and the book-to-market ratio explain expected returns and are therefore proxies for risk (Fama and French, 1992).

The results and implications drawn from the paper of Fama and French (1992) triggered a whole stream of subsequent studies. These studies extend the findings of Fama and French (1992) by looking at different countries, different samples and/or different time periods. Interesting to see is that the findings of these studies seem to be very specific to the studied country and time period. For example in US studies (Fama and French, 1992; Kim, 1997; Howton and Peterson, 1998) there is an overall tendency to find a size and book-to-market factor risk premium, compared to UK studies (Chan and Chui, 1996; Strong and Xu, 1997; Morelli, 2007) that do not seem to find this size effect, but rather find leverage and book-to-market to be significant. Studies that focus on the Asian market (for example Wong, Tan and Liu, 2006; Lau, Lee and McInish, 2002; Mohanty, 2002) again show very different results. Even though most of the studies on the Asian market, similar to studies on the US market, find the size and book-to-market variables to be significant, they also find sales growth and the cash-flow-to-price ratio to be important factors. Another interesting difference is found when comparing the results of studies on developed and emerging countries (for example Claessens, Dasgupta and Glen, 1995) as almost all of the signs of the variables change. For example whereas in developed countries the size effect consistently states that small firms tend to outperform large firms, the opposite effect is found for many emerging market countries. Results also seem to be dependent on the period that is investigated and are often affected by big macroeconomic events like a financial crisis. Furthermore, many studies do not investigate the same factors. In accordance to these findings it is therefore not possible to use the results from one or several studies on a specific country, market and time period to derive the factor risk premia of another market for a specific time period, which means that every particular market and time period should be studied individually in order to determine which factors are important in explaining stock returns.

One country that hasn’t received much academic attention on that matter is the German market. Despite this, the German stock market enjoys a high recognition and maintains a good reputation among stock traders and is, besides the UK stock exchange, the most important market place in Europe. On top of that the German market attracts many international investors and numerous foreign firms are listed on its Frankfurt Stock Exchange

("*Frankfurter Wertpapierbörse*"). While for example for countries like the US, UK, certain parts of Asia and multiple developing countries there exist many studies doing research about the cross-section of expected returns, the German market has not received the academic attention it deserves. This is the gap that this thesis wants to fill, by looking at what firm-specific variables can explain expected stock returns, thereby trying to identify factor risk premia.

1.3 Research Questions

Continuing from the previously identified gap the research questions that are investigated in this thesis are as follows:

- *Which firm-specific variables can explain the cross-section of expected stock returns in the German market?*
- *What combination of firm-specific variables best captures the cross-section of expected stock returns in the German market?*
- *How do the results that are obtained for the German market compare to studies on other countries?*
- *What practical implications does it have when a factor is found to be significantly related to expected returns?*

1.4 Research Purpose

The purpose of this thesis is to answer these previously specified research questions. Taking gained insights from previous research and practice as a basis, this thesis wants to examine, which factors can explain the cross-sectional variation in expected stock returns for the German market during 2009 to 2014. The specific time period is chosen to provide the readers of this thesis the most recent and relevant information on what factors to consider when investing in the German stock market. Also the fact that Germany was heavily affected by the financial crisis around 2007/2008 is a determinant for the choice of this time period. First, because having a strong down period in the sample would most likely affect the results in a way that would not be representative for today's situation. Second, many things have changed after the crisis such as for example the previously outlined tendency towards more factor based investing. Therefore this thesis gives an answer to the question if this way of investing proves useful now in the aftermath of the crisis. In order to clearly detect which variables

should be looked at when making one's investment decision, this thesis takes into account all variables that are commonly used in previous research and are looked at in practice. To the knowledge of the writers of this thesis extant research has only focused on the combination of some of those variables in their studies, as no other study includes all. The variables used in this thesis are market beta, size, the earnings-to-price ratio, leverage, the book-to-market ratio, the dividend yield, the cash flow-to-price ratio and sales growth. The overall goal is to determine the corresponding risk premia associated with the variables that are found to be significant in explaining expected returns, more specifically the sign of a variable's coefficient is of interest since it gives an insight into whether a high or a low version of the focal variable is associated with a risk premium and yields higher expected returns.

1.5 Target Group

The results will give further insights into the relationship between risk factors and returns and as such are mainly of interest to people in the investment business, namely for security analysts, fund managers and stock investors in the context of building portfolios and evaluating their portfolio´s performance. Due to the German Stock Market being an important target for international investors, the results of this thesis are not limited to Germans, but rather could be of interest to investors all over the world, who want to invest in the German stock market. The practical implications of this thesis could give them guidance, which factors should be looked at when making their investment decisions, namely, which factors serve as risk measures and can be considered as a risk premium in stock returns.

1.6 Outline of the Thesis

The remainder of this thesis is structured as follows. In the next section the theoretical background to asset pricing as well as the cross-section of expected stock returns is presented. Furthermore, related literature on the cross-section of expected returns is introduced and discussed. Based on these insights the thesis proceeds in the next chapter with the introduction of the variables and the development of the hypotheses to be tested. Next, the method used for the analysis is presented and the data for investigating the research question is introduced. The thesis then provides a description of the computation of each variable. Special attention is paid here to the estimation of the market beta. Then, necessary final adjustments are made and the variables are included into the cross-sectional regressions.

Chapter 5 starts with a presentation and interpretation of the estimated betas as well as descriptive statistics. This is then followed by the presentation of the results of the univariate and multivariate cross-sectional regressions, which are thoroughly explained and discussed with respect to their outcome, agreement with existing research and practical implications. Next, the sensitivity of the results is tested. The chapter concludes by stating some critical points. The final chapter is a concluding discussion, which includes besides a brief summary a detailed description of the practical implications of the main results. Finally possible future research questions are addressed. For the reader’s convenience, an overview of each section's content is provided at the beginning of each chapter.

For a theoretical background the next section gives now an overview of asset pricing and the cross-section of expected returns and subsequently introduces and discusses extant research.

2 Theoretical Background and Literature Review

This part of the thesis gives an overview of asset pricing and the cross-section of expected returns that form the theoretical basis of this thesis. The starting point is asset pricing. Subsequently, the cross-section of expected returns approach and related literature is presented and discussed, which provide an insight into the research area of focus.

2.1 Asset Pricing Models

The *Capital Asset Pricing Model (CAPM)* developed by Sharpe (1964), Lintner (1965), Black (1972), Mossin (1966) and Treynor (1962) is considered to be the starting point and foundation of asset pricing theory. Today, almost five decades later, it is still the most popular and widely used asset pricing model in both the business and academic world. Its popularity stems from the fact that it provides a very good, yet intuitively understandable answer to some of the most fundamental questions in finance, namely how to measure risk and how risk affects expected returns (Fama and French, 2004). The CAPM is for example also extensively applied in corporate valuations, more specifically in the calculation of a firm's cost of equity which form together with the cost of debt the inputs for the weighted average cost of capital (WACC) used as the discount rate for discounting free cash flows in the corporate valuation process (Koller, Goedhart and Wessels, 2010).

The intuition behind the CAPM is that not all types of risk have an impact on asset prices. The model decomposes a portfolio's risk into two different categories, namely; systematic and unsystematic risk. Systematic risk can hardly be avoided completely as it cannot be diversified away compared to the unsystematic risk that is unique to an individual asset and uncorrelated with general market movements (Sharpe, 1964). Thus, investors should be compensated for taking on systematic risk, but not for the unsystematic risk. Furthermore, the expected return of an asset is equal to a compensation for the time value of money (embodied by the risk free rate) and the market risk premium (Smith and Walsh, 2012). The model has the following appearance:

Equation 1: Capital Asset Pricing Model

$$E[R_i] = R_f + \beta_i (E[R_m] - R_f)$$

Where, $E[R_i]$ is the expected return of the security or portfolio *i*, R_f is the risk free rate, $E[R_m]$ is the expected return of the market portfolio and $\beta_i = \frac{Cov[R_i,\ R_m]}{Var[R_m]}$.

Unfortunately, not many studies could confirm the CAPM's predictions and therefore researchers started to look for better models. In 1993, Fama and French introduced their so-called *Fama-French Three-Factor Model,* an asset pricing model, where besides the market factor, two other factors based on size and the book-to-market ratio are included (Fama and French, 1993). This is based on research that in practice investors are concerned about several types of risks and is the reason why the model has received extensive attention in the business world. According to Forbes magazine it is preferred to the CAPM and useful when constructing portfolios and understanding a portfolio's performance (Forbes, 2013). The size factor in this model refers to the fact that small firms tend to outperform large ones. It is represented by *SMB*, which stands for "Small (market cap) Minus Big" and is measured by taking the excess returns of a portfolio with small firms with a small market cap (*S*) over portfolios that include stocks with a big market cap (*B*). The book-to-market factor considers the fact that firms with a high book-to-market ratio, also referred to as value stocks, tend to outperform those with a low book-to-market ratio. This is represented by *HML*, which stands for "High (book-to-market) Minus Low", where the excess returns of value stocks (*H*) over stocks with a low book-to-market ratio (*L*) is taken (Fama and French, 1993).

Equation 2: Fama and French Three-Factor Model

$$E[R_i] = R_f + \beta_{im}(E[R_m]-R_f) + \beta_{is}E(SMB) + \beta_{ih}E(HML)$$

Where, *E(SMB)* is the expected value of the difference between the excess return of a portfolio with small stocks and one with big stocks, *E(HML)* is the expected value of the difference between excess return on a portfolio that includes high book-to-market stocks and the excess of return of one that consists of stocks of firms with low book-to-market ratios β_{im}, β_{is} and β_{ih} are the estimated coefficients (Fama and French, 1993).

Carhart (1997) builds on the model by Fama and French (1993) and adds an additional factor, the momentum factor. Adding this factor was a response to existing research, among others, a study by Jegadeesh and Titman (1993) that found that stocks that performed well in the past will continue to outperform others also in the next period. This model is referred to as the *Carhart Four Factor Model*. The momentum factor in this model is represented by *UMD*,

which stands for "Up (performance) Minus Down", where (*U*) stands for past winners and (*D*) for past losers (Carhart, 1997).

Equation 3: Carhart Four-Factor Model

$$E[R_i] = R_f + \beta_{im}(E[R_m]-R_f) + \beta_{is}E(SMB) + \beta_{ih}E(HML) + \beta_{iu}E(UMD)$$

Where, $E(UMD)$ is computed each month as the expected value of the difference in excess returns of past winners (*U*) and past losers (*D*) over the past 12 months and *E(SMB)* and *E(HML)* are most commonly adjusted on a yearly basis (Carhart, 1997).

The Carhart Four-Factor Model is commonly applied in practice; it is for example used by capital investment firms in the process of examining whether a specific asset should be included into an underlying portfolio (Atlas Capital Advisors, 2015). Even though it has been the workhorse model in the financial world ever since it was introduced, like all models it has some problems since there are many anomalies that it cannot explain (Forbes, 2014). As a reaction Fama and French (2014) have recently proposed a *Fama-French Five-Factor Model*. Building on their own Three-Factor Model from 1993, they propose adding two new factors; Using the theory behind the Dividend Discount Model, they infer a profitability and an investment factor. The profitability factor is represented by *RMW*, which stands for "Robust Minus Weak" and is the difference between returns of portfolios with robust (*R*) and weak (*W*) profitability. The investment factor is represented by *CMA*, which stands for "Conservative Minus Aggressive" and is the difference between returns on portfolios of low (*C*) and high (*A*) investment stocks (Fama and French, 2014). The Model has the following appearance:

Equation 4: Fama and French Five-Factor Model

$$E[R_i] = R_f + \beta_{im}(E[R_m]-R_f) + \beta_{is}E(SMB) + \beta_{ih}E(HML) + \beta_{ir}E(RMW) + \beta_{ic}E(CMA)$$

Where, $E(RMW)$ is the expected value of the difference between excess return on a portfolio of stocks with robust profitability and the excess return on a portfolio of stocks with weak profitability, $E(CMA)$ is the expected value of the difference between excess return on a portfolio of low investment stocks and the excess return on a portfolio of high investment stocks (Fama and French, 2014).

Due to the novelty of this model, only time can tell if it will replace the widely applied Fama and French Three-Factor Model and Carhart Four-Factor Models. But with regard to Fama

and French's wide endorsement there is a good possibility that this new model will soon become the new workhorse model in the financial academic and business world.

Besides, these models the literature has for a long time been also interested in determining factor risk premia associated with other firm-specific variables. While many studies find no support for the traditional CAPM beta, they identify other factors that should explain expected returns – factors that form the basis for the asset pricing models discussed above. A pioneering contribution to this research area was made by *Fama and French (1992)*, who discover that the CAPM beta is insignificant while other variables like size and the book-to-market ratio prove to be important explanatory variables and are priced by the market. Their findings resulted in extensive discussions among many researchers and a whole stream of new studies. Fama and French had solely focused on the US market from 1963 to 1990. Apart from the market beta, size and the book-to-market ratio, also the earnings-to-price ratio and leverage served as explanatory variables. Whereas leverage (measured both as market leverage and book leverage) was significant, they show that the difference between the two that display opposite signs is nothing else than the book-to-market ratio (Fama and French, 1992).

The Fama-French Three-Factor Model, the Carhart Four-Factor Model and the Fama-French Five-Factor Model are asset pricing models that already stipulate the variables to be included and therefore are of a more static nature. In contrast to this, this thesis wishes to examine the explanatory power of different firm-specific variables in the cross-section of expected returns and to determine the factor risk premia associated with these, rather than testing a specific asset pricing model. With this respect, the approach is different from the one of the before mentioned asset pricing models. When setting up their Three-Factor Model also Fama and French have relied on their results from their paper on the cross-section of expected returns: Given the significance of the book-to-market and the size variable in their 1992 research, they propose the Three-Factor Model in 1993. Due to the fact that this thesis wants to identify other factors, the approach by Fama and French (1992), which is based on the cross-sectional regression approach of Fama and MacBeth (1973), offers the flexibility needed for investigating this purpose.

Due to this reason this thesis, like Asgharian and Hansson (2000), will focus in the subsequent literature discussion solely on literature related to the approach of Fama and French (1992) and thus does not discuss literature related to the Three-Factor Model of Fama

and French (1993), the Four-Factor Model of Carhart (1997) and the Five-Factor Model of Fama and French (2014) in the next section any further.

2.2 Literature Review

As previously mentioned Fama and French (1992), base their analysis on the cross-sectional regression methodology developed by Fama and MacBeth (1973). Specific to this approach is the use of a so-called two pass estimation methodology. First, the market betas are estimated, for example by the traditional CAPM. These are then, in the second step, included with other firm-specific variables that are expected to explain returns into the cross-sectional regression model (Fama and MacBeth, 1973). Also many subsequent studies have relied on this methodology and Skoulakis (2008) suggests that this is the preferred method to be used when investigating the cross-section of expected returns and for determining factor risk premia.

Unlike the other variables included in their model, beta is not observable and has to be estimated. However, including the previously estimated betas into the cross-sectional regression leads to the well-known errors-in-the variables problem, where one would have an underestimation of beta and an overestimation of the other coefficients that are included in the model. The overestimation of the other coefficients is related to how high the correlation between for example two variables is, where one is measured with and the other one without error (Kim, 1995). Fama and MacBeth (1973) decrease this problem by using portfolios instead of individual stocks in their cross-sectional regression model. However, one should note that this does not solve the errors-in-the-variables problem (Ho, Strange and Piesse, 2006). Also the usage of portfolios results in a loss of information as for example Asgharian and Hansson (2000) point out. For this purpose Fama and French (1992) in contrast to Fama and MacBeth (1973) only use a portfolio approach for the estimation of the betas, assign these to the individual stocks and then carry out the analysis using the individual stocks (Fama and French, 1992).

The years following the publishing of the Fama and French (1992) article are characterized by a rapid growth in the number of studies that re-investigated this matter. Early studies usually focus on the US (for example Davis, 1994; Kothari, Shanken and Sloan, 1995; Kim, 1997; Howton and Peterson, 1998) and the UK (for example Chan and Chui, 1996; Strong and Xu, 1997 and later Morelli, 2007). Later studies that address this topic concentrate on Asian markets (for example Ho, Strange and Piesse, 2006; Lau, Lee and McInish, 2002; Mohanty,

2002; Wang and Di Iorio, 2007; Wong, Tan and Liu, 2006 and Shafana, Rimziya and Jariya, 2013). While some studies replicate the portfolio methodology by Fama and French (1992) most of the articles develop modified versions. Therefore this literature review does not only present previous studies, but rather also refers to the different approaches. It should be noted at this point that some of the presented studies are of a more older nature[1], however these studies form the theoretical basis for this thesis and are therefore of importance to a fundamental understanding of the research topic. Other than that, recently, this research area has regained relevance with regard to "Factor Investing" as an alternative concept to "asset classes" in the aftermath of the crisis and thus is of interest to analyze. Therefore the next section of the thesis aims at presenting and discussing results of studies on the US Market, the UK and Sweden, Emerging Markets and parts of Asia as well as on the German market.

Studies on the US Market

Davis (1994) was one of the first to reexamine the findings by Fama and French, however he extends their research, by looking at the period before 1963 referred to as the "pre-COMPUSTAT era" period. Similar to Fama and French, he finds that beta does not have explanatory power over subsequent returns in a univariate regression. Also Kothari, Shanken and Sloan (1995) consider the pre-COMPUSTAT period, however in contrast to previous research they find that beta is statistically significantly positive. For their beta estimation they use annual data, while other studies results' rely on monthly data. Kim (1995) addresses the errors-in-the-variables problem and uses a modified version of the Fama and French (1992) approach implementing a rolling beta to account for time-varying betas. With his improved model, Kim (1995) also finds supporting evidence for the market beta. Also a later study of him, Kim (1997), confirms his previous results. Howton and Peterson (1998) use a time-varying dual-beta model, where risk changes depending on bull and bear markets. They stress the fact that when using a constant risk beta they find results similar to the ones by Fama and French (1992), however, when using their time-varying dual-beta model their results show that in bull markets betas are positive and statistically significant, whereas in bear markets, with the exception of January, betas are significantly negative (Howton and Peterson, 1998).

[1] A typical phenomenon in the academic world is that a pioneering paper is directly followed by an explosion of related studies re-investigating the issues, and when the "hype" is over, attention is turned to other topics.

Similar to Fama and French (1992) Kothari, Shanken and Sloan (1995) attribute an important role to firm size. This result is further confirmed by Kim (1995), who only considers beta and size as explanatory variables, as well as Kim (1997). However, Kim (1997) points out that the result is sensitive to the data frequency, where size becomes insignificant when using quarterly instead of monthly data (Kim, 1997). Distinguishing between bull and bear markets Howton and Peterson (1998) show that size is only significant in bear markets. In contrast to this Davis (1994) provides evidence that size is sensitive to the choice of the testing period; while no size effect is found for the whole testing period, within sub-periods size proves to be statistically significant (Davis, 1994). Regarding the book-to-market ratio Davis (1994) confirms the results by Fama and French (1992) that the ratio has significant explanatory power over subsequent returns. This is further supported by Kim (1997), who provides evidence that the significance of the book-to-market ratio is even robust to several specifications (Kim, 1997). Also Kothari, Shanken and Sloan (1995) obtain significant results for the book-to-market ratio, however they claim that evidence for a book-to-market effect is weaker in their study compared to other studies (Kothari, Shanken and Sloan, 1995). Howton and Peterson (1998) again show that the results are conditional on the market. Similar to their finding on firm size, also the book-to-market ratio seems to be an important factor in bear markets, but this explanatory power vanishes in bull markets (Howton and Peterson, 1998).

Contrary to the findings by Fama and French (1992), both Kim (1997) and Davis (1994) find the earnings yield to display explanatory power. This is contradicted by Howton and Peterson (1998), who prove this ratio to be insignificant. Besides, Davis (1994) also includes a sales growth and a cash flow yield variable, but both seem not to proxy for risk (Davis, 1994).

Generally, the results are often subject to a January seasonality. Davis (1994) looks at this phenomenon and claims it to be even much stronger than reported by Fama and French (1992) (Davis, 1994). Also the results of Howton and Peterson (1998) differed in January months. Kothari, Shanken and Sloan (1995) even claim to have proof of seasonality issues in months other than january.

Studies on the UK and Swedish Market

One of the first studies to examine the UK market was the one by Chan and Chui (1996). Similar to the US findings by Kim (1997) they show that the results are sensitive to the frequency of the data used. Furthermore, they assign the book-to-market ratio to be an

important factor (Chan and Chui, 1996). This is supported by Strong and Xu (1997) as well as Morelli (2007), both also examining the UK market. However, size is according to their findings not significant in the UK market, which is in contrast to the findings of studies that focus on the US market, but again consistent with other studies on the UK such as Morelli (2007) and Strong and Xu (1997) as well as with Asgharian and Hansson (2000), who study the Swedish market. Besides, they also find a significant return-beta relationship for which they propose inflation to be a determinant factor, however they only attribute a minor role to the unconditional beta (Chan and Chui, 1996). Strong and Xu (1997) even find that the unconditional beta does not play a role in the UK, which is in line with Morelli (2007), however, Morelli (2007), extending previous research also investigates the conditional beta and finds supporting evidence for it. Employing a time-varying beta, estimated by using a bivariate GARCH(1,1) model, Asgharian and Hansson (2000) also find for Sweden that their conditional beta is preferable to the unconditional one used by many studies. They furthermore also correct for the errors-in-the-variables problem (Asgharian and Hansson, 2000). Besides the conditional beta, also leverage proved to be significant in their study on the Swedish market, which is in line with Chan and Chui (1996) as well as Strong and Xu (1997) who both found this variable to proxy for risk in the UK, while Morelli (2007) did not include a leverage variable at all. Chan and Chui (1996) moreover provide evidence of the explanatory power of the dividend yield, however, no other study on the UK market includes this variable.

Studies on Emerging Markets and Asia

Looking at 19 emerging countries Claessens, Dasgupta and Glen (1995) prove size to be statistically significantly positive. This result is in contrast to all previous research on developed markets, where size, if statistically significant, has always a negative sign. In addition to size, the price-to-book value and the dividend yield are studied. Similar results to size are found, where the signs are opposite of what was found in studies investigating developed countries (Claessens, Dasgupta and Glen, 1995). This result is further confirmed by Shafana, Rimziya and Jariya (2013) who find a statistically significant negative sign for the book-to-market ratio in their study on Sri Lanka.

Lau, Lee and McInish (2002) look at several variables including beta, firm size, earnings-to-price ratio, book-to-market ratio, cash-flow-to-price ratio and sales growth for Singapore and Malaysia. Similar to US research size plays an important role in both countries. The

importance of size is further confirmed by Mohanty (2002) for the Indian market, Ho, Strange and Piesse (2006) for Hong Kong, Wong, Tan and Liu (2006) for China and by Wang and Di Iorio (2007) also for China. Using the conditional beta approach of Pettengill, Sundaram and Mathur (1995) Lau, Lee and McInish (2002) also find significant results for beta, which is consistent with Ho, Strange and Piesse (2006)'s study for Hong Kong, but inconsistent with the results from Wang and Di Iorio (2007) for China. Wong, Tan and Liu (2006) even find the unconditional beta to be statistically significant for China. Lau, Lee and McInish (2002) further outline that asset pricing is not the same across countries; while sales growth has explanatory power only in Singapore (which is consistent with Lakonishok, Shleifer and Vishny (1994) studying Japan), the earnings-to-price ratio is only statistically significant for Malaysia. The result for the earnings-to-price ratio is also supported by Wang and Di Iorio (2007) for China - at least for some of the inspected months. While Lau, Lee and McInish (2002) attribute no explanatory role to the book-to-market ratio for both Singapore and Malaysia, which is further supported by Lakonishok, Shleifer and Vishny (1994) for Japan, Wang and Di Iorio (2007) do find evidence of a book-to-market effect for China, which is consistent with the study by Wong, Tan and Liu (2006), who also study the Chinese market.

Not so commonly used firm-specific variables are the cash flow-to-price ratio as well as the dividend yield. Lakonishok, Shleifer and Vishny (1994) find the cash flow-to-price ratio to be important for Japan. Wang and Di Iorio (2007) studying China show that the dividend yield serves as a proxy for risk. Similar to US findings Lau, Lee and McInish (2002) as well as Wong, Tan and Liu (2006) provide evidence of a January seasonality in the Chinese market.

Studies on the German Market

Despite the popularity of the German market among international investors, the research on the cross-section of expected returns is limited. Most studies that investigate asset pricing for the German market focus on testing existing asset pricing models such as for example a more recent study by Artmann, et al. (2010).

A study that does use the Fama and French (1992) approach is the research of Heston, Rouwenhorst and Wessels (1999), who investigate this matter for 12 European countries, among them also Germany. However, in their model size and market beta serve as the only explanatory variables. Furthermore they inspect an earlier time period, namely 1980 to 1995. In contrast to other studies that also implement the portfolio approach by Fama and French

(1992) for the estimation of beta, they build international portfolios instead of portfolios within the stock market of a focal country. Contrary to the findings of other studies they find the unconditional beta to be statistically significant, however, they point out that the relationship between stock returns and beta is weak within countries compared to their results across countries. This result also applies for the German market, where no significant results for beta are found when focusing only on this market and ignoring inter-country variation (Heston, Rouwenhorst and Wessels, 1999). Elsas, El-Shaer and Theissen (2003) examine the relationship between beta and return for the German market in the period 1960 to 1995. However, they do not consider any other firm-specific variables in their analysis. Using the approach by Pettengill, Sundaram and Mathur (1995) they provide evidence that while the unconditional beta does not have an effect, the conditional beta is a statistically significant proxy for risk (Elsas, El-Shaer and Teissen, 2003).

As can be seen there are clear differences between the studied countries. Whereas size is often statistically significant for US studies and studies on Asian markets, evidence of a size effect is not found in studies on European markets like the UK and Sweden. In contrast to that, the book-to-market equity ratio proves to be an important determinant of asset pricing in the UK, US, Sweden and many Asian markets. In most UK studies and Sweden also leverage often yields significant results, however, interestingly this variable is not really used in other studies. Appendix 1 provides a detailed summary of all key studies on this matter and states for each study the variables tested, the studied market, the inspected time period, the main findings and other relevant information.

Critical Evaluation of Previous Research

One must also remain critical of previous research and therefore this section briefly discusses deficiencies of extant studies. First of all, the sample selection procedures of some studies provide the basis for certain biases. For example Davis (1994), who studies the US market, excludes all small firms, however, also inspects the explanatory power of firm size. This does not only affect the results of the size variable, but might also have an impact on other results due to the fact that small firms do not display the same characteristics as large firms.

Another study that one has to be sceptical about in terms of its sample is the one by Morelli (2007). He uses 300 randomly selected firms from the LSPD. This clearly introduces a survivorship bias and questions about the representativeness of this sample arise. Besides,

most of the studies rely on data from the COMPUSTAT database or databases in general and are therefore subject to a certain database bias. As Kim (1997) and Kothari, Shanken and Sloan (1995) point out, firms that are more profitable and large are a lot more likely to be entered into the database (Kim, 1997; Kothari, Shanken and Sloan, 1995). Certainly, this bias was even more severe in earlier time periods, however most previous studies have a focus on these less recent time periods. A further critical issue is that almost all studies have strong recession periods in their large testing periods and are usually not adjusting for them. Consider for example the case of Kothari, Shanken and Sloan (1995), who study the time period 1927 to 1990 in the US, which includes among others the Great Depression.

Davis (1994) shows that the results are specific to the examined time period (Davis, 1994). Generally, firm policies and trends are not the same as they have been in earlier times. For example it is reported that stock repurchases have to a large extent substituted dividends in the US (Ogden, Jen and O`Connor, 2003). Also, nowadays there are even more large differences across firm size with huge firms present in the sample. Thus, results differ across time periods and therefore one cannot use a less recent study on a market to derive practical implications from it that are of relevance for today`s investment business.

One of the studies above also suffers from a small sample bias; Shafana, Rimziya and Jariya (2013) studying Sri Lanka use only 12 firms out of 25 firms that are listed on the Milanka Price Index. Furthermore, six of those are financial firms, but financial firms should usually be excluded in such studies due to their very distinctive accounting characteristics, which could result in interpretation issues.

In addition, not all studies adjust for non-synchronous trading of the included stocks, such as Morelli (2007) and for example Ho, Strange and Piesse (2006). However, this is important due to the fact that the estimated beta is not the same when a stock - for example for a small firm - is not traded frequently.

Finally, none of the previous studies have included all of the fundamental/ accounting variables[2] that have been proposed to explain expected stock returns. There are many

[2] Volatility and the fact that stocks with a good performance in the past continue to outperform others also in the future (momentum) would be also variables that could have been included, however, this thesis focuses on commonly used firm-specific variables that are of relevance for practice.

commonly used variables[3], but extant studies usually only investigate a fraction of those. However, this does not give the whole picture and makes comparison between countries difficult. For this reason, this thesis uses all (commonly) used accounting/ fundamental variables of previous research. These variables are introduced in the next chapter and by using the reasoning and results of the studies that have been discussed in this chapter, one or multiple hypotheses for each of the explanatory variables are proposed, which are then tested and interpreted in chapter 5.

[3] For example Wang and Di Iorio (2007) as well as Wong, Tan and Liu (2006) include in their research on the Chinese stock market a liquidity variable that they refer to as being specific for this market. This is not considered in this thesis.

3 Hypothesis Development and Variables

Taking the gained insights from previous research as a basis, this chapter focuses on the introduction of the variables to be used in the remainder of this thesis and develops the hypotheses to be investigated. A summarized overview of all developed hypotheses concludes this section.

This thesis investigates the explanatory power of market beta, size, the book-to-market ratio, earnings-to-price ratio (also referred to as earnings yield), leverage, the dividend yield, the cash flow-to-price ratio and sales growth. The choice of these variables is driven by both previous research and business practice and this thesis essentially uses all commonly used fundamental variables of previous research. This ensures that the selection of the variables have on the one hand a well-founded theoretical basis and on the other hand are commonly known to the target group of this thesis. Also a certain degree of comparability between other studies is ensured as well as the usage of these variables allows drawing inferences that are relevant for practical implementation.

3.1 Beta

The market beta is certainly the most important factor in asset pricing and has received wide attention both in the academic world and business practice. According to theory it can be seen as a proxy for risk and higher betas are associated with riskier firms and higher excess returns. However, evidence regarding beta being significant in explaining expected returns is mixed. Despite this fact, a certain pattern can be noted; while unconditional betas often prove to be not statistically significant, conditional betas usually yield significant results. For example Jagannathan and Wang (1996) employing a time varying beta show that the conditional CAPM beta is preferred to the traditional unconditional one. Pettengill, Sundaram and Mathur (1995) develop another approach for a conditional beta. They distinguish between up and down markets and find that beta is positive and significant in up markets and negative and significant in down markets (Pettengill, Sundaram and Mathur, 1995). As shown in the literature section, this approach is adopted by many studies, which mostly confirm the explanatory power of the conditional beta. Asgharian and Hansson (2000) employ a GARCH (1,1) for estimating a conditional beta and find that this is significant in explaining the cross-section of expected returns for the Swedish market. As previously mentioned Elsas, El-Shaer

and Theissen (2003) investigating the period of 1960 to 1995 find supporting evidence of a conditional return-beta relationship for the German market. However this research focuses on the German market before the recent crisis around 2008. Therefore it is of interest, if still today beta serves as a proxy for risk. If so, generally a positive relation between beta and expected returns is expected. However, Pettengill, Sundaram and Mathur (1995) and related studies that use this approach confirm a significant negative beta-return relation during periods of negative market returns (for example Pettengill, Sundaram and Mathur, 1995; Morelli, 2007). This would mean that in periods of down markets, higher betas are associated with lower expected returns. The hypotheses to be tested are:

H1a: There is a positive relation beta and expected returns in the German market.

H1b: During up markets, there is a positive relation between beta and expected returns in the German market.

H1c: During down markets, there is a negative relation between beta and expected returns in the German market.

3.2 Size

Firm size is usually proxied by the logarithm of market equity. Banz (1981) was among the first to provide evidence of the existence of a so-called size effect. According to this, small firms have on average higher returns than larger ones (Banz, 1981). This is shown by a statistically significant negative coefficient for the size variable when taken into account for explaining expected returns. As shown in the literature review size proves to be a major determinant in asset pricing in the US markets as well as in Asian markets, but there is not really evidence for a size effect being present in European markets such as the UK and Sweden. Also Heston, Rouwenhorst and Wessels (1999) find no support for a size effect in the German market. This implies that in Germany the stocks of small firms do not on average outperform the stocks of large firms. More specifically, since no significant results for size are found in those countries, size doesn´t play a role in explaining expected returns - at least not in those countries.

According to empirical evidence, small firms get easier distressed than larger firms do and recover slower from recessions and therefore are riskier (Chan and Chen, 1991; Fama and French, 1993). Berk (1995) shows that riskier firms are characterized by a lower market cap

and thus expected returns are higher. Intuitively, this makes sense, since investors expect higher returns when investing in riskier stocks, however this also comes along with the risk of a large loss. Apparently, investors are compensated for taking on this risk and therefore small firms on average outperform large ones, which are associated with more stability and therefore do not require a risk premium. Inferring from this, size could be a proxy for risk and therefore this thesis tests the following hypothesis:

H2: There is a negative relation between size and expected returns in the German market.

3.3 Book-to-Market Ratio

The book-to-market ratio is the ratio of a firm's book equity to its market cap and helps investors and analysts identify if a stock is under- or overvalued. It is a very commonly used measure in the investment business. Investment firms for example prefer to invest into stocks with a high book-to-market ratio. This is due to the fact that these have a low price (market equity) and low prices mirror the fact that the market expects this firm not to perform good in the future. However, this clearly offers upside potential and if the price goes up, then investors can realize returns. Stocks with these characteristic are often referred to as value stocks. Analysts and investors that pick stocks with a low price relative to a strong book equity are said to engage in value investing - a strategy that is well-known in the business world (Piotroski, 2000). The great investor Warren Buffet himself is for example a typical value investor (BusinessInsider, 2012).

Also throughout the asset pricing literature, a particular attention is paid to the book-to-market ratio. Chan and Chen (1991) say that the book-to-market ratio is a proxy for risk and can be interpreted as a corporate distress factor (Chan and Chen, 1991). In fact, the majority of studies confirm the book-to-market ratio as a significant explanatory variable of expected returns. Also in the studied European markets, UK and Sweden, the ratio plays an important role, where a positive relationship between the ratio and expected returns is found. This means that stocks with a high book-to-market ratio, namely with comparatively low prices given their accounting equity, are associated with distress that needs to be compensated for with a higher risk premium. This is in line with practice in today's investment business. Thus, inferring from previous research and practice, the following hypothesis is tested:

H3: There is a positive relation between expected returns and the book-to-market ratio in the German market.

3.4 Earnings-to-Price Ratio

The earnings-to-price ratio (E/P), also known as earnings yield, is the ratio of a firm's earnings divided by its market cap. The ratio captures the potential return an investor could make on his investment, if all earnings would be paid out as dividend. Like the book-to-market ratio, the earnings yield indicates whether a stock is under- or overvalued and is therefore of interest for value investors. Using the earnings yield investors can not only compare different stocks but also across different asset classes. The E/P ratio is therefore commonly used by investors and portfolio managers for asset allocation purposes (Ivy Funds, 2012). Also in corporate valuations using multiples, the ratio is widely used, usually in its inverse form, the price-to-earnings ratio (Koller, Goedhart and Wessels, 2010). Generally, it should be paid attention to the industry a given firm operates in, since the ratio varies across industries. But comparable firms in the market could be also misvalued. Therefore one should be careful when using this ratio.

According to Koller, Goedhart and Wessels (2010) the numerator and denominator of a ratio must be consistent. Applied to this case, this means that numerator and denominator are both equity related due to the fact that this is a ratio of relevance to shareholders, who form the target group of this thesis. Therefore this thesis uses market equity in the denominator and net income instead of EBIT in the numerator. It should be noted that earnings can be manipulated by managers and are dependent on the application of accounting rules (Koller, Goedhart and Wessels, 2010).

As outlined in the literature section, throughout the finance literature the evidence regarding the significance of this ratio is mixed. According to Ball (1978) the ratio can be seen as a "catch-all" proxy for other factors (Ball, 1978). In the underlying UK studies the earnings-to-price ratio is either not used, or not statistically significant. Also Asgharian and Hansson (2000) find no support on the Swedish market for this ratio, whereas some of the US studies claim that the ratio serves as a proxy for risk. The literature also distinguishes between a positive and a negative ratio due to the fact that the interpretation is somewhat different. Thus, two variables are simultaneously inspected. One represents positive earnings-to-price ratios and the other the negative ones proxied by a dummy variable, that becomes one if the ratio is

negative and zero otherwise (Fama and French, 1992). If the positive price-to earnings ratio is a proxy for risk, then stocks with a higher ratio, namely stocks that are undervalued, require a higher risk premium and should earn higher returns. Similarly, a negative price-to-earnings ratio is associated with lower expected returns. The hypotheses to be tested are:

H4a: There is a positive relationship between a positive earnings-to-price ratio and expected returns in the German market.

H4b: There is a negative relationship between a negative earnings-to-price ratio and expected returns in the German market.

3.5 Leverage

Leverage refers to the fact how much of the firm´s capital is financed with debt. There are several ways of how to measure leverage, in practice commonly used is the ratio of long-term debt to equity. Throughout the finance literature there has been extensive research about leverage and many theories concerning leverage have been developed. One of them is the Traditional Trade Off Theory. According to this theory a firm benefits from taking on more debt due to tax benefits, however only until a certain point. Beyond this point expected costs of financial distress are so high that they cannot make up for the added value of the tax benefits and therefore firm value decreases (Ogden, Jen and O`Connor, 2003). Thus, with the firm taking on more and more debt, its riskiness has increased. With respect to this leverage can be seen as a proxy for firm risk. But isn´t beta sufficient to capture this risk? Beta is a function of three things: Cyclicality of business, financial leverage and operating leverage. Regarding financial leverage the intuition is that the more debt a firm has, the higher the beta (Koller, Goedhart and Wessels, 2010).

The evidence regarding the significance of leverage in explaining expected returns in empirical research is mixed. Bhandari (1988) was one of the first to examine this and - controlling for beta - finds a significant result for the debt to equity ratio in his research on the US market. Using book leverage, measured as total capital divided by book equity, Asgharian and Hansson (2000) find for the Swedish market a significant negative relation between leverage and expected returns, even when beta is included in the regression. Also other studies usually document a negative coefficient for book leverage. This means that higher book leverage is associated with lower expected returns and a lower leverage is associated

with higher expected returns. This is interesting, since the opposite would be expected since investors that invest in riskier firms with a high leverage should be compensated for taking on this risk. However, this could be also related to the fact that it is hard for already distressed firms to get a new loan and therefore these go for equity issues instead and have a lower leverage (Ogden, Jen and O`Connor, 2003). According to this, firms with a low leverage are considered to be more in distress and therefore investors are compensated for this. This following hypothesis is tested:

H5: There is a negative relation between book leverage and expected returns in the German market.

3.6 Dividend Yield

The dividend yield is in its simple form the ratio of a company's dividend payment to its market equity. Putting capital gains aside, the ratio captures the return an investor makes on his investment. Not all stocks pay dividends and it is possible to distinguish between those investors who prefer dividend-paying stocks for the sake of the dividend, often referred to as "income investors" and those whose primary goal is to yield large returns independent of whether a firm pays dividends or not (Financial Times, 2015). The dividend payout itself is said to decrease the stock price, however this effect only holds for the short-term (Ogden, Jen and O`Connor, 2003). In contrast to this, this thesis is interested whether dividends relative to a low price can explain expected return and therefore the focus is of a more long-term nature. Essentially this is also part of a value investing strategy, however dividends today are not as common as they have been in earlier times (Ogden, Jen and O`Connor, 2003). In the past, dividends played an important role and were for example also used in corporate valuations; the so-called Dividend Discount Model (DDM) values a firm by computing the present value of expected dividend per share payments under consideration of a constant growth rate in dividends into perpetuity. While in the past the payout of dividends was a very common way to return cash to shareholders, it has lost its charm over the past decades as more and more companies have turned to stock repurchases as a way of returning cash to shareholders (Ogden, Jen and O`Connor, 2003). McKinsey´s bestselling guide to corporate valuation, which presents several methods and approaches to firm valuation (Koller, Goedhart and Wessels, 2010) does not even mention the DDM.

There are not many studies that include the dividend yield. For example Chan and Chui (1996) studying the UK market find a positive relationship. This means that the dividend yield is a proxy for risk and requires a risk premium. First, because the dividend yield is similar to the book-to-market ratio seen as a corporate distress factor that requires compensation. Second, dividends are taxed and thus a higher risk premium is expected (Chan and Chui, 1996). The following hypothesis is tested:

H6: There is a positive relation between the dividend yield and expected returns in the German market.

3.7 Cash Flow-to-Price Ratio

The cash flow-to-price ratio, also known as the cash flow yield, is the ratio of a firm's cash flow to its market cap or similarly the ratio of cash flow per share to the focal firm's stock price (Trade.Education, 2015). The ratio measures how much cash flow a firm generates given its market equity. As such it indicates if a firm is under- or overvalued and therefore is along with the earnings-to-price ratio and the book-to-market ratio in particular of interest to value investors. It is important to note here that cash flow compared to earnings is much less affected by managerial discretion and accounting standards (Koller, Goedhart and Wessels, 2010). Furthermore, it is said that the cash flow yield, compared to the earnings yield gives a more reliable picture about the firm. Generally, the use of the ratio makes sense when comparing firms within a given industry in order to find out if a ratio is comparatively low or high. For example a high ratio can indicate that a firm is capital-intensive (Trade.Education, 2015). Cash flows in general play an important role in corporate finance and form the basis for valuing a firm through the Discounted Free Cash Flow (DCF) method. Similarly to the case of the earnings-to-price ratio, numerator and denominator should be consistent – in this case equity related - and as such the focus here is on the cash flow that could potentially be paid out to shareholders only, referred to as cash flows to equity (Koller, Goedhart and Wessels, 2010). These are of more interest to the target group of this thesis.

Even though the importance of cash flows is widely recognized, not many previous studies have included a cash flow-to-price ratio. Similar to the earnings-to-price ratio, the usage of this ratio requires special treatment due to the different interpretation of positive and negative values and therefore, when investigating this ratio - the literature simultaneously uses two variables, whereas one represents the positive ratio due to positive cash flows and the other

one stands for ratios based on negative cash flows that is usually represented by a dummy variable (Davis, 1994). Davis (1994) studying the US market, finds a significant positive coefficient for the positive cash flow-to-price ratio. Lakonishok, Shleifer and Vishny (1994) find similar results for the Japanese market. A positive coefficient for the positive cash-flow-to price ratio would mean that firms with a high positive cash flow-to-price ratio, more specifically firms with a comparably low stock price given their positive cash flows, require a higher risk premium. In other words: undervalued firms earn on average higher expected returns than overvalued ones. Similarly, it is expected that in the case of a negative ratio, proxied by a dummy variable, firms with a negative ratio have lower expected returns. The following hypotheses are tested:

H7a: There is a positive relationship between a positive cash flow-to-price ratio and expected returns in the German Market.

H7b: There is a negative relationship between a negative cash flow-to-price ratio and expected returns in the German Market.

3.8 Sales Growth

Sales growth is, as the term already says, the growth in a firm's sales. There are many ways how to calculate it reaching from simply computing the growth from one year to another one to taking for example a multiple year's compound annual average growth as for example done in Davis (1994). Sales growth is often referred to as a company's top line growth. A particular investor strategy that looks at this measure is referred to as growth investing. The idea behind this approach is to identify firms that are expected to experience substantial growth, the expectation being that this will positively affect stock price (Investor Verlag, 2013). This strategy is particularly suited when investing into young firms and became popular in the 1990s when IT firms were growing quickly (Koller, Goedhart and Wessels, 2010), however this strategy also inherits high risks and can be more of a speculative nature (Investor Verlag, 2013). Evidence shows that a growth in sales does not necessarily go hand in hand with higher returns. Consider for example the case of Wal-Mart and Target; while Wal-Mart has shown consistently higher growth over a period of ten years, Target's investors yielded higher returns. The reason for this is the so-called expectations treadmill, where delivering on expectations does not pay out for shareholders since the information is already incorporated in the stock price. Thus, there is a difference between a good stock and good firm (Koller,

Goedhart and Wessels, 2010). Moreover, sustaining a high growth rate is not easy and a company could uphold high growth simply through making more acquisitions. Therefore one should be careful when interpreting this measure. When valuing a focal firm sales growth plays an important role in forecasting its financial statement items, however only those firms with high sales growth end up with a higher value if they yield returns exceeding their cost of capital (Koller, Goedhart and Wessels, 2010). Apart from this, sales growth is still used as a performance indicator by companies themselves and managerial compensation can be tied to it. Due to the fact that this variable is dependent on many firm-specific factors like the stage of the firm in the business life cycle, the industry the firm operates in and the state of the overall economy and is subject to managerial discretion, firms are starting to move away from this measure.

Previous research documents a negative relationship between sales growth and expected returns (for example Lau, Lee and McInish, 2002 and Lakonishok, Shleifer and Vishny, 1994). This means that a high growth in sales is associated with lower expected returns compared to firms with a lower sales growth. This relationship is consistent with the previously outlined case of Wal-Mart and Target. The following hypothesis is tested:

H8: There is a negative relation between sales growth and expected returns in the German market.

Now that all variables have been introduced, the following table 1 provides a summarized overview of all hypotheses that are going to be tested in this thesis.

Table 1: Overview of Hypotheses

No.	Content	Expected Sign
H1a	There is a positive relation beta and expected returns in the German market.	+
H1b	During up markets, there is a positive relation between beta and expected returns in the German market	+
H1c	During down markets, there is a negative relation between beta and expected returns in the German market	-
H2	There is a negative relation between size and expected returns in the German market	-
H3	There is a positive relation between expected returns and the book-to-market ratio in the German market.	+
H4a	There is a positive relationship between a positive earnings-to-price ratio and expected returns in the German market.	+
H4b	There is a negative relationship between a negative earnings-to-price ratio and expected returns in the German market.	-
H5	There is a negative relation between book leverage and expected returns in the German market.	-
H6	There is a positive relation between the dividend yield and expected returns in the German market	+
H7a	There is a positive relationship between a positive cash flow-to-price ratio and expected returns in the German Market	+
H7b	There is a negative relationship between a negative cash flow-to-price ratio and expected returns in the German Market.	-
H8	There is a negative relation between sales growth and expected returns in the German market.	-

Table 1 provides a summary of all developed hypotheses that are going to be tested in this thesis.

As can be seen from table 1 different relationships between these firm-specific variables and expected returns are expected. Since also the sign of the coefficient for each variable is of interest one-sided hypothesis testing is applied. Given the developed hypotheses the thesis proceeds now in the next chapter with the introduction of the methodological approach to test the variable's explanatory power.

4 Methodology

The first part of this chapter deals with the introduction of the approach used for the analysis. Then, the data set is presented. Subsequently, each variable´s computation is described. Based on this, further exclusions are made and the final sample is presented. Then, beta is estimated and lastly necessary adjustments are made before the variables are included into the cross-sectional regression models.

4.1 Research Approach

For its investigative purpose this thesis makes use of the cross-sectional regression (CSR) approach developed by Fama and MacBeth (1973). As already outlined in the introductory chapters as well as section 2.2 this is the preferred method to be used when investigating the cross-section of expected returns and determining factor risk premia.

The method in its general form can be described as follows: First market betas are estimated through separate time-series regressions using the CAPM and then together with other firm-specific variables included into the CSR model as explanatory variables. This leads to the previously mentioned well-known errors-in-the-variables problem. To decrease this problem this thesis makes use of the portfolio approach by Fama and French (1992). Throughout the literature on the cross-section of expected returns this was generally the used approach to estimate the unconditional beta. Other than that, this approach also offers the perfect basis for estimating the conditional beta and allows this thesis to examine both the unconditional and conditional beta. Please note that this section only outlines the general approach and section 4.5 provides a detailed description of the application of this approach in this thesis.

The approach can be summarized as follows: Let t denote a year in the examined testing period. In order to be able to test the explanatory power of different firm-specific variables it has to be ensured that these are known to the public before they are taken into consideration for explaining expected returns. Thus, accounting variables are used as of December of year t-1 for each year of the testing phase that begins in July of year t. This gap of at least 6 months makes sure that this requirement is fulfilled (Fama and French, 1992). Then, market betas are estimated through time-series regressions for each individual security using 2-5 years of monthly data prior to July of year t. These betas are referred to as pre-ranking betas and are estimated by using the traditional CAPM. Subsequently, information on firm size is obtained

as of June of year t and portfolios are built - first based on firm size and then on the stocks' pre-ranking beta. For each portfolio equally weighted monthly portfolio returns are computed for the following 12 months from July of year t to June of year t+1. This process is repeated for every year within the testing period, that means portfolios are formed and equally weighted monthly portfolio returns are calculated over a period of 12 months. Then, the full sample of monthly portfolio returns are regressed against the returns of a computed proxy of the market portfolio in order to obtain the portfolio betas, which are referred to as post-ranking betas. Using the Aggregate Coefficient method by Dimson (1979) the estimates are adjusted for non-synchronous trading and finally matched with each stock that is in the focal portfolio during the examined period. These are the betas that are included together with the other firm-specific factors in the cross-sectional regressions. Fama and MacBeth (1973) use portfolios in their cross-sectional regressions, however, this thesis, like Fama and French (1992) and many other studies uses individual stocks rather than portfolios in order to preserve information (Fama and French, 1992).

Finally, the monthly returns of year t are matched with the obtained beta estimates for year t, size of year t and accounting variables as of December of year t-1. Now, each month a cross-sectional regression is run by applying OLS. The time-series average of the coefficient estimates then form the basis for subsequent hypothesis testing. For this a student t-test with t-1 degrees of freedom is applied. Recall that this thesis is especially also interested in the sign of the estimated coefficient and therefor one-sided hypotheses testing is applied.

In addition to the approach of Fama and French (1992), which relies on the traditional unconditional CAPM, this thesis also implements an approach where the conditional relation between beta and returns is tested such as done in Pettengill, Sundaram and Mathur (1995). This is due to findings of previous research claiming that the unconditional beta is not significant in explaining the cross-section of expected returns. Pettengill, Sundaram and Mathur (1995) examine the return-beta relationship conditional on the state of the market. They introduce a dummy variable approach, where δ takes on one when market excess returns are positive (up markets) and zero, when they are negative (down markets). So, conditional on the sign of the market excess returns, either a coefficient for BETA(+) or BETA(-) is estimated in the following model (Pettengill, Sundaram and Mathur, 1995):

Equation 5: Conditional Beta

$$R_i - R_F = \Upsilon_0 + \Upsilon_1 \cdot \delta \cdot BETA(+) + \Upsilon_0 \cdot (1-\delta) \cdot BETA(-) + \varepsilon_i$$

This can easily be done by distinguishing between months where the market excess return is positive and months where it is negative and then running the cross-sectional regressions. A detailed description about the computation of each of the explanatory variables is done in the corresponding section. But first the data-set to which the methodology is applied is introduced.

4.2 Data

This thesis studies the German market. For this purpose it makes use of all German firms that are listed on the Frankfurt Stock Exchange. The Frankfurt Stock Exchange ("*Frankfurter Wertpapierbörse*") is the largest of the seven exchanges in Germany and is responsible for 85% of the overall turnover of the German Trading Market (Deutsche Börse, 2015). The initial data set contains all stocks listed on the Composite DAX, a market index that covers all German firms listed in the Prime and General Standard of the Frankfurt Stock Exchange, which represents according to Frankfurt Stock Exchange the entire equity market for domestic firms (Börse Frankfurt, 2015). The data is gathered through Datastream, which covers in addition to information on stock prices also firm-specific accounting data. However, some adjustments have to be made before the final data set is obtained.

The focus is on all non-financial firms. This has two major reasons. First, firm-specific factors do not have the same meaning for financial and non-financial firms, especially since accounting variables are included and the financial reports for financial firms somewhat differ. Consider for example the fact that this thesis also includes the cash flow-to-price ratio; cash flows for financial firms are certainly not what they are for non-financial ones and thus this might distort the picture. Other than that firm size, measured by the natural logarithm of market equity, would be not representative for highly levered financial firms given that institutions like Deutsche Bank and Commerzbank are clearly large in terms of their size. Another argument why these firms should be excluded is given by Chan and Chui (1996). They claim that in financial firms the book values are often market values, which is not preferable for this analysis since also book values are taken into account (Chan and Chui, 1996). Consider here for example the book-to-market ratio. If the book value of equity would be denoted in market value, then the interpretation would not be the same as for other firms.

The testing period for the analysis of the research question reaches from 2009 to 2014, more specifically from July 2009 until June 2014. The reason for the choice of this period is twofold. First, this most recent period allows making practical implications of the results of this thesis that are of interest for today's investment business, which is the target group of this thesis. Second, the choice of this period offers the opportunity to leave out the financial crisis of 2007 and 2008 to a large extent, although one must say that Germany still suffered in 2009 from the effects of the crisis. However, as previously outlined, a lot has changed in the aftermath of the crisis and the tendency went more towards factor investing. Thus, the results of this thesis and its practical implications focusing on the post-crisis period are expected to be representative for the current situation in the German market. To ensure more reliable results for the estimation of the pre-ranking betas this thesis uses five full years prior to the testing period. As previously mentioned, accounting information has to be publicly available before used to explain expected returns. For each year within the testing period, accounting information as of December of year t-1 is needed as well as information on firm size (market value of equity) as of June of year t. Lastly, information on stock prices from July of year t to June of year t+1 is required as this is vital for carrying out the cross-sectional regressions.

All stocks that do not fulfill these requirements are excluded from the sample. Therefore only firms that “survived” the financial crisis are taken into account. One might argue that due to these constraints the thesis solely focuses on more mature firms and thus does not consider firms that for example only had been listed for three years. However, for the investigative purposes of this thesis it is necessary that information on stock prices and accounting measures is available for a specific firm.

The sample consists of a total of 347 stocks. However, further exclusions have to be made based on the properties of the explanatory variables included into the model. So, in the following section the computation of each accounting variable is described before the final sample is introduced and beta can be estimated.

4.3 Preparation of Variables

For the computation of the variables that are to be included in the cross sectional regressions, this thesis follows the approach of Fama and French (1992) and related studies. This section

contains a description of how the dependent and independent variables are prepared and computed. Note that all data has been retrieved from Datastream.[4]

4.3.1 Dependent Variable

The dependent variable is the monthly stock return of the studied firms. For this, the monthly prices from June 2004 until June 2014 are obtained from Datastream, which are adjusted for dividends and capital changes such as splits and equity issues. Furthermore, also the three month money market rate is obtained, which serves as a proxy for the risk-free rate and is transformed accordingly into its monthly equivalent. Datastream (2010) recommends to use three month money market/ interbank rates as a proxy for the risk-free rate as these are similar to the three month treasury bill rates used in studies on the US, Canada and the UK. Subsequently log returns are computed and finally by subtracting the risk-free rate, the excess returns are calculated for each of the firms in the sample.

4.3.2 Firm-Specific Explanatory Variables

As a first step, it is made sure that all accounting data is measured consistently and if not the data is converted accordingly. The accounting variables are computed as of December of year t-1. The fiscal year end for German firms is usually in December. However, there are also firms that have a different fiscal year end due to their specific business needs. This thesis uses the accounting variables as of December t-1 for all the firms and therefore the same fiscal year end for all selected firms is assumed. This is a reasonable assumption based on findings by Fama and French (1992) which show that the impact on the results when using firm-specific fiscal year-ends is negligible (Fama and French, 1992).

The explanatory variables as of December of year t-1 will then be matched with the stock returns from July of year t to June of year t+1 (Fama and French, 1992). An accounting variable stays constant through a period of 12 months. Table 2 gives an overview of the computation of each variable.

---

[4] Appendix 2 shows an overview of the Datastream abbreviation as well as the specific use of this variable in the thesis.

Table 2: Computation of Variables

Variable	Abbreviation	Description
Beta	Beta	For the calculation of beta this thesis follows the portfolio approach of Fama and French (1992) and related studies. A detailed description about the estimation can be found in the corresponding section for beta estimation (4.5).
Beta (cond.)	BETA(+)	For the estimation of the conditional beta this thesis uses the approach of Pettengill, Sundaram and Mathur (1995), where BETA(+) is the beta conditional on up markets. For a detailed description please see section 4.1.
Beta (cond.)	BETA(-)	For the estimation of the conditional beta this thesis uses the approach of Pettengill, Sundaram and Mathur (1995), where BETA(-) is the beta conditional on down markets. For a detailed description please see section 4.1.
Size	Ln(ME)	Following Fama and French (1992) and related studies firm size is measured by the natural logarithm of market equity as of June of year t. A firm's market equity is uniformly denoted in millions of Euros.
Book - to - Market Ratio	BE/ME	For the computation of the book-to-market ratio a firm's book equity is divided by its market cap, both measured as of December of year t-1.
Earnings -to- Price Ratio	E(+)/P	For the earnings-to-price ratio a firm's earnings is divided by its market equity, both as of December of year t-1. For the definition of earnings, this thesis follows Kim (1997) who uses net income, which is compared to EBIT a measure that is more of interest to shareholders. The E(+)/P ratio takes on the value of the ratio when positive and zero otherwise.
Earnings -to- Price Ratio	E/P Dummy	For the earnings-to-price ratio a firm's earnings is divided by its market equity as of December of year t-1. For the definition of earnings, this thesis follows Kim (1997) who uses net income, which is compared to EBIT a measure that is more of interest for shareholders. The E/P Dummy takes on a value of one if the ratio is negative and zero otherwise.
Book Leverage	TA/BE	Following Fama and French (1992), Asgharian and Hansson (2000) and related studies book leverage is computed as the ratio of a firm's total assets to its book equity, both as of December of year t-1.[5]
Dividend Yield	D/P	For the computation of the dividend yield variable this thesis follows Lakonishok, Shleifer and Vishny (1994) who divide a firm's annual dividend by the market value of equity as of December of year t-1.
Cash Flow - to - Price Ratio	CF(+)/P	For the computation of cash flow this thesis computes the Cash Flows to Equity by adding to a firm's net income; a firm's depreciation, amortization and depletion as of December of year t-1. This definition closely follows Davis (1994).[6] The cash flow is then divided by the firm's market cap in December of year t-1. The CF(+)/P ratio takes on the ratio's value for positive values and is zero otherwise.
Cash Flow - to - Price Ratio	CF/P Dummy	For the computation of cash flow this thesis computes the Cash Flow to Equity by adding to a firm's net income; a firm's depreciation, amortization and depletion as of December of year t-1. This definition closely follows Davis (1994). The cash flow is then divided by the firm's market cap in December of year t-1. The CF/P dummy ratio takes on a value of one for negative values and is zero otherwise.
Sales Growth	SG	For the computation of sales growth this thesis computes the growth in sales from year t-2 to year t-1 using the reported numbers as of December of the focal year.

[5] This is an approximation of the real leverage since not only interesting-bearing debt is included.

[6] This definition of cash flow is rather simple. However, a very detailed calculation as for example suggested in Koller, Goedhart and Wessels (2010) is not easy to implement for such a big sample of firms.

Given that now all the variables have been calculated further exclusions are made based on the outcome of the variables so that outliers do not distort the results. This is outlined in the next section.

4.4 Exclusions and Final Sample Selection

As a first step, the dataset is checked for other outliers and anomalies. All firms with a negative book-to-market ratio as well as all cases with a negative leverage are deleted due to the fact that the interpretation for these ratios is somewhat difficult. In cases Datastream does not have data on the required accounting variables for a specific firm, financial statements are used to fill up the missing data. However, if the data is not available the specific firm is also excluded from the sample. The firms that were excluded were from various industries and thus this is not expected to bias the results. This can be seen from table 3 below, which shows the exclusions of the firms of each industry (according to SIC Codes). The final sample comprises 300 stocks.[7]

Table 3: Exclusions per Industry and Final Sample

	Agriculture, Forestry, Fishing	Mining	Construction	Manufacturing	Transportation & Public Utilities	Wholesale Trade	Retail Trade	Finance, Insur-ance, Real Estate	Services	Public Administration	Sum
Number of Firms before Exclusions	2	3	8	172	29	10	16	0	107	0	347
Number of Exclusions	0	0	-1	-21	-4	-1	-3	0	-17	0	-47
Number of Firms after Exclusions	2	3	7	151	25	9	13	0	90	0	300

Table 3 gives an overview over the number of included firms per industry (according to SIC codes) as well as the exclusions.

One can see here that most of the listed German firms are in the manufacturing or services industry. This is not surprising since it is no secret that Germany relies heavily on those two sectors and essentially the export of manufactured products such as cars and chemical substances is very important for Germany.[8]

[7] Appendix 3 provides an overview of all the companies' names.

[8] Please also note that financial firms have already been excluded in an earlier stage.

A number of 300 stocks is in line with other studies on the German market such as Elsas, El-Shaer and Theissen (2003), who base their analysis on 246 up to 316 stocks and Artmann, et al. (2010), who include on average 289 stocks for different subperiods. However, in contrast to Morelli (2007), who randomly selects 300 firms from all securities on the LSDP for his study of the UK stock market, this thesis uses all available non-financial publicly listed German firms that fulfill the data requirements as outlined in section 4.2 and this section. This is considered a good sample to draw inferences for the German stock market on non-financial firms. Given the final sample of 300 stocks, this thesis, as a next step, estimates betas for each firm for each year of the testing period.

4.5 Estimation of Beta

As outlined in section 4.1 this thesis makes use of the portfolio approach of Fama and French (1992) for the estimation of beta. While section 4.1 focuses on the general description of the methodological approach, this section shows now in detail how this thesis applies the approach. First, a proxy for the market portfolio is needed. While the Composite DAX (CDAX) represents the domestic equity market of Germany as a whole, it is not completely suitable in this case since some exclusions have been made. Thus, an index is created by computing a value-weighted index of all 300 stocks included in the analysis and subsequently calculating the corresponding returns and excess returns. Now, the so-called pre-ranking betas can be estimated through regressing excess stock returns on excess market returns using 5 years of monthly return data prior to July of year t. As previously outlined, this thesis decided to take 5 years for the estimation of the pre-ranking betas to obtain more reliable results due to the fact that the financial crisis is present in the years prior to the testing period.

Next, the underlying stocks are sorted by their size (ln(ME)) as of June of year t. Then the quintile breakpoints are determined and thus 5 portfolios consisting of 60 stocks each are formed. Due to evidence by Fama and French (1992) that size and the betas of the size portfolios are highly correlated, each size portfolio is further decomposed into 5 portfolios based on the stock´s pre-ranking betas in order to be able to examine the impact of size and beta independently from one another (Fama and French, 1992). The resulting 25 size-beta portfolios consist of 12 stocks each. This number is in line with Elsas, El-Shaer and Theissen (2003) who use 20 portfolios for an earlier time period of Germany and Morelli (2007), who obtained 25 portfolios for his 300 randomly selected stocks.

As a next step, equally weighted monthly portfolio returns are computed for the following 12 months, namely from July of year t to June of year t+1. These are referred to as post-ranking returns. The process is repeated for every year t within the testing period, which comprises 5 years. Thus, in June of each year 25 beta-size portfolios are formed and equally weighted monthly portfolio returns for the following 12 months are calculated for those. Table 4 gives an overview of the time periods used for the specific purposes.

Table 4: Overview of Time Periods

Periods	Start	End
Estimation Period for Pre-Ranking Betas	July 2004	June 2009
Estimation Period of Post-Ranking Betas	July 2009	June 2014

Table 4 provides an overview of the time periods used for the specific purposes.

To correct for non-synchronous trading the Aggregate Coefficient method of Dimson (1979) is applied; the slope coefficients of a regression of the post-ranking monthly portfolio returns of the full sample (60 months) on the current, lagged and lead of the market returns are estimated. While Fama and French (1992) only regress on the current and lagged market returns due to their findings that a lead and additional lags do not really have an impact, this thesis also takes one lead since this has indeed an effect. The resulting 25 portfolio beta estimates are assigned to each stock that is in the focal portfolio within this year and represent the betas to be used in the CSR model as explanatory variable. For each individual stock the beta is the same for a period of 12 months and can change when the stock changes the portfolio from one year to another which is dependent on its size as well as its pre-ranking beta. The results are presented in the corresponding results section, where also descriptive statistics regarding the other explanatory variables are shown. The next section of this chapter makes further adjustments before finally the cross-sectional regressions can be estimated.

4.6 Validity and Reliability of Model

In order to be able to derive valid inferences the model has to be reliable. Recall that this thesis implements the Fama and MacBeth CSR approach and as such 60 monthly cross-sectional regressions are estimated for each model that is tested. Then the time-series averages of the estimated coefficients are taken that form the basis for subsequent hypothesis testing.

A possible problem in cross-sectional regressions could be cross-sectional heteroskedasticity, where the variance of the errors is not constant. In order to reduce the "size effect" logs are taken for both the book-to-market ratio and the leverage variable, so that the resulting variables are ln(BE/ME) and ln(TA/BE). Besides that, Fama and French (1992) provide evidence that the log form in the case of leverage is a well-suited functional form to capture potential leverage effects (Fama and French, 1992). Also the book-to-market ratio is included in log form into the model in all previous studies, which reduces the size effect.

An issue could be multicollinearity. This is referred to when the explanatory variables of a model are very highly correlated. As a rule of thumb, it is spoken about near multicollinearity when the absolute value of the correlation between a pair of variables is equal to or larger than 0.80 (Brooks, 2008). In order to see if multicollinearity is a problem here, it is made use of a correlation matrix, which shows the correlation between each possible pair of explanatory variables. The correlation matrix can be inspected below:

Table 5: Correlation Matrix

	Beta	Ln(ME)	Ln(BE/ ME)	E(+)/P	E/P Dummy	Ln(TA/ BE)	D/P	CF(+)/P	CF/P Dummy	SG
Beta	1.00									
Ln(ME)	0.37	1.00								
Ln(BE/ME)	0.00	-0.11	1.00							
E(+)/P	-0.01	0.01	0.22	1.00						
E/P Dummy	-0.05	-0.30	0.00	-0.40	1.00					
Ln(TA/BE)	0.01	0.00	-0.61	-0.05	0.16	1.00				
D/P	-0.14	-0.02	0.20	0.50	-0.07	0.03	1.00			
CF(+)/P	-0.02	-0.03	0.22	0.56	-0.29	0.12	0.28	1.00		
CF/P Dummy	-0.04	-0.29	-0.04	-0.30	0.74	0.15	-0.07	-0.31	1.00	
SG	0.07	0.05	0.03	0.03	-0.09	-0.06	-0.02	0.00	-0.07	1.00

The table shows the average of the 60 monthly cross-sectional correlations between each pair of variables included in the analysis, where ln(ME) is the proxy for firm size, ln(BE/ME) is the log of the book-to-market ratio, E(+)/P is the earnings-to-price ratio for positive earnings, E/P Dummy is the earnings-to-price ratio for negative earnings, ln(TA/BE) is the log of the leverage variable, D/P is the dividend yield, CF(+)/P is the cash flow-to-price ratio for positive cash flows, CF/P is the cash flow-to-price ratio for negative cash flows and SG stands for sales growth. The number of stocks (cross-sections) is N=300.

As can be seen some variables are quite highly correlated such as for example the E/P Dummy and CF/P Dummy that have a correlation of 74%, however no correlation is at 80% or higher. Thus, although most of the variables are clearly related, multicollinearity issues do not seem to be a problem here.

Finally, it should be noted that models that include beta are still subject to the errors-in-the-variables problem. Recall that this thesis implements the portfolio approach of Fama and French (1992), which aims at decreasing this problem; however, one must note here that this does not entirely solve it.

Now, the univariate and multivariate CSR models can be run and subsequent hypothesis testing can be applied. Since it is not only attempted to examine if a variable's coefficient estimate is statistically significant different from zero, but also to investigate the significance of the sign of the estimated coefficient, one-sided hypothesis tests are applied in each case. This is done by computing the t-statistics by dividing each variable’s coefficient estimate through its standard error and subsequently making use of the t-distribution function with one tail in MS Excel. For the reader's convenience the t-statistics and p-values of these one-sided tests are provided below each estimate.

The next section presents the results of the beta estimation, descriptive statistics on all included variables as well as the cross-sectional regression results and subsequently discusses these results.

5 Results and Analysis

In this chapter the results are shown and discussed. After providing the results of the beta estimation and descriptive statistics the regression results are presented and thoroughly discussed with respect to the made hypotheses, existing literature and practical implications. Furthermore also the sensitivity of the results is tested. Lastly, critical points are addressed.

5.1 Results of Beta Estimation

In this thesis, 25 size-beta portfolios are formed and for each the post-ranking betas are estimated over the testing period July 2009 to June 2014. Table 6 on the following page shows the post-ranking betas, the average of the equally weighted monthly portfolio returns and the average size of all included stocks for each portfolio. It is important to note that some crucial inferences can be made by looking at table 6 as well as figure 1 (page 42) and figure 2 (page 42).

First of all it is possible to see from table 6 on page 41 and figure 1 on page 42 that for each size quintile, the post-ranking betas tend to increase and thus to a certain extent follow the pre-ranking betas, showing that the ordering of the post-ranking betas is often already captured by the pre-ranking betas. This is consistent with the work of among others, Fama and French (1992), Morelli (2007) and Chan and Chui (1996). Second, within each size quintile, size is almost the same when compared across the five beta portfolios. According to Morelli (2007) this justifies the use of portfolios based on size and beta as it leads to variation in the post-ranking betas that is not correlated with size. This is important since it allows differentiating between beta and size in the test results (Fama and French, 1992). Third, the average monthly portfolio returns for the smallest size quintile are often smaller than those of the largest size quintile, contradicting the size effect that is found in many US studies, like the one of Fama and French (1992) and Kim (1995). This fact especially becomes clear when looking at figure 2 on page 42, which shows the average of the monthly portfolio returns across portfolios. This is a possible indicator that the size variable might be insignificant in the German market. Fourth, high beta portfolios do not necessarily outperform low-beta portfolios. This is interesting since a positive relationship between beta and expected returns is expected and therefore higher beta stocks should require a higher risk premium.

Table 6: Results of Beta Estimation

Post-ranking betas of the 25 size-beta portfolios: July 2009-June 2014

		β-1	β-2	β-3	β-4	β-5
small	Ln(ME)-1	0.48	0.44	0.54	0.89	1.11
	Ln(ME)-2	0.13	0.65	0.50	0.92	1.11
	Ln(ME)-3	0.43	0.77	0.69	0.88	1.16
	Ln(ME)-4	0.71	0.79	1.06	0.99	1.32
large	Ln(ME)-5	0.42	0.69	1.07	1.18	1.46

Average of equally weighted monthly portfolio returns (%) of the 25 size-beta portfolios

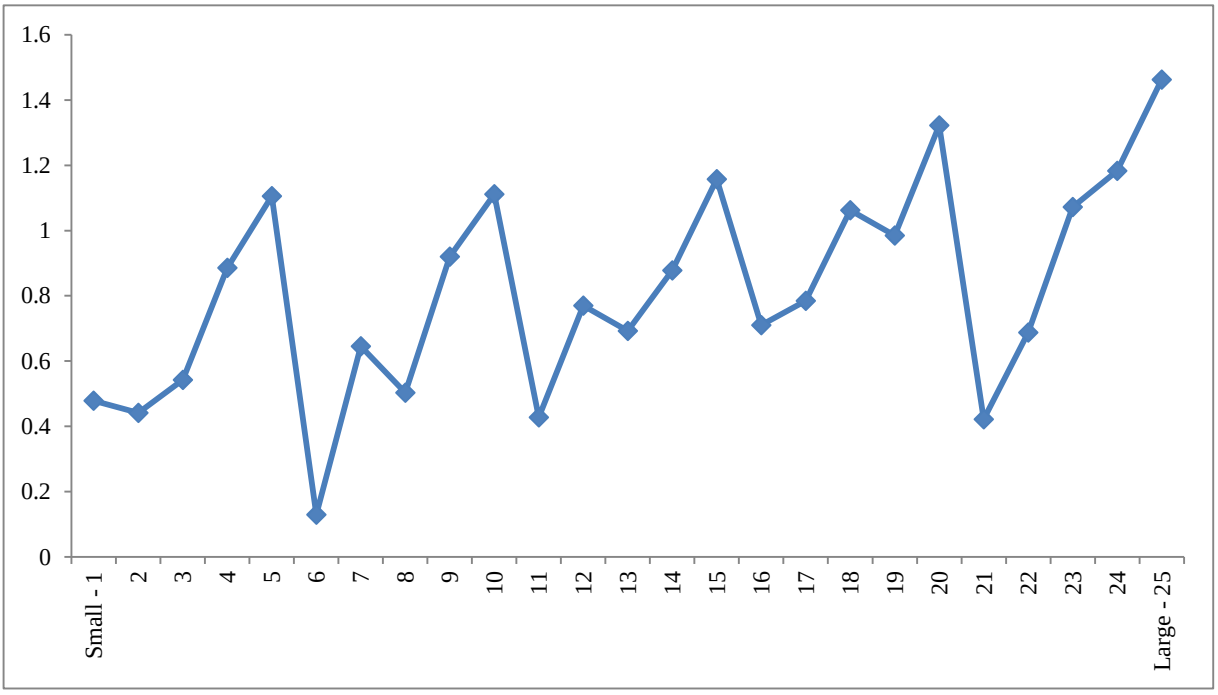
		β-1	β-2	β-3	β-4	β-5
small	Ln(ME)-1	0.37%	0.85%	0.44%	1.40%	-0.15%
	Ln(ME)-2	-0.18%	0.90%	1.11%	1.02%	0.97%
	Ln(ME)-3	0.40%	0.92%	1.31%	1.37%	1.06%
	Ln(ME)-4	0.48%	0.99%	1.24%	1.40%	1.50%
large	Ln(ME)-5	0.59%	0.73%	0.99%	1.14%	1.15%

Average size (ln(ME)) of the 25 size-beta portfolios

		β-1	β-2	β-3	β-4	β-5
small	Ln(ME)-1	1.92	2.10	2.04	2.14	2.11
	Ln(ME)-2	3.48	3.54	3.60	3.58	3.57
	Ln(ME)-3	4.64	4.43	4.60	4.51	4.66
	Ln(ME)-4	6.05	5.94	5.84	6.03	6.13
large	Ln(ME)-5	8.05	8.55	8.96	8.88	8.40

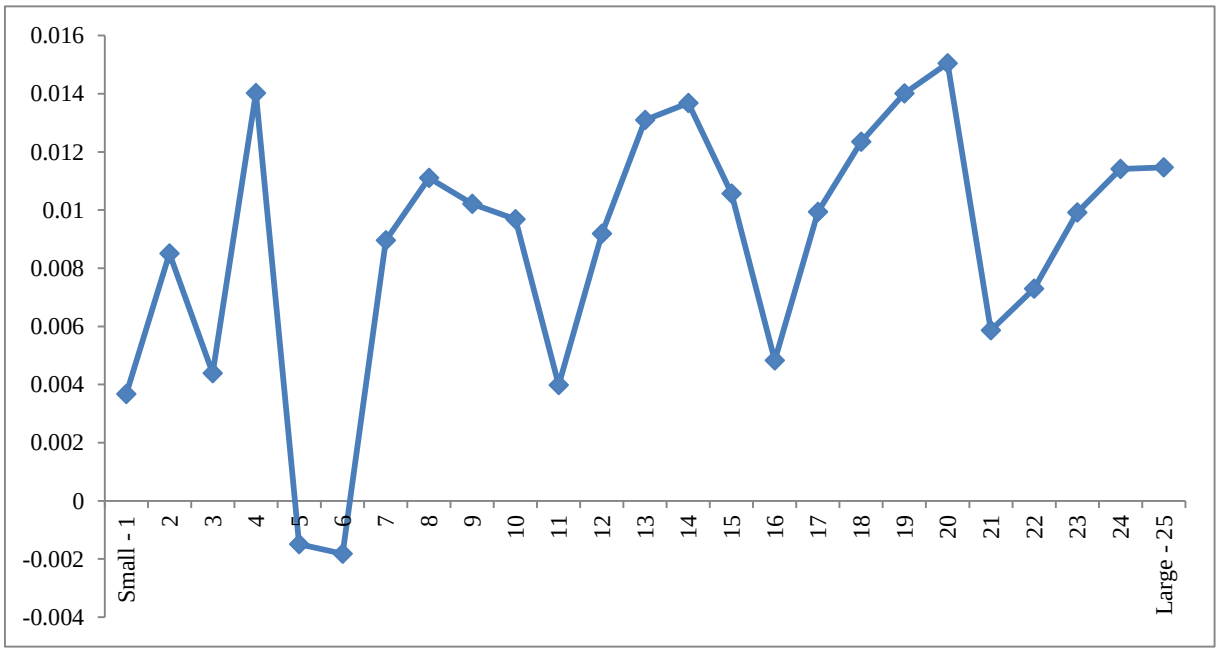
For each year in the testing period 5 portfolios are formed based on firm size, each portfolio is then split up into 5 further portfolios based in the pre-ranking betas. The result are 25 size-beta portfolios containing 12 stocks each. Monthly portfolio returns are computed over a period of 12 months from July of year t to June of year t+1. For the estimation of the post-ranking betas that are shown here the full sample (60 months) of portfolio excess returns is used. The betas are adjusted for non-synchronous trading using Dimson (1979). Average returns are computed by building the average of the full sample returns for each portfolio. Size is measured by the logarithm of market equity, which is denoted in millions of Euros and for each portfolio the average of the size of the included stocks was taken.

Figure 1: Post-Ranking Betas of the 25 Size-Beta Portfolios



The figure shows the post-ranking betas across the 25 size-beta portfolios starting from the portfolios with the smallest size quintile with the lowest pre-ranking betas to the largest size quintile with the highest pre-ranking betas. It can be seen that the ordering of the post-ranking betas roughly captures the one of the pre-ranking betas on which portfolios were formed.

Figure 2: Average Monthly Excess Portfolio Returns



The figure shows the average monthly portfolio excess return over the testing period from July 2009 to June 2014 for each of the 25 size-beta portfolios starting from the smallest size quintile with the lowest pre-ranking betas to the largest size quintile with the highest pre-ranking betas. It can be seen that small firms do not necessarily outperform large ones.

Now, that the results of the beta estimation process have been shown, the next section presents descriptive statistics for all explanatory variables as well as the dependent variable.

5.2 Descriptive Statistics

In order to get an idea of the variables included in the cross-sectional regression, table 7 contains summary statistics. Please note, that in the case of size, the book-to-market ratio and leverage, the variables here are shown before the logs were taken. The reason for this is that this makes the description and interpretation of those variables somewhat easier.

Table 7: Descriptive Statistics

Explanatory Variables

	Beta	ME (in millions)	BE/ME	E(+)/P	E/P Dummy	TA/BE	D/P	CF(+)/P	CF/P Dummy	SG
Mean	0.8153	2 636	0.9996	0.0796	0.2273	3.2063	0.0419	0.1739	0.1387	0.07
Median	0.7852	107	0.7707	0.0595	0.0000	2.2166	0.0156	0.1233	0.0000	0.05
St. Dev.	0.3193	9 218	0.9381	0.1079	0.4191	5.3862	0.1924	0.2283	0.3456	0.44

Dependent Variable (Stock Excess Returns)

	July 2009 - June 2010	July 2010 - June 2011	July 2011 - June 2012	July 2012 - June 2013	July 2013 - June 2014	Whole Period
Mean	0.0206	0.0145	-0.0142	0.0097	0.0134	0.0088
Med.	0.0106	0.0065	-0.0081	0.0072	0.0085	0.0046
St. Dev.	0.1101	0.1044	0.1097	0.0966	0.1065	0.1062

Table 7 contains descriptive statistics on the explanatory variables and the dependent variable, where ME stands for a firm's market equity, BE/ME is the book-to-market ratio, TA/BE is the book leverage, E(+)/P is the earnings-to-price ratio for positive earnings (net income) that takes on a value of zero for negative earnings, E/P Dummy is the earnings-to-price dummy variable that becomes one if the ratio is negative and zero otherwise, CF(+)/P is the cash-flow-to-price ratio for positive cash flows (zero otherwise) and CF/P Dummy is the cash-flow-to price dummy that becomes one for negative cash flows and zero otherwise, D/P represents the dividend yield and SG stands for sales growth. The table gives an overview of mean, median (med.) and standard deviation (St. Dev.).

Directly continuing from the *beta* estimation part, the table above also includes descriptive statistics for beta. It can be seen that the average and median for beta are quite close to each other and both are smaller than one. This indicates that on average stocks are less sensitive to market movements, i.e. less risky than the market portfolio. Thus, on average a unit change in the market return is associated with less than a unit change in the stock return.

From the descriptive statistics for *market equity* that proxies in its natural log form for firm size it can be clearly seen that there are large differences across the sample. The standard deviation is very high and mean and median are quite far from one another. This means that very small firms as well as very large firms are inherent to the sample, which allows this thesis to clearly detect if there is a size effect in the German market or not. Besides this underlines that this thesis takes into account small stocks in contrast to some other studies that excluded these, the reason often being that databases prefer large firms over smaller ones.

The *book-to-market ratio (BE/ME)* is on average one, indicating that on average book equity and market equity are equal and thus the market as its whole is neither overvalued, nor undervalued. However, the median is 0.7707, which evokes the presumption that more firms have a ratio lower than one. Value investors are interested in stocks that have a ratio larger than one. Furthermore, the difference between the mean and median rationalizes the previous decision for taking this variable in its natural log form.

Net income is roughly about 8% of a firm's market equity (when net income is positive). When taking the reciprocal of this 12.5 is obtained for the resulting price-to-earnings ratio. Thus, on average German firms trade at a multiple of 12.5 of their net income. This confirms results by Thomson Reuters (2014) that show that the multiple for Germany is 12, being under the European average of 13.6. This gives rise to the suspicion that many firms underperform and would argue in favor of a value investing strategy. Given that the mean of the *E/P Dummy* is a lot closer to zero than to one, indicates that most of the firms have a positive net income.

The mean of *TA/BE* that proxies in its natural log form for the book leverage is at first glance not easy to interpret. Therefore the inverse of the ratio is taken. This gives a ratio of book equity to total assets of about 31% and thus leverage is on average around 69% in the

sample.[9] This seems quite high. However, according to a study by the German Central Bank ("*Deutsche Bundesbank*") the ratio of book equity to total assets has reached in Germany in December 2012 a level of about 28%, and thus average leverage, measured as total debt to total assets, is about 72%. (Deutsche Bundesbank, 2013). This shows that German firms on average rely heavily on debt financing. However, the large standard deviation suggests that there are huge differences across the sample. This also justifies the use of the variable in its natural log form since taking logs makes its distribution better-behaved.

The *dividend-to-price ratio (D/P)* is on average 0.0419, the median being even lower. This illustrates the presumption that many German firms do not pay dividends anymore. When having a closer look at the dataset it is noted that 71 out of the 300 firms did not pay dividends throughout the whole testing period. 123 of the 300 firms did not pay a dividend for at least one year in the examined testing period. This could already indicate that the variable is not significant in explaining expected returns.

As for the *positive cash flow-to-price ratio (CF(+)/P)* it can be seen that cash flows make out on average 17% of a firm's market equity. However, both ratios should be compared within a given industry in order to make inferences if a ratio is too low or too high compared to its peers. A high ratio could indicate a capital-intensive firm. The *negative cash flow-to-price ratio (CF/P Dummy)* is with a value of roughly 0.14 closer to zero than to one, which indicates that more firms have positive cash flows.

Sales growth (SG) is on average 7%, the median being 5%. Thus, German firms seem to grow. Nonetheless, one should be careful when interpreting that number since a growth in sales can be the result of a) overall market growth, b) new market share and c) acquisitions (Koller, Goedhart and Wessels, 2010) and as already mentioned in the hypothesis development section, sales numbers can be manipulated. Generally, it makes sense that sales growth is clearly positive due to the fact that this thesis examines the period directly after the crisis and therefore firms are currently recovering.

For the dependent variable, the *monthly stock excess returns*, the mean over the whole testing period is 0.9%. The standard deviation is over all years within the testing period almost at

[9] One should note that not only interest bearing debt is included here.

about the same level of 10%. Judging from the negative mean and median return in the period around August 2011 a short down market period is present in the sample. In fact, when looking up the development of the important German performance indices DAX and CDAX during that period, it can be noted that those were at considerable low levels compared to the months before and after this focal period. The reason for this was the debt crisis surrounding Greece as well as the rating downgrade of the USA. Figure 3 shows the market returns computed from the created value weighted market index of the 300 stocks of this thesis.

Figure 3: Excess Market Returns for the Testing Period July 2009 – June 2014

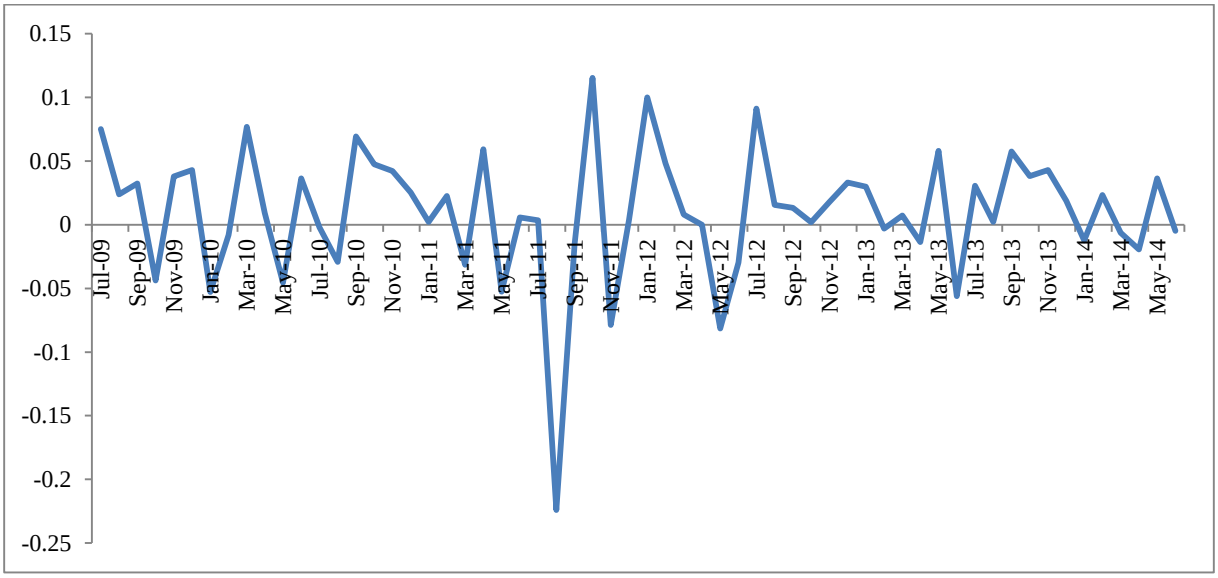


Figure 3 shows the monthly excess market returns for the testing period July 2009 to June 2014.

The figure illustrates the previously mentioned down period. In general, the figure shows periods of up markets and down markets and as such offers a good basis for the application of the conditional beta approach. The results for this as well as the results for all the other variables are now presented in the following section.

5.3 Results and Interpretation

The results of the cross-sectional regressions can be found in Table 8. Following previous research, this thesis starts with a univariate analysis for each variable and subsequently tests combinations of variables when proven significant in the univariate case. Exceptions are the cash flow-to-price and the earnings-to-price variables; those are each regressed in a bivariate regression together with their corresponding dummy variables. Please note that one-sided tests have been carried out in each case.

Table 8: Cross-Sectional Regression Results

Alpha	Beta	ln(ME)	ln(BE/ME)	E(+)/P	E/P Dummy	ln(TA/BE)	D/P	CF(+)/P	CF/P Dummy	SG
0.0026	0.0075									
[1.0388]	[1.2727]									
(0.1516)	(0.1041)									
0.0067**		0.0004								
[1.6866]		[0.5771]								
(0.0485)		(0.2830)								
0.0092**			0.0019**							
[2.1463]			[1.7398]							
(0.0180)			(0.0436)							
0.0091**				0.0117*	-0.0063**					
[2.0692]				[1.5781	[-1.9930]					
(0.0215)				(0.0599)	(0.0254)					
0.0085**						0.0004				
[1.9830]						[0.3182]				
(0.0260)						(0.3757)				
0.0088**							0.0013			
[2.0196]							[0.4684]			
(0.0240)							(0.3206)			
0.0082**								0.0078**	-0.0068**	
[1.8664]								[2.0821]	[-1.7382]	
(0.0335)								(0.0208)	(0.0437)	
0.0090**										-0.0033
[2.1372]										[-1.0295]
(0.0184)										(0.1537)
0.0099**			0.0017*	0.0079	-0.0069**					
[2.1956]			[1.4433]	[0.9670]	[-2.1699]					
(0.0160)			(0.0771)	(0.1688)	(0.0170)					
0.0090**			0.0016*					0.0058*	-0.0074**	
[1.9901]			[1.4181]					[1.4573]	[-1.8875]	
(0.0256)			(0.0807)					(0.0752)	(0.0320)	
0.0040*	0.0072		0.0017*	0.0076	-0.0067**					
[1.5252]	[1.2006]		[1.4480]	[0.9316]	[-2.1096]					
(0.0663)	(0.1174)		(0.0765)	(0.1777)	(0.0196)					
0.0029	0.0074		0.0016*					0.0061*	-0.0073**	
[1.0637]	[1.2531]		[1.4059]					[1.5476]	[-1.9076]	
(0.1459)	(0.1076)		(0.0825)					(0.0635)	(0.0307)	

This table shows the results of the univariate and multivariate cross-sectional regressions. Every month the cross-section of stock returns is regressed on variables that are expected to explain the returns. Subsequently the time-series average of the estimated coefficients is taken that builds the basis for the computation of t-statistics and p-values for applying one-sided hypothesis tests. Results with *** are statistically significant at the 1-%-level, results with ** are statistically significant at the 5%-level and, results with * are statistically significant at the 10-%-level. All accounting variables are measured as of December of year t-1 with the exception of firm size, which is represented by the logarithm of the market cap as of June of year t. E(+)/P is the earnings-to-price ratio for positive earnings and becomes 0 if earnings are negative. E/P dummy is used when negative earnings occur and takes on a value of 1 in this case, otherwise 0. CF(+)/P is the cash-flow-to-price ratio for positive cash flows and becomes 0 if cash flows are negative. CF/P dummy is used when negative cash flows occur and takes on a value of 1 in this case, otherwise 0. T statistics are computed by dividing the average coefficients by the standard error and subsequently p-values are provided using the t distribution function with one tail in Excel. T-statistics are provided in edgy parentheses [..], and p-values are provided in round parentheses (..). below each coefficient estimate.

In order to be able to better assess the models, also results for the alpha coefficient for each model and data on its significance is reported.

For a clear and structured overview of the results, the results for each variable are now discussed in a separate section. In this respect the thesis will come back to the research questions stated at the beginning of this thesis and answer which variables are significant in explaining expected returns, which combinations of variables best capture subsequent returns, to which countries the results are similar and what practical implications the results have.

5.3.1 Beta

As shown in Table 8 when the unconditional beta is the only explanatory variable in the regression it is not found to be positively statistically significant. However, with a p-value of 0.1041 it just missed to be statistically significant at the 10%-level. This shows that the unconditional beta is given the inspected time period not significant, but alludes that different results could be obtained for other testing periods. When other explanatory variables like book-to-market equity ratio and E/P or CF/P are added to the regression the unconditional beta coefficient still remains insignificant with its p-value playing around the 10%-level. Thus, high beta stocks do not outperform low beta stocks and therefore this contradicts the hypothesis of this thesis. This essentially also would imply that investors should make their decision irrespective of a firm's beta. The insignificance of the unconditional beta is consistent with previous studies, among others that of Fama and French (1992) (US), Morelli (2007) (UK) and Davis (1994) (US).

What about the conditional beta? Recall that previous research usually documents a conditional relationship between beta and expected returns, where beta is significant when the condition of the market is accounted for. Also this thesis tests this hypothesis and table 9 shows the results of the cross-sectional regressions with the conditional betas, including information on the frequency of up and down markets and the average monthly excess market return during these states of the market.

Table 9: Conditional Beta Results

	All markets		Up markets		Down markets	
Number of months	60		40		20	
Average monthly excess market return	0.99%		2.34%		-1.35%	
CSR Results for Conditional Beta	Beta	alpha	BETA(+)	alpha	BETA(-)	alpha
Coefficient Estimate (average)	0.0075	0.0026	0.0275***	-0.0003	-0.0323***	0.0086**
T-Statistics	1.2727	1.0388	5.5501	-0.1066	-3.2177	1.9095
P-Value	0.1041	0.1516	0.0000	0.4578	0.0023	0.0357

The results in this table show whether beta is significant in explaining expected returns when being conditional on up and down markets. This is essentially the approach of Pettengill, Sundaram and Mathur (1995). For comparison purposes the result for the unconditional beta is included. ***indicates significance at the 1%-level, ** indicates significance at the 5%-level and * indicates significance at the 10%-level. Furthermore the alpha coefficients are included. A one-sided t-test was used.

Both conditional beta coefficients are highly significant and have the expected signs indicating that there is a strong positive (negative) relationship between the conditional betas and the stock returns during months when the excess market return is positive (negative). These findings are consistent with other researches that use the conditional beta approach of Pettengill, Sundaram and Mathur (1995) like for example Morelli (2007), who studies the UK. Furthermore, this result confirms previous findings by Elsas, El-Shaer and Theissen (2003) for the German market. The results indicate that high beta stocks have higher (lower) expected returns than low beta stocks when the realized excess market return is positive (negative).[10] Furthermore, in up markets the insignificant alpha coefficient shows that a model

[10] Since a t-test is valid in small sample sizes, the 20 observations for the down markets should not be a problem.

that only has the conditional beta as an explanatory variable is sufficient. However, for down markets, alpha is always statistically significantly positive indicating that an abnormal return exists. The results imply that investors should pay attention to the overall state of the market. Furthermore, these results suggest that the results are sensitive to the condition of the market.

5.3.2 Size

Size is not found to be statistically significant in the univariate regression and therefore is not included in any multivariate regression. Furthermore, it should be noted that a negative sign was expected for the coefficient, however, similar to Strong and Xu (1997) (UK) a positive sign and insignificant result (one-sided test) for this variable is obtained. With a p-value of 0.2830 the result for size is clearly not statistically significantly positive and in fact, overall not statistically different from zero when implementing also a two-sided test (p-value: 0.5660). The result confirms previously outlined thoughts from section 5.1 (results of beta estimation) that size is not a proxy for risk in the German market. This contradicts the findings of US studies of for example the one of Fama and French (1992) and Kim (1995), as well as the ones by all Asian studies, but is consistent with UK studies by Morelli (2007), Chan and Chui (1996) and Strong and Xu (1997).

A reason for this outcome might be that this thesis focuses on the period directly after the financial crisis. Small and large firms included in the examined sample have all made it through the crisis and still exist throughout the whole testing period including June 2014. Both types of firms probably suffered heavy losses during the crisis and therefore one might argue that now in the period after the crisis small firms just as large firms are not associated with higher risk since they both have survived the crisis. However, in UK studies size was also insignificant although a crisis period was often included. Apparently, in the UK and Germany, small firms are generally not considered to be more risky. The finding encourages shareholders to make their investment decisions independently of the size of a given firm.

5.3.3 Book-to-Market Ratio

Irrespective of whether the book-to-market equity ratio is used in a univariate regression or multivariate regression, it is always found to be statistically significant and positive. However, depending on the variables included, the significance level varies. Thus, companies with a high book-to-market ratio, also known as value stocks, on average tend to outperform

companies with a low book-to-market ratio. This confirms the hypothesis of this thesis and is consistent with the vast majority of research conducted on the UK, US and Asian markets, like Fama and French (1992) (US), Davis (1994) (US), Lakonishok, Shleifer and Vishny (1994) (Japan), Kothari, Shanken and Sloan (1995) (US), Chan and Chui (1996) (UK), Kim (1997) (UK), Wong, Than and Liu (2006) (China), Morelli (2007) (UK) and others. These results suggest that also in the German market this ratio plays an important role in explaining subsequent returns and thus can be considered to require a significant risk premium. Thus, the finding supports the hypothesis of Chan and Chen (1991) that a high ratio can be seen as a corporate distress factor that has to be compensated. Furthermore, the finding also support the value investing strategy, used by many successful investors like for example Warren Buffet. However, it should be noted that the ratio`s significance decreases once the earnings-to-price or the cash-flow-to-price variables are added to the model.

5.3.4 Earnings-to-Price Ratio

In the bivariate regression, with one explanatory variable being the earnings-to-price ratio when the earnings are positive and the other being a dummy variable that equals one when earnings are negative, both coefficients are statistically significant and also have the expected signs. The coefficient for E(+)/P ratio turns out to be positive (p-value: 0.0599) while the coefficient for the dummy variable used for negative values, E/P Dummy, shows a negative sign (p-value: 0.0254) indicating that firms with a higher E(+)/P ratio on average outperform firms with a lower E(+)/P ratio and that firms with a negative E/P ratio on average have a lower risk premium than firms with a positive E/P ratio. However when the book-to-market equity variable is added to the regression the E(+)/P ratio loses its significance (p-value: 0.1688) while the coefficient for the dummy variable remains negative and statistically significant (p-value: 0.0170). Possibly because the book-to-market equity variable captures most of the risk that is also captured by the E(+)/P ratio. A reason for this could be the fact that both ratios can provide evidence if a firm trades at a comparatively low value given its accounting background, namely that the firm is undervalued compared to its peers. This result remains the same irrespective of whether beta is included into the model. The significance of E(+)/P is consistent with Kim (1997) (US), Davis (1994) (US), Lakonishok, Shleifer and Vishny (1994) (Japan) and Lau, Lee and McInish (2002) (Malaysia). A significance for the E/P Dummy was found by Davis (1994) (US) and Howton and Peterson (1998) (US). In all tested models regarding the earnings-to-price ratio alpha was positive and statistically

significant indicating that an abnormal return exists, which is not explained by the factors used in this model.

5.3.5 Leverage

For the case of book leverage, this thesis finds no support for a significant negative relationship. In fact, the sign was positive and strongly insignificant (p-value: 0.3757). What is the reason for this result? While Asgharian and Hansson (2000) found a significant negative coefficient for book leverage in the Swedish market, they show that leverage becomes insignificant when excluding the recession period in the early 1990s. They conclude that leverage is more of an industry effect rather than a leverage effect (Asgharian and Hansson, 2000). In fact, when inspecting the periods studied by other researchers that find significant results for leverage, it can be noted that recession periods are included in their samples. A main reason for this is that those studies have examined longer periods and therefore often more than one recession period is inherent to their sample. For example Strong and Xu (1997) studied the period 1973 to 1992 in the UK, which includes the 1973 oil crisis, the recession in the beginning of the 1980s as well as the recession in the early 1990s. However, this study focuses on the German market after the financial crisis around 2008. This might be the reason why leverage does not play a role in explaining expected returns.

The result shows that investors should invest into stocks irrespective of the leverage of a firm. Apparently, neither firms with low book leverage nor firms with a high leverage are associated with distress that requires compensation (two-sided test, p-value: 0.7514). Generally, the overall tendency of German firms is to go for debt rather than for equity and the interest on debt in Germany can be considered quite low (Die Welt, 2014). Also one must say that access to debt financing for firms in Germany is quite easy compared to other countries (Handelsblatt, 2012) and therefore a higher or lower leverage is not associated with distress but rather with a firm`s preferences and other reasons.

5.3.6 Dividend Yield

Regarding the dividend yield this thesis finds no significant positive results (p-value: 0.3206). However, as already noted in the hypothesis development section many firms do not pay dividends and instead go for share repurchases to return cash to shareholders or might also reinvest the dividends. Furthermore one must note that previous studies that find a significant

relationship are of an older nature studying earlier time periods (for example Chan and Chui (1996) (UK)), where the role of dividends was of more importance. Beyond that, in 2008, the German tax law was reformed and since then both dividends and capital gains are equally taxed with 25% (plus other taxes). Before this reformation capital gains were only taxed when the holding period was shorter than twelve months (Lohnsteuerhilfeverein Hessen, 2010). Thus, the argument by Chan and Chui (1996) that the dividend yield proxies for risk due to tax reasons does not apply here since capital gains are equally taxed. Thus, a high dividend yield is not a proxy for risk and is not associated with higher expected returns compared to other firms with a low dividend yield. Inferring from this it is recommended that investors choose stocks independent of the outcome of the dividend yield since this ratio does not proxy for risk and is not compensated for. This argument does of course not extend to the so-called income investors, who specifically invest into dividend paying stocks in order to receive the dividend income.

5.3.7 Cash Flow-to-Price Ratio

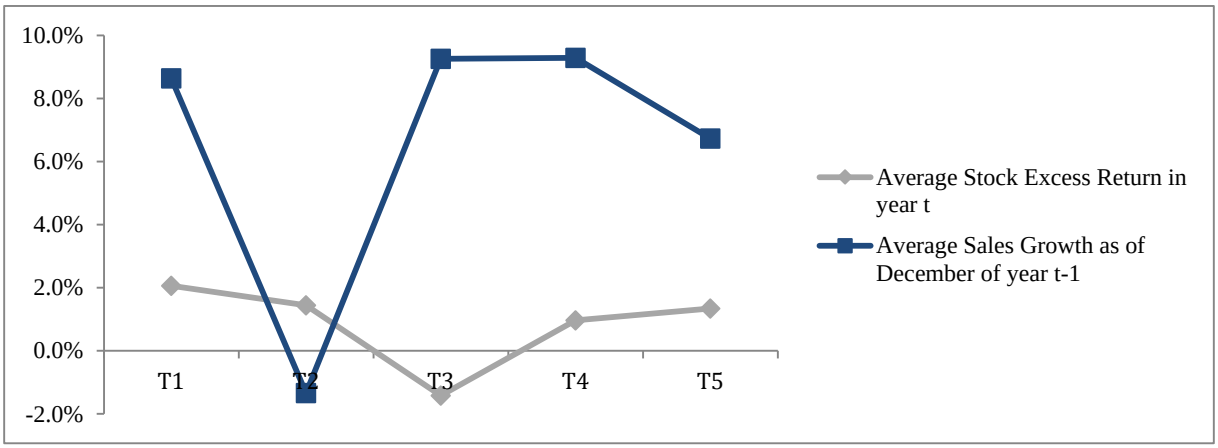
Regarding both CF(+)/P and CF/P Dummy significant results are obtained. For CF(+)/P this means that it is positively related to expected returns (p-value: 0.0208) and thus similar to the book-to-market and the earnings-to-price ratio a higher ratio is associated with higher expected returns. In the case of the CF/P dummy support for a negative relationship between the ratio and returns is found (p-value: 0.0437) meaning that firms with a negative CF/P ratio earn lower expected returns. This result is consistent with other studies such as Davis (1994) (US) and Lakonishok, Shleifer and Vishny (1994) (Japan). However, not many studies have included this variable. Given its results, this thesis clearly argues in favor of including the ratio in subsequent studies.

On top of that both the CF(+)/P and CF/P Dummy remain significant and maintain the expected signs when adding ln(BE/ME) and beta to the equation. Especially highlighted has to be the case of CF/P Dummy that continues to be significant at the 5%-level (p-value: 0.0307), whereas CF(+)/P is only significant at the 10%-level (p-value: 0.0635) when the book-to-market ratio and beta are added. Furthermore, the alpha is positive, but not statistically significant. This indicates that a model that includes beta, CF(+)/P, CF/P Dummy and ln(BE/ME) is a good one to explain expected returns. The result furthermore highlights the importance of cash flows and essentially supports a value investing strategy.

5.3.8 Sales Growth

The results of this thesis do not find significant results for the explanatory power of sales growth. While the coefficient has the expected negative sign, the p-value of 0.1537 demonstrates that SG is not significantly priced in the German stock market. Recall that sales growth as of December of year t-1 (that means the growth from December t-2 to December t-1) stayed constant through a period of 12 months and was matched with the monthly returns of the testing period of year t. The following figure 4 gives an overview about that:

Figure 4: Average Sales Growth and Stock Excess Returns



The figure shows for each year of the five years in the testing period the average excess return of the 300 stocks and the corresponding average sales growth calculated at December of year t-1 (growth from December of year t-2 to December of year t-1).

While for example in the third year of the testing period (T3) a very high sales growth compared to the year before can be noted, the average excess return was lower than in its prior year. This supports the expected negative relationship between sales growth and returns. However, in T2 a positive relationship can be noted since the sales growth is negative compared to the year before, and also returns have decreased. This contradicts the predicted negative relationship between sales growth and returns. Thus, the insignificant result for sales growth makes sense. Recall that sales growth is subject to managerial discretion and a growth in sales does not necessarily mean that stock returns must be affected by this since expectations play an important role. The result of this thesis shows that a low sales growth is not associated with higher expected returns. This means that sales growth is not a proxy for risk and therefore investors should not take this into account when making their investment decision.

5.4 Final Model

Now, that the results for each variable have been presented the question arises which of the models best captures the cross-section of expected returns. This is essentially one of the research questions that were stated in the introductory chapters of this thesis. The answer is that a model containing the unconditional beta, book-to-market equity and the cash flow-to-price ratio as explanatory variables is the best one in capturing the cross-sectional variation in expected stock returns. It can be inspected below.

Equation 6: Final Model

$$R_i - r_f = \alpha_0 + \Upsilon_1 \text{beta}_i + \Upsilon_2 \ln(BE/ME)_i + \Upsilon_3 (CF(+)/P)_i + \Upsilon_4 (CF/P\ Dummy)_i + u_i$$

Where R_i is the return of security i, r_f is the risk-free rate, beta is the unconditional market beta, α_0 , Υ_1, Υ_2, Υ_3 and Υ_4 the coefficients that are estimated (where Υ_4 has a negative sign), $ln(BE/ME)_i$ is the logarithm of the ratio of book equity to market equity for firm i measured as of December of year t-1, $(CF(+)/P)_i$ the cash flow-to-price ratio of security i for positive cash flows that becomes zero for negative values, $(CF/P\ Dummy)_i$ the cash flow-to-price ratio for negative values that takes on one if negative and zero otherwise, both measured at December of year t-1 and u_i representing the error term. Recall that this cross-sectional regression is run in each of the 60 months of the testing period.

The reason for this model being the best one is the fact that the positive alpha coefficient is not statistically significantly larger than zero, indicating that no abnormal returns exists and that the model therefore is sufficient to capture expected returns in the German market. While beta was slightly insignificant, the book-to-market ratio as well as both cash flow-to-price variables prove to be significant. Stocks with a high book-to-market equity and a high cash flow-to-price ratio tend to outperform other stocks and investors should try to identify those stocks. As outlined in the literature section, many previous studies find that the results are quite sensitive for example to the months inspected or the state of the market. In order to find out if this is also the case here, the next section inspects the sensitivity of the results.

5.5 Sensitivity of Results

In this section the robustness of the results is tested. First, the focus is on firm size, which has not been statistically significant. However, so far size measured as of June of year t was used

for explaining returns of year t. Thus, size was constant over a period of 12 months. Now, it is inspected if a time-varying size is significant. For this, monthly updated values for a firm's market equity are used. The resulting coefficient is again 0.0004 and the p-value is with 0.2826 almost the same as before, showing that also time-varying firm size is not a proxy for risk and thus it can be concluded that the insignificance of size in the German market is a robust result. It should be also noted here, that from the ocular inspection of the data it can be seen that there are not considerable changes in a firm´s size throughout a year.

Another thing that is investigated is if the results are subject to a so-called January Effect. Returns are usually higher in January months. A January Effect in the cross-section of expected returns would mean that the results in January months are different with respect to the coefficient size and its significance (Wong, Tan and Liu, 2006). Extant research often documents that the significance of the variables are mostly because of January (for example Fama and French (1992) and Davis (1994)). However, Wong, Tan and Liu (2006) show that beta is even more significant in non-January months. Recall from the descriptive statistics table that the average monthly return over the whole testing period was 0.88%. When re-computing the number for January months a value of 3.56% is obtained, while the number for non-January months is only 0.64%. This clearly demonstrates that there are seasonal highs in January months. Due to the fact that this thesis only considers a time period of 60 months, which is comparatively short, it only has five January months that could be tested, which is a quite small number. However, the presence of the effect can also be tested by looking if the variables are still significant in non-January months. This is also how Wong, Tan and Liu (2006) scan for the presence of the effect. To test the robustness of the final model, this thesis therefore runs this model again for non-January months. Table 10 shows the results:

Table 10: Regression Results for Non-January Months

Alpha	Beta	ln(BE/ME)	CF(+)/P	CF/P Dummy
0.0015	0.0064	0.0018*	0.0068*	-0.0103***
[0.5329]	[1.0444]	[1.4808]	[1.6466]	[-2.9091]
(0.2982)	(0.1505)	(0.0722)	(0.0527)	(0.0026)

This table shows the results of the multivariate cross-sectional regression of the final model for non-January months. T-statistics are provided in edgy parentheses [..], and p-values are provided in round parentheses (..). Results with *** are statistically significant at the 1-%-level, results with ** are statistically significant at the 5%-level and, results with * are statistically significant at the 10-%-level. For a detailed description of the variables see table 8.

When comparing the results from table 10 to the previous ones it can been seen that the interpretation of the results stays pretty much the same; both CF(+)/P and CF/P Dummy as well as ln(BE/ME) are significant. Beta remains insignificant however, it should be noted that beta`s p-value worsened compared to before, which gives rise to the suspicion of a January effect. In the case of the cash flow-to-price variables the p-values improved although they already had been significant before. This could be seen as some January seasonality, however inferences made stay the same and therefore it can be concluded that the January Effect is not a problem here. Investors can still rely on the model that includes beta, ln(BE/ME) and CF(+)/P as well as CF/P Dummy.

To further test the results of the final model the variables' explanatory power is examined when being conditional on the state of the market, analogous to the conditional beta using the approach of Pettengill, Sundaram, and Mathur, 1995. The results can be inspected in Table 11 below. For comparison purposes also the previous conditional beta results are shown in the table.

Table 11: Regression Results Conditional on Up and Down Markets

Up - Markets

Alpha	BETA(+)	LN(BE/ME)	CF(+)/P	CF/P Dummy
-0.0003	0.0275***			
[-0.1066]	[5.5501]			
(0.4578)	(0.0000)			
0.0003	0.0273***	0.0017	0.0042	-0.0091**
[0.1007]	[5.4377]	[1.1123]	[0.9212]	[-1.7939]
(0.4602)	(0.0000)	(0.1364)	(0.1813)	(0.0403)

Down - Markets

Alpha	BETA(-)	LN(BE/ME)	CF(+)/P	CF/P Dummy
0.0086**	-0.0323***			
[1.9095]	[-3.2177]			
-0.0357	(0.0023)			
0.0079**	-0.0323***	0.0014	0.0099	-0.0038
[1.8173]	[-3.2599]	[0.9014]	[1.2993]	[-0.6839]
(0.0425)	(0.0021)	(0.1893)	(0.1047)	(0.2511)

This table shows the results of beta and the final model when conditional on the state of the market. The testing period of 60 months consists of 40 up market months and 20 down market months. T-statistics are provided in edgy parentheses [..], and p-values are provided in round parentheses (..) below each coefficient estimate. Results with *** are statistically significant at the 1-%-level, results with ** are statistically significant at the 5%-level and, results with * are statistically significant at the 10-%-level.

The conditional betas are found to be highly significant even when combined with the other explanatory variables of the final model. Interestingly, when inspecting the results of the final model for up and down markets it can be seen that the interpretation of the results changes. Both ln(BE/ME) and CF(+)/P become completely insignificant in up markets and down markets and the CF/P Dummy remains only significant when conditional on up markets. This essentially means that when the state of the market is known, the conditional beta seems to capture all of the risk that was previously explained by the other variables, resulting in the insignificance of the other variables.

The insignificance of the alpha in up markets when the conditional beta is the only explanatory variable suggests that the conditional beta here fully explains the expected returns, this is however not the case for down markets. The insignificance of the book-to-market equity variable and the cash flow-to-price ratio suggest that value investing is not asked for when the state of the market is known. However, when thinking through this result the following should be noted; The state of the market is more of a short-term nature and essentially cannot be predicted. Today could be an up market, however tomorrow prices could fall and negative returns would be obtained. A value investing strategy has more of a long-term focus and would pay out in the German market in the long run. At some point, the low prices of those distressed/ undervalued firms will adjust upward. This is when capital gains can be realized. For an overview, the results of this section as well as the results of the previous sections are summarized in table 12 below:

Table 12: Summary of Results

No.	**Variable**	**Content**	**True?**	**Notes**
H1a	beta	There is a positive relation beta and expected returns in the German market.	(No)	just missed to be significant at the 10%-level (p-value 0.1041)
H1b	BETA(+)	During up markets, there is a positive relation between beta and expected returns in the German market	Yes	Robust result
H1c	BETA(-)	During down markets, there is a negative relation between beta and expected returns in the German market	Yes	Robust result

H2	ln(ME)	There is a negative relation between size and expected returns in the German market	No	Result is valid also for time - varying size
H3	ln(BE/ME)	There is a positive relation between expected returns and the book-to-market ratio in the German market.	Yes	Result is not robust for up and down markets when cond. beta is included
H4a	E(+)/P	There is a positive relationship between a positive earnings-to-price ratio and expected returns in the German market.	Yes	only valid if except for the E/P Dummy no other variables are included
H4b	E/P Dummy	There is a negative relationship between a negative earnings-to-price ratio and expected returns in the German market.	Yes	still valid when including other variables
H5	ln(TA/BE)	There is a negative relation between book leverage and expected returns in the German market.	No	probably no significant result due to post-crisis period or easy access to debt financing
H6	D/P	There is a positive relation between the dividend yield and expected returns in the German market	No	today firms often do not pay dividends, dividends and capital gains are equally taxed in Germany
H7a	CF(+)/P	There is a positive relationship between a positive Cash Flow-to-Price Ratio and expected returns in the German Market	Yes	valid when other variables are included, but not in up and down markets when cond. beta is in model
H7b	CF/P Dummy	There is a negative relationship between a negative cash flow-to-price ratio and expected returns in the German Market.	Yes	not valid in down markets, when cond. beta is in model
H8	SG	There is a negative relation between sales growth and expected returns in the German market.	No	likely post-crisis effect; overall growth of market

Table 12 provides a summary of the results of this thesis.

From table 12 it can be seen that not all expected hypotheses proved to be true. This means that not all variables tested in this thesis proxy for risk and are compensated for. Essentially, it can be also seen that results differ when the state of the market is taken into account. Other than that, there are also some critical points that have to be addressed and therefore the next section briefly summarizes those.

5.6 Critical Remarks

In this section critical points regarding the data source, data selection and the processing are addressed. First of all it should be stressed that this thesis excludes financial firms due to previously outlined reasons and thus inferences that are made for the German stock market are only valid for non-financial firms.

Second, only stocks are included in the analysis that have data over the full testing period as well as over the five years prior to the testing period. Thus, this thesis focuses on more mature firms and does not consider firms that are recently listed or have been delisted during the examined period. This means that a certain degree of survivorship bias is inherent to the sample. Third, a small selection bias could still be in the sample. Recall that this thesis's data was retrieved from Thomson Reuters Datastream. The initial sample of this thesis included all firms that are listed in Prime and General Standard of the Frankfurt Stock Exchange, more specifically those that form the CDAX, which represents the whole German market. However, using a source like Datastream sets the foundation for a certain selection bias, since the information on all the required variables was not always available. Where possible, some of the data was collected manually, however still some firms had to be deleted due to missing data. According to Kim (1997) and Kothari, Shanken and Sloan (1995) accounting information on firms that are large and/ or perform well is usually more likely to be entered into the database in its entirety. However, regarding the size variable it can be said that the descriptive statistics part has shown that there are both extremely large and small firms in the sample and therefore this selection bias is not expected to be severe here. A fourth critical point is also related to the data source; in Datastream numbers are often rounded. This introduces a certain measurement error, which could slightly impact results.

Fifth, when using accounting data of prior year´s financial statements in the analysis, this thesis assumed the same fiscal year end, namely December, for all examined firms. But some firms might have fiscal year ends other than December. However, findings by Fama and French (1992) state that this should not affect inferences. Sixth, regressions that include beta might still be subject to the errors-in-the variables problem. Recall that this thesis uses the portfolio approach implemented by Fama and French (1992) for the estimation of beta. But this approach only decreases but does not solve this problem. Seventh, the studied time period of this thesis is the post-crisis period of 2009 to 2014. The results could be also sensitive to the specific period studied and therefore the practical implications of the results here are

applicable to the current time period of the German market, however, this does not mean that these results are sustainable throughout the next decades.

Eighth, many studies test the robustness of their results by examining subperiods. The testing period in this thesis is only five years, which makes it somewhat difficult to examine subperiods. Recall also that this period was specifically chosen to leave out the effect of the financial crisis in order to study the post-crisis period. Lastly, prior research shows that the results are sometimes sensitive to the used data frequency, for example Kim (1997) finds that the coefficient for size in his study is not significant anymore when using quarterly instead of monthly data. This thesis only uses monthly data and thus it cannot tell if the results would differ when using another data frequency.

When thinking through these points, one realizes that although some minor deficiencies are present, the results of this thesis can be considered as reliable. This has been further confirmed when testing the sensitivity of the results of the final model regarding a January Effect. Inferring from this, the findings of this thesis are of relevance for today's investors in the German stock market and therefore have several practical implications, which are after a short conclusion outlined in the next and final chapter.

6 Concluding Discussion

This final chapter of the thesis aims at summarizing and discussing the main findings and pointing out its practical implications. In this context the thesis also provides an answer to the research questions addressed in the first chapter. Finally, possible future research questions are pointed out, which conclude the thesis.

6.1 Conclusion

In the aftermath of the financial crisis "Factor Investing" has evolved as a popular strategy for making one's investment decision. Macroeconomic, equity related and regional factors should explain expected returns, more specifically can be considered a proxy for risk that should be compensated. Focusing on equity specific factors, this thesis investigates the explanatory power of the firm-specific variables market beta, firm size, the book-to-market ratio, the earnings yield, leverage, the dividend yield, the cash-flow-to price ratio and sales growth for 300 non-financial firms during the period 2009 to 2014 in the German market.

Applying the cross-sectional regression approach of Fama and MacBeth (1973) and the portfolio approach by Fama and French (1992) the thesis yields results that can be summarized as follows: The unconditional market beta proves to be insignificant. Moreover, the conditional beta yields highly significant results, indicating that market beta is indeed an important variable that should be considered. The book-to-market ratio, earnings-to-price ratio and the cash flow-to-price ratio seem to be important factors to look at when making investment decisions in the German stock market. However, this thesis does not find supporting evidence for the explanatory role of leverage, the dividend yield, size and sales growth and these are therefore not considered to be proxies for risk - at least not in this market.

The insignificant result for size is consistent with other studies on European markets such as the UK and Sweden, but inconsistent with studies on the US and Asian markets. This result especially illustrates that the findings clearly vary across countries. Also the role of leverage varies across countries. However, the book-to-market ratio seems to be one of the most common proxies for risk since it plays a role in many studies on various countries.

Testing the book-to-market ratio, beta and the cash flow-to price ratio variables in the same model shows that except for beta all other variables display significant explanatory power. This model proves to be the best one in explaining the cross-section of expected returns due to the fact that no abnormal return is associated with it. However, the results are sensitive to the state of the market; both variables become less significant or even insignificant when the conditional beta is added to the model, which would argue in favor of a strategy that pays particular attention to the overall state of the market. What practical implications do all of these results have?

6.2 Practical Implications

The results of this thesis show that fundamental analysis can make sense, more specifically the findings support a value investing strategy as part of a factor-based strategy. Also business practice has recognized this potential and the German asset management firm Acatis as well as the German branches of Robeco and Franklin Templeton Investments actively pursue this strategy (Robeco, 2015; Acatis, 2015; Franklin Templeton Investments, 2013).

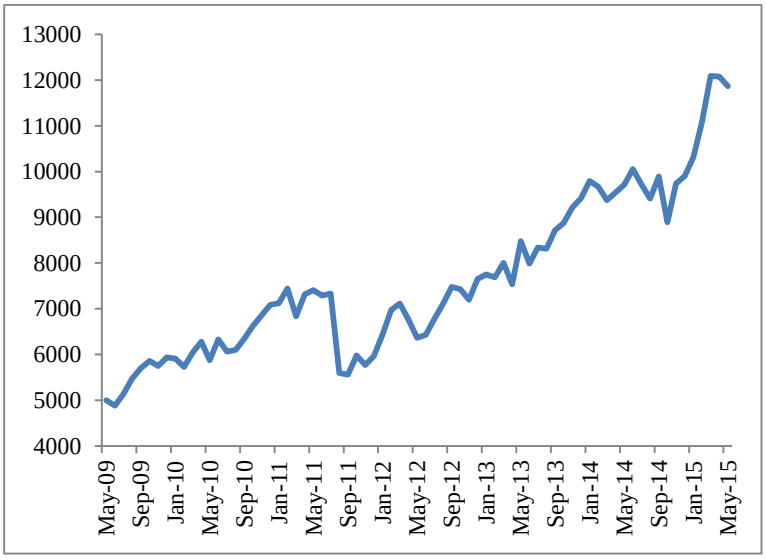
This thesis provides further insights on this matter and shows that a particular value strategy that considers firms with strong accounting numbers specifically in terms of their book equity, net income and cash flow and a comparably low price given these numbers, pays out in the German market. Thus, stocks with a high positive cash flow-to-price ratio, book-to-market ratio and positive earnings-to-price ratio are associated with risk that requires adequate compensation and therefore should be considered for an investment. While the dividend yield is also part of a value investing strategy, the results of this thesis do not encourage investors to look at it. However, some investors wish to invest into stocks for the sake of the dividend, which can be of course a reason to invest in that stock.

The results should not only be taken as a basis for building portfolios, but rather also for evaluating the portfolio’s performance and for benchmarking against other portfolios. For example the average returns of portfolios that display similar average book-to-market ratios can be compared. Generally, the book-to-market ratio offers the simplest way to examine if a stock is over- or undervalued and gives a quick snapshot about a firm's stock. In the case of the cash flow-to-price and earnings-to-price variables one has to compare within a given industry to get a clear picture about which stocks are trading at a comparatively low value given their accounting background. As previously outlined, a model containing beta, the

book-to-market ratio as well as the cash flow-to-price variables is the best one to completely explain expected returns. Thus it is recommended to simultaneously inspect those measures for a given stock and compare it to its peers. Although the earnings-to-price ratio is significant this thesis recommends going for the cash flow-to-price ratio instead. The reason for this is that models containing the earnings-to-price ratio still showed abnormal returns and therefore do not entirely explain expected returns. Furthermore, although cash flows are less intuitive to compute, one must say that in general they give a better picture about the firm and are less subject to managerial discretion. Besides, it is recommended to monitor the firms in terms of the focal factors for several years, to have an idea how these evolve over time. This is especially important for the cash flow-to-price ratio since cash flows can vary a lot over time.

Beyond that, the results of this thesis also suggest to pay attention to the overall state of the market. Betas conditional on up markets and down markets are important factors to look at. High beta stocks yield high returns in up markets, but low-beta stocks should be preferred in down markets. In fact when the market is in an up phase, it is sufficient to only pay attention to beta, since it fully explains expected returns. Besides that, also stocks with negative cash flows in up markets should be avoided due to the fact that they are significantly associated with lower expected returns. What is today's situation? Is the German market currently associated with more of an up market or a down market phase? Figure X below shows the development of the DAX over the past six years.

Figure 5: DAX May 2009 – May 2015



The figure provides an overview of the DAX (Deutscher Aktienindex) performance between May 2009 and May 2015. The DAX is a blue chip stock market index consisting of 30 major German firms trading on the Frankfurt Stock Exchange.

It can be seen that Germany's most important stock index has been characterized with a clear upward trend over the past years and is now at an alarmingly high level. It shows that a buy and hold strategy of stocks with a low price has paid out over the past years, since on average prices have constantly risen. Essentially, this supports a value investing strategy, but also raises concerns whether the upward trend can be upheld during the next couple of months. Also high beta stocks would have been a good strategy due to the fact that these are associated with a high risk premium in up markets. However, the state of the market is more of a short-term nature and one cannot predict for how long the up phase of the market will persist. In contrast to this, a value strategy has more of a long-term focus since it assumes that the price of an undervalued firm will at some point adjust.

This current high of the market could allude the next bubble that is going to burst. But when prices are low again, this is the perfect time to go for more value investing. In fact, quite high returns could be obtained when jumping on the bandwagon in a down market situation. But one must be patient in order to succeed. Also Warren Buffet says that value investing is nothing for people who want to make a quick profit (BusinessInsider, 2012). Generally, it also depends on the risk appetite of the investor. Conservative investors should yield for low-beta stocks and when pursuing a value investing strategy they should choose relatively stable firms such as blue chips, since these firms should survive a crisis and their price is likely to adjust again in the long run. Risk tolerant investors could speculate that the current market is still not satisfied in terms of its growth and go for high beta stocks to make capital gains in the short-term as well as identify undervalued firms whose price might still rise. Given a downfall, these investors should generally go for value investing in anticipation that the down phase will at some point translate into a high phase from which they can over-proportionally benefit. With this respect speculative investors should not necessarily go for blue chips that are considered to be more of a safe haven.

Finally, it should be noted that this thesis does not recommend to base one's investment decision now entirely on the principles of value investing and the conditional beta. Also traditional diversification, the dividend payment (in case of an income investor) or simply personal interest in a firm should still be motives when picking stocks.

6.3 Future Research

When investigating the cross-section of expected returns, academic research usually focused on non-financial firms. However, it would be also of interest what factors should be looked at when investing into stocks of financial firms. With this respect, besides Germany, also the UK would be an interesting market to analyze due to the fact that numerous financial institutions and insurance companies are listed on their stock exchanges.

Recall also that Factor Investing distinguishes between three blocks, one of it being equity-related variables on which this thesis focuses. However, also macroeconomic and regional variables are considered to be part of a factor-investing strategy and therefore future research could examine this for the German market in the aftermath of the financial crisis. In general, it would be interesting which of the three blocks best explain expected returns for a given market.

It is also important to note that this thesis only considers stocks, however equities are not the only asset class one can invest in. Therefore, somewhat similar research on the factor risk premia of other asset classes like; fixed-income (bonds), cash and cash equivalents (money market instruments), real estate and commodities could also prove to be of relevance and interest to investors and portfolio managers.

References

Arcatis, 2015. *Value Investing.* [online] Available at: <http://www.acatis.de/de/value-investing/> [Accessed 20 May 2015].

Artmann, S., Finter, P., Kempf, A., Koch, S. and Theissen, E., 2010. The cross-section of German stock returns: New data and new evidence, *Available at SSRN 1652140*.

Asgharian, H. and Hansson, B. 2000. Cross-sectional analysis of Swedish stock returns with time-varying beta: the Swedish stock market 1983–96, *European Financial Management,* 6(2), pp. 213-233.

Atlas Capital Advisors LLC, 2015. *Factor Model Basics.* [online] Available at: <http://www.atlasca.com/education/portfolio-strategy/factor-models/> [Accessed 15 May 2015].

Ball, R., 1978. Anomalies in relationships between securities' yields and yield-surrogates, *Journal of Financial Economics,* 6(2), pp. 103-126.

Banz, R.W., 1981. The relationship between return and market value of common stocks, *Journal of Financial Economics,* 9(1), pp. 3-18.

Basu, S., 1983. The relationship between earnings' yield, market value and return for NYSE common stocks: Further evidence, *Journal of Financial Economics,* 12(1), pp. 129-156.

Berk, J.B., 1995. A critique of size-related anomalies, *Review of Financial Studies,* 8(2), pp. 275-286.

Bhandari, L.C., 1988. Debt/equity ratio and expected common stock returns: Empirical evidence, *The Journal of Finance,* 43(2), pp. 507-528.

Bhattacharya, S., 1980. Nondissipative signaling structures and dividend policy, *The quarterly journal of Economics,* pp. 1-24.

Black, F., 1972. Capital market equilibrium with restricted borrowing, *Journal of business,* , pp. 444-455.

Börse Frankfurt, 2015. *All Share Indices.* [online] Available at: <http://www.boerse-frankfurt.de/en/basics+overview/indices/all+share+indices> [Accessed 27 April 2015].

Brooks, C., 2008. *Introductory econometrics for finance,* 2nd Edition edn, Cambridge University Press.

Business Insider, 2012. *Warren Buffet can´t believe more people haven´t copied his investment strategy.* [online] Available at: <http://www.businessinsider.com/warren-buffett-on-value-investing-2012-9?IR=T> [Accessed 29 April 2015].

Carhart, M.M., 1997. On persistence in mutual fund performance, *The Journal of finance,* 52(1), pp. 57-82.

Chan, A. and Chui, A.P., 1996. An Empirical Re-Examination of the Cross-Section of Expected Returns: UK Evidence, *Journal of Business Finance and Accounting,* 23(9-10), pp. 1435-1452.

Chan, K. and Chen, N., 1991. Structural and return characteristics of small and large firms, *The Journal of Finance,* 46(4), pp. 1467-1484.

Claessens, S., Dasgupta, S. and Glen, J., 1995. *The cross-section of stock returns: Evidence from the emerging markets,* World Bank Publications.

Datastream, 2010. *Risk-Free Interest Rates.* [online] Available at: <http://extranet.datastream.com/data/Exchange%20&%20Interest%20Rates/RiskFreeInterestRates.htm> [Accessed 18 May 2015].

Davis, J.L., 1994. The cross-section of realized stock returns: The pre-COMPUSTAT evidence, *The Journal of Finance,* 49(5), pp. 1579-1593.

Deutsche Börse, 2015. *The Frankfurt Stock Exchange.* [online] Available at: <https://deutsche-boerse.com/dbg/dispatch/en/kir/dbg_nav/about_us/20_FWB_Frankfurt_Stock_Exchange> [Accessed 15 April 2015].

Deutsche Bundesbank, 2013. *Ertragslage und Finanzierungsverhältnisse Deutscher Unternehmen im Jahr 2012.* [online] Available at:

<https://www.bundesbank.de/Redaktion/DE/Downloads/Veroeffentlichungen/Monatsberichtsaufsaetze/2013/2013_12_ertragslage.pdf?__blob=publicationFile> [Accessed 7 May 2015].

Die Welt, 2014. *Deutsche Firmen meiden die Kapitalmärkte.* [online] Available at: <http://www.welt.de/wirtschaft/article131000076/Deutsche-Firmen-meiden-die-Kapitalmaerkte.html> [Accessed 21 May 2015].

Dimson, E., 1979. Risk measurement when shares are subject to infrequent trading, *Journal of Financial Economics,* 7(2), pp. 197-226.

Elsas, R., El-Shaer, M. and Theissen, E., 2003. Beta and returns revisited: evidence from the German stock market, *Journal of International Financial Markets, Institutions and Money,* 13(1), pp. 1-18.

Fama, E.F. and French, K.R., 2014. Dissecting Anomalies with a Five-Factor Model, *Fama-Miller Working Paper.*

Fama, E.F. and French, K.R., 1993. Common risk factors in the returns on stocks and bonds, *Journal of Financial Economics,* 33(1), pp. 3-56.

Fama, E.F. and French, K.R., 1992. The cross-section of expected stock returns, *the Journal of Finance,* 47(2), pp. 427-465.

Fama, E.F. and French, K.R., 2004. The Capital Asset Pricing Model: Theory and Evidence, *The Journal of Economic Perspectives,* 18(3), pp. 25-46.

Fama, E.F. and MacBeth, J.D., 1973. Risk, Return, and Equilibrium: Empirical Tests, *Journal of Political Economy,* 81(3), pp. 607-636.

Financial Times, 2015. *Definition of Income Investing*. [online] Available at: <http://lexicon.ft.com/Term?term=income%20investing > [Accessed 12 May 2015].

Forbes, 2013. *Fama-French-Three-Factor-Model.* [online] Available at: <http://www.forbes.com/sites/frankarmstrong/2013/05/23/fama-french-three-factor-model/> [Accessed 11 May 2015].

Forbes, 2014. *What's Up With Fama & French's New 5-Factor Model? The Mysterious New Factor V.* [online] Available at: <http://www.forbes.com/sites/phildemuth/2014/01/20/whats-

up-with-fama-frenchs-new-5-factor-model-the-mysterious-new-factor-v/> [Accessed 28 April 2015].

Franklin Templeton Investments, 2015. *Risk Factor Investing: The Evolution of Multi-Asset Strategies.* [online] Available at: <http://global.beyondbullsandbears.com/2015/02/20/risk-Factor Investing-evolution-multi-asset-strategies/> [Accessed 07 May 2015]

Franklin Templeton Investments, 2015. *Value vs. Growth - Franklin Templeton Investments Deutschland.* [online] Available at: <https://www.franklintempleton.de/de_DE/privatanleger/fondswissen/value-vs-growth> [Accessed 17 May 2015].

Handelsblatt, 2012. *Firmen haben leichten Zugang zu Krediten.* [online] Available at: <http://www.handelsblatt.com/unternehmen/banken-versicherungen/ifo-und-bankenverband-firmen-haben-leichten-zugang-zu-krediten/7079476.html > [Accessed 20 May 2015].

Heston, S.L., Rouwenhorst, K.G. and Wessels, R.E., 1999. The Role of Beta and Size in the Cross-Section of European Stock Returns, *European Financial Management,* 5(1), pp. 9-27.

Ho, R.Y., Strange, R. and Piesse, J., 2006. On the conditional pricing effects of beta, size, and book-to-market equity in the Hong Kong market, *Journal of International Financial Markets, Institutions and Money,* 16(3), pp. 199-214.

Howton, S.W. and Peterson, D.R., 1998. An Examination of Cross-Sectional Realized Stock Returns using a Varying-Risk Beta Model, *Financial Review,* 33(3), pp. 199-212.

Investor Verlag, 2013. *Value-Investing vs. Growth-Investing.* [online] Available at: <http://www.investor-verlag.de/value-analyse/grundlagen-der-fundamentalanalyse/value-investing-vs-growth-investing/ > [Accessed 5 May 2015].

Ivy Funds, 2014. Valuations and Volatility: *Investors may overlook key factors in asset selection*. [online] Available at: <https://www.ivyfunds.com/sites/default/files/TMF10266.pdf> [Accessed 10 May 2015].

Jagannathan, R. and Wang, Z., 1996. The conditional CAPM and the cross-section of expected returns, *The Journal of finance,* 51(1), pp. 3-53.

Jegadeesh, N., 1992. Does Market Risk Really Explain the Size Effect?, *The Journal of Financial and Quantitative Analysis,* 27(3), pp. 337-351.

Kim, D., 1997. A reexamination of firm size, book-to-market, and earnings price in the cross-section of expected stock returns, *Journal of Financial and Quantitative Analysis,* 32(04), pp. 463-489.

Kim, D., 1995. The errors in the variables problem in the cross-section of expected stock returns, *The journal of Finance,* 50(5), pp. 1605-1634.

Koller, T., Goedhart, M. and Wessels, D., 2010. *Valuation: measuring and managing the value of companies,* John Wiley and Sons.

Kothari, S.P., Shanken, J. and Sloan, R.G., 1995. Another look at the cross-section of expected stock returns, *The Journal of Finance,* 50(1), pp. 185-224.

Lakonishok, J., Shleifer, A. and Vishny, R.W., 1994. Contrarian investment, extrapolation, and risk, *The journal of finance,* 49(5), pp. 1541-1578.

Lau, S.T., Lee, C.T. and McInish, T.H., 2002. Stock returns and beta, firms size, E/P, CF/P, book-to-market, and sales growth: evidence from Singapore and Malaysia, *Journal of Multinational Financial Management,* 12(3), pp. 207-222.

Lintner, J., 1965. The valuation of risk assets and the selection of risky investments in stock portfolios and capital budgets, *The review of economics and statistics,* pp. 13-37.

Lohnsteuerhilfe Hessen e.V., 2010. *Keine Angst vor der Quellen-/Abgeltungssteuer.* [online] Available at: <http://www.lv-alh.de/web/index.php?option=com_content&view=article&id=225%3Aquellen-abgeltungssteuer&catid=36&Itemid=135> [Accessed 15 May 2015].

Markowitz, H., 1959. *Portfolio Selection: Efficient Diversification of Investments,* Cowles Foundation Monograph No. 16 edn, John WIley and Sons, Inc., New York.

Maroney, N. and Protopapadakis, A., 2002. The book-to-market and size effects in a general asset pricing model: Evidence from seven national markets, *European Finance Review,* 6(2), pp. 189-221.

Mohanty, P., 2002. Evidence of size effect on stock returns in India, *Vikalpa,* 27(3), pp. 27-38.

Morelli, D., 2007. Beta, size, book-to-market equity and returns: A study based on UK data, *Journal of Multinational Financial Management,* 17(3), pp. 257-272.

Mossin, J., 1966. Equilibrium in a Capital Asset Market, *Econometrica,* 34(4), pp. 768-783.

Ogden, J.P., Jen, F.C. and O'Connor, P.F., 2003. *Advanced corporate finance: policies and strategies,* Prentice hall Upper Saddle River, NJ.

Pettengill, G.N., Sundaram, S. and Mathur, I., 1995. The conditional relation between beta and returns, *Journal of Financial and quantitative Analysis,* 30(01), pp. 101-116.

Piotroski, J.D., 2000. Value investing: The use of historical financial statement information to separate winners from losers, *Journal of Accounting Research,* pp. 1-41.

Robeco, 2014. *Factor Investing wird eine Revolution in Gang setzen.* [online] Available at: <http://www.robeco.de/aktuelle-analysen/2014/Factor Investing-wird-eine-revolution-in-gang-setzen.jsp > [Accessed 22 May 2015]

Robeco, 2015. *Quantitative Investing.* [online] Available at: <http://www.robeco.de/institutionelle-anleger/quantitative-investing.jsp> [Accessed 22 May 2015].

Shafana, M., Rimziya, A. F., and Jariya, A. I., 2013. Relationship between Stock Returns and Firm Size, and Book-To-Market Equity: Empirical Evidence from Selected Companies Listed on Milanka Price Index in Colombo Stock Exchange, *Journal of Emerging Trends in Economics and Management Sciences,* 4(2), pp. 217-225.

Sharpe, W.F., 1964. Capital asset prices: A theory of market equilibrium under conditions of risk, *The journal of finance,* 19(3), pp. 425-442.

Skoulakis, G., 2008. Panel data inference in finance: Least-squares vs fama-macbeth, *Available at SSRN 1108865*.

Smith, T. and Walsh, K., 2013. Why the CAPM is Half-Right and Everything Else is Wrong, *Abacus*, 49, pp. 73-78.

Strong, N. and Xu, X.G., 1997. Explaining the cross-section of UK expected stock returns, *The British Accounting Review*, 29(1), pp. 1-23.

Thomson Reuters, 2014. Investment Focus - Germany struggles to get its DAX in a row. [online] Available at: <http://www.reuters.com/article/2014/08/22/markets-germany-stocks-idUSL4N0QS34R20140822> [Accessed 20 May 2015].

Trade.Education, 2015. *The Price to Cash Flow Ratio (P/CF)*. [online] Availabe at: <https://www.trade.education/price-to-cash-flow-ratio/ > [Accessed 17 May 2015].

Treynor, J., 1962. *Toward a Theory of Market Value of Risky Assets*, Unpublished manuscript; A final version was published in 1999, in Asset Pricing and Portfolio Performance, London, pp. 15–22.

Van Rensburg, P. and Robertson, M., 2003. Size, price-to-earnings and beta on the JSE Securities Exchange, *Investment Analysts Journal*, 58, pp. p. 7-16.

Wang, Y. and Di Iorio, A., 2007. The cross section of expected stock returns in the Chinese A-share market, *Global Finance Journal*, 17(3), pp. 335-349.

Wong, K.A., Tan, R.S.K. and Liu, W., 2006. The cross-section of stock returns on the Shanghai Stock Exchange, *Review of Quantitative Finance and Accounting*, 26(1), pp. 23-39.

Yale Insights, 2014. *What is factor-based investing?* [online] Available at: <http://insights.som.yale.edu/insights/what-factor-based-investing> [Accessed 3 May 2015].

Appendix 1: Literature Overview

Author/ Year	Sample Market	Time period	Methodology	Content & Results	size	leverage	BE/ME	beta	E(+)/P	E/P Dummy	SG	D/P	CF/P	Special features/ Remarks/ Criticism/ Limitations
Fama & French (1992)	US	1963-1990	CSR model of Fama & MacBeth (1973), use own Portfolio Approach	Included Variables	Y	Y	Y	Y	Y	Y	N	N	N	*leverage measured in two ways both significant (TA/MV= pos., TA/BV= neg.) Portfolio Approach for beta estimation and use of individual securities in CSR model, use OLS
				Sign	-	+/-*	+	+/-	+	+/-	NA	NA	NA	
				Significant Result?	Y	Y	Y	N	N	N	NA	NA	NA	
Asgharian & Hansson (2000)	Sweden	1983-1996	CSR model of Fama-MacBeth (1973) and own approach using time-varying betas and WLS	Included Variables	Y	Y	Y	Y	Y	Y	N	N	N	solve EIV problem using an error correction model *significant leverage is industry effect not leverage effect; when excluding recession period, result is insignificant ** is significant when excluding the recession in early 1990s.
				Sign	-	-	+	+	+	+	NA	NA	NA	
				Significant Result?	N**	Y*	Y	N**	N	N	NA	NA	NA	
Kim (1997)	US	1958-1993	CSR model of Fama & MacBeth (1973), adjusted version of Fama & French (1992) portfolio approach	Included Variables	Y	N	Y	Y	Y	Y	N	N	N	correction for errors-in-the-variables bias, *significant only for monthly returns, not for quarterly. furthermore, when excluding BE/ME the E/P becomes insignificant** only slightly significant when using monthly returns
				Sign	-	NA	+	+	+	-	NA	NA	NA	
				Significant Result?	Y**	NA	Y	Y	Y*	N	NA	NA	NA	
Kim (1995)	US	1926-1991	CSR model of Fama & MacBeth (1973), adjusted version of Fama & French (1992) portfolio approach	Included Variables	Y	N	N	Y	N	N	N	N	N	correction for errors-in-variables bias, use WLS, they find that if they correct for EIV problem then a significant relation between beta and average returns can be found, use rolling betas
				Sign	-	NA	NA	+	NA	NA	NA	NA	NA	
				Significant Result?	Y	NA	NA	Y	NA	NA	NA	NA	NA	
Chan & Chui (1996)	UK	1973-1990	CSR model of Fama & MacBeth (1973),Fama & French (1992) portfolio approach	Included Variables	Y	Y	Y	Y	N	N	N	Y	N	*leverage (TA/MV= pos. and sign., TA/BV= neg. and not sign.), also include share price (significant), ** minor role of beta, negative sign might be due to high inflation, beta becomes insignificant when using annual returns
				Sign	-	+/-*	+	-	NA	NA	NA	+	NA	
				Significant Result?	N	Y	Y	Y**	NA	NA	NA	Y	NA	

Author/ Year	Sample Market	Time period	Methodology	Content & Results	size	leverage	BE/ME	beta	E(+)/P	E/P Dummy	SG	D/P	CF/P	Special features/ Remarks/ Criticism/ Limitations
Claessens, Dasgupta & Glen (1995)	19 Emerging Markets	1986-1993	Panel data technique using between estimators	Included Variables	Y	N	Y	Y	Y	N	N	Y	N	also include exchange risk, relative market cap, turnover/shares outstanding (significant) & trading volume*In 11 of 19 countries **Different for each market.
				Sign	+*	NA	+/-**	+/-**	+/-**	NA	NA	+/-**	NA	
				Significant Result?	Y	NA	N	Y	N	NA	NA	Y	NA	
Davis (1994)	US	1940-1963	CSR model of Fama & MacBeth (1973), adjusted version of Fama & French (1992) portfolio approach	Included Variables	Y	N	Y	Y	Y	Y	Y	N	Y	Note January seasonality, use dummy variables for examination of E/P ratio, CF = earnings + depreciation, depletion & amortization
				Sign	NA	NA	+	+	+	+	-	NA	+	
				Significant Result?	N	NA	Y	N	Y	Y	N	NA	Y	
Heston, Rouwenhorst & Wessels (1999)	12 European Countries, also Germany	1980-1995	CSR model of Fama & MacBeth (1973), adjusted version of Fama & French (1992) portfolio approach	Included Variables	Y	N	N	Y	N	N	N	N	N	January Effect, high beta countries outperform low beta ones and within countries the relationship between return and the beta is not so strong anymore, use international portfolios for beta estimation
				Sign	-	NA	NA	+	NA	NA	NA	NA	NA	
				Significant Result?	Y	NA	NA	Y	NA	NA	NA	NA	NA	
Ho, Strange & Piesse (2006)	Hong Kong	1983-1998	CSR model of Fama & MacBeth (1973), adjusted version of Fama & French (1992) portfolio approach	Included Variables	Y	N	Y	Y	N	N	N	N	N	* results shown for all markets; they had also investigated the effect in up and down markets and the results differed here; all studied variables show conditional pricing effects
				Sign	-	NA	+	+/-	NA	NA	NA	NA	NA	
				Significant Result?	Y*	NA	Y*	N*	NA	NA	NA	NA	NA	
Kothari, hanken & Sloan (1995)	US	1927-1990	CSR model of Fama & MacBeth (1973), Fama & French (1992) portfolio approach	Included Variables	Y	N	Y	Y	N	N	N	N	N	use annual betas instead of monthly, find that the resuults are sensitive to the interval chosen
				Sign	-	NA	+	+	NA	NA	NA	NA	NA	
				Significant Result?	Y	NA	N	Y	NA	NA	NA	NA	NA	

Author/ Year	Sample Market	Time period	Methodology	Content & Results	size	leverage	BE/ME	beta	E(+)/P	E/P Dummy	SG	D/P	CF/P	Special features/ Remarks/ Criticism/ Limitations
Lau, Lee & McInish (2002)	Singapore & Malaysia	1988-1996	CSR model of Fama & MacBeth (1973), adjusted version of Fama & French (1992) portfolio approach	Included Variables	Y	N	Y	Y	Y	N	Y	N	Y	use a dummy variable for beta that is conditional on state of market*different signs of beta for different months of market excess returns. **Only in Malaysia they find a significant postive E/P effect.***only in Singapore.
				Sign	-	NA	+	+/-*	+**	NA	-	NA	+	
				Significant Result?	Y	NA	N	Y	Y	NA	Y***	NA	N	
Mohanty (2002)	India	1991-2000	CSR model of Fama & MacBeth (1973), Fama & French (1992) portfolio approach	Included Variables	Y	Y	Y	Y	Y***	N	Y	N	Y	*Two ways of measuring leverage, both insignificant when size is in the equation (MV= pos., BV= neg.) **instead of B/M they use M/B *** if negative or zero then ratio is equal zero
				Sign	-	+/-*	-**	+	+	NA	+	NA	-	
				Significant Result?	Y	N	N	N	N	NA	N	NA	N	
Morelli (2007)	UK	1980-2000	CSR model of Fama & MacBeth (1973) & Approach of Pettengill et al. (1995), Fama &	Included Variables	Y	N	Y	Y	N	N	N	N	N	*use conditional beta following the approach of Pettengill et al. (1995), i.e. beta conditional on state of the market
				Sign	-	NA	+	+/-	NA	NA	NA	NA	NA	
				Significant Result?	N	NA	Y	Y*	NA	NA	NA	NA	NA	
Strong & Xu (1997)	UK	1973-1992	CSR model of Fama & MacBeth (1973), Fama & French (1992) portfolio approach	Included Variables	Y	Y	Y	Y	Y	Y	N	N	N	*Two ways of measuring leverage, both significant (BV= neg., MV= pos.)
				Sign	+	+/-*	-	+/-	+/-	+	NA	NA	NA	
				Significant Result?	N	Y	Y	N	N	N	NA	NA	NA	
Van Rensburg & Robertson (2003)	South Africa	1990-2000	CSR model of Fama & MacBeth (1973), Fama & French (1992) portfolio approach	Included Variables	Y	N	N	Y	Y	N	N	N	N	*Instead of E/P they use P/E and find significant negtive results.
				Sign	-	NA	NA	-	-*	NA	NA	NA	NA	
				Significant Result?	Y	NA	NA	Y	Y	NA	NA	NA	NA	

Author/ Year	Sample Market	Time period	Methodology	Content & Results	size	leverage	BE/ME	beta	E(+)/P	E/P Dummy	SG	D/P	CF/P	Special features/ Remarks/ Criticism/ Limitations
Wang & Di Iorio (2007)	China	1994-2002	CSR model of Fama & MacBeth (1973), adjusted version of Fama & French (1992) portfolio approach	Included Variables	Y	N	Y	Y	Y	Y	N	Y	N	They also include a Liquidity variable. Also they use a conditional beta as well as unconditional one and find no significant results for both.*only significant in conditional version using dummy variables
				Sign	-	NA	+	-	+	+/-	NA	+/-	NA	
				Significant Result?	Y	NA	Y	N	N	N	NA	Y*	NA	
Wong, Tan & Liu (2006)	China	1995-2002	CSR model of Fama & MacBeth (1973), adjusted version of Fama & French (1992) portfolio approach	Included Variables	Y	N	Y	Y	N	N	N	N	N	include additional variable that is specific to Chinese stock market, correct for EIV problem using approach of Kim (1995, 1997), but show that inferences drawn would not seriously deviate from the analysis without correction
				Sign	-	NA	+	-	NA	NA	NA	NA	NA	
				Significant Result?	Y	NA	Y	Y	NA	NA	NA	NA	NA	
Howton & Peterson (1998)	US	1977-1994	CSR Model of Fama & MacBeth (1973), dual-beta model of Bhardwaj & Brooks (1993), Fama & French	Included Variables	Y	N	Y	Y	Y	Y	N	N	N	* significant in bull-markets or bear-markets **significant for constant beta & in bear-markets***significant in bear-market ****significant when constant betas and bear-market betas
				Sign	-	NA	+	+/-	+/-	-	NA	NA	NA	
				Significant Result?	Y***	NA	Y**	Y*	N	Y****	NA	NA	NA	
Lakonishok, Shleifer & Vishny (1994)	Japan	1968-1989	CSR model of Fama & MacBeth (1973), adjusted version of Fama & French (1992) portfolio approach	Included Variables	Y	N	Y	Y**	Y	Y	Y	Y**	Y*	* using dummy variables, ** not included in the regression
				Sign	-	NA	+	NA	+	-	-	NA	+	
				Significant Result?	N	NA	N	NA	Y	N	Y	NA	Y	
Shafana, Rimziya & Jariya (2013)	Sri Lanka	2005-2010	CSR model of Fama & MacBeth (1973), Fama & French (1992) portfolio approach	Included Variables	Y	N	Y	N	N	N	N	N	N	only include 12 firms out of 25 listed on Milanka Price Index
				Sign	+	NA	-	NA	NA	NA	NA	NA	NA	
				Significant Result?	N	NA	Y	NA	NA	NA	NA	NA	NA	

Appendix 2: Datastream Mnenomics

Datastream Mnenomic	Name/Use
P	Stock Price
WC02999	Total Assets
MV	Market Value of Equity, maket cap
WC03501	Book Equity
WC01705	Net Income
WC01151	Amortization, Depreciation & Depletion
WC01001	Sales
WC05376	Dividends
ECWGM3M	Three month money market rate, used as proxy for risk-free rate

Appendix 3: Names of 300 Companies Included in Final Sample

3U HOLDING	BHS TABLETOP	DIERIG HOLDING
7C SOLARPARKEN K	BIJOU BRIGITTE MODISCHE ACC.	DISKUS WERKE
7DAYS MUSIC ENTM.	BILFINGER BERGER	DMG MORI SEIKI
A S CREATION TAPETEN	BIOTEST	DOCCHECK
AAP IMPLANTATE	BMW	DR HOENLE
AD PEPPER MEDIA INTL.	BORUSSIA DORTMUND	DRILLISCH
ADESSO	BOSS (HUGO)	DUERKOPP ADLER
ADIDAS	BREMER LAGERHAUS GESELL.	DUERR
ADM HAMBURG	BRILLIANT	E ON
ADVA OPTICAL NETWG.	BRUDER MANNESMANN	EASY SOFTWARE
ADVANCED VISION TECH.	CAATOOSEE	ECKERT & ZIEGLER STRAHLEN & MEDZI.
AHLERS	CANCOM	EDEL
AIXTRON	CARL ZEISS MEDITEC	EHLEBRACHT
ALBA	CATALIS	EIFELHOEHEN-KLINIK
ALEXANDERWERK	CCR LOGISTICS SYSTEMS	EINHELL GERMANY
ALL FOR ONE STEEB	CELESIO	EISEN-UND HUTTENWERKE
ALLGEIER	CENIT	ELMOS SEMICONDUCTOR
ALPHAFORM	CENTROTEC SUSTAINABLE	ELRINGKLINGER
AMADEUS FIRE	CEOTRONICS	ENBW ENGE.BADEN-WURTG.
ANALYTIK JENA	CEWE STIFTUNG	ENERGIEKONTOR
ARTNET	COMPUGROUP MEDICAL	ERMN.COMM.& CNTL.TECH.
ATEVIA N	CONSTANTIN MEDIEN	EVOTEC
ATOSS SOFTWARE	CONTINENTAL	FERNHEIZWERK NEUKOLLN
AUDI	CPU SOFTWAREHOUSE	FIELMANN
AUGUSTA TCHG.	CTS EVENTIM	FIRST SENSOR
AURUBIS	CURANUM	FORTEC ELEKTRONIK
AXEL SPRINGER	CURASAN	FRAPORT
B+S BANKSYSTEME	CYBITS HOLDING	FREENET
BALDA	CYCOS	FRESENIUS
BASF	DAIMLER	FRESENIUS MED.CARE
BASLER	DATA MODUL	FRIWO
BAYER	DCI DTB.FOR COM.& IND.	FROSTA
BAYERISCHE GEWERBEBAU	DEAG DEUTSCHE ENTM.	FUCHS PETROLUB
BAYWA	DESIGN HOTELS	FUNKWERK
BEATE UHSE	DEUFOL	GBS SOFTWARE
BECHTLE	DEUTSCHE LUFTHANSA	GEA GROUP
BEIERSDORF	DEUTSCHE POST	GELSENWASSER
BEKO HOLDING	DEUTSCHE TELEKOM	GERATHERM MEDICAL
BERTRANDT	DEUTZ	GERRY WEBER INTL.
BETA SYSTEMS SOFTWARE	DIALOG SEMICON.	GESCO

GFK	KSB	NTT COM SECURITY
GFT TECHNOLOGIES	KUKA	NUCLETRON ELECTRONIC
GIGASET	KWS SAAT	OCEANICA
GRAMMER	LECHWERKE	ODEON FILM
GREIFFENBERGER	LEIFHEIT	OHB
GRENKELEASING	LEONI	ONVISTA
GRUSCHWITZ TEXTILWERKE	LINDE	ORAD HI-TECH SYS.
H & R	LOGWIN	ORBIS
HANSA GROUP	LPKF LASER & ELTN.	PANAMAX
HAWESKO HOLDING	LS TELCOM	PARK & BELLHEIMER
HEIDELB.DRUCKMASCHINEN	LUDWIG BECK	PAUL HARTMANN
HEIDELBERGCEMENT	MAINOVA	PFEIFFER VACUUM TECH.
HENKEL	MAN	PFERDEWETTEN DE K
HERLITZ	MASTERFLEX	PIRONET NDH
HIGHLIGHT COMMS.	MAX AUTOMATION	PLENUM
HOCHTIEF	MEDICLIN	PNE WIND
HORNBACH-BAUMARKT	MEDIGENE	PRO DV
HYDROTEC	MEDION	PROGRESS-WERK OBERKIRCH
HYRICAN INSS.	MEDISANA	PROSIEBENSAT 1 MEDIA
I FAO	MENSCH UD.MASCHINE SFTW.	PSI
IFA HOTEL & TOURISTIK	MERCK KGAA	PULSION MEDICAL SYS.
INDUS HOLDING	METRO	PUMA
INFAS HOLDING	MME MOVIEMENT	PVA TEPLA
INFINEON TECHNOLOGIES	MNLR.UBERKINGEN-TEIN	QIAGEN
INIT	MOLOGEN	QSC
INNOTEC TSS	MONINGER HOLDING	R STAHL
INTERSHOP COMMS.	MORPHOSYS	RATIONAL
ISRA VISION	MS INDUSTRIE	REALTECH
IVU TRAFFIC TECHS.	MSG LIFE	REGENBOGEN
JENOPTIK	MUEHLBAUER HOLDING	RENK
JOH FREIDRICH BEHRENS	MUELLER-LILA LOGISTICS	RHEINMETALL
JUBII EUROPE	MVV ENERGIE	RHOEN-KLINIKUM
K + S	MYBET HOLDING	RWE
KAP-BETEILIGUNGS	NEMETSCHEK	S&T
KHD HMB.WDG.INTL.	NET	SACHSENMILCH
KOELN-DSSLDFR.DT.RHCF.	NEXUS	SAG SOLARSTROM
KOENIG & BAUER	NORCOM INFO.TECH.	SALZGITTER
KONTRON	NORDDEUTSCHE STEINGUT FABRIK	SAP
KPS	NORDEX	SARTORIUS
KRONES	NORDWEST HANDEL	SCHALTBAU HOLDING

SCHLOSS WACHENHEIM	SOLARWORLD K	TRANSTEC
SCHUMAG	SPLENDID MEDIEN	TRIPLAN
SCHWAELBCHEN MOLKEREI	ST.-GOBAIN OBERLAND	TUI
SCHWEIZER ELECTRONIC	STADA ARZNEIMITTEL	TURBON
SDWD.SALZWERKE	STOEHR	UMS UTD.MED.SYS.INTL.
SECUNET SCTY.NETWORKS	STRABAG	UNITED INTERNET
SEDLBAUER	STRATEC BIOMEDICAL	UNITED LABELS
SENATOR ENTERTAINMENT	SUEDZUCKER	USU SOFTWARE
SGL CARBON	SUESS MICROTEC	UZIN UTZ
SHS VIVEON	SUNWAYS	VBH HOLDING
SIEMENS	SURTECO	VILLEROY & BOCH
SIMONA	SYGNIS	VOLKSWAGEN
SINGULUS TECHNOLOGIES	SYNAXON	VOSSLOH
SINNERSCHRADER	SYZYGY	WASGAU PDK.& HANDELS
SIXT	TAKKT	WEBAC-HOLDING
SNP SCHNNEUR.& PTN.	TC UNTGKT.	WESTAG & GETALIT
SOFTING	TECHNOTRANS	WIRECARD
SOFTLINE	TELEGATE	WMF WUTBGE.MTWFBK.
SOFTWARE	THYSSENKRUPP	YOUR FAMILY ENTM.
SOLAR FABRIK	TOMORROW FOCUS	ZAPF CREATION