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Modeling the relationship between financial indicators and company performance. An empirical study for US-listed companies.

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"The only failure is not trying"

Abstract (English)

Based on data of US-listed companies a relationship between potential indicators and company performance is to be found. It is assumed that there do exist certain general factors, which are crucial for the success of companies. To quantify success three different performance measures are used, i.e. market performance measured by stock price change, cash flow performance measured by cash dividends distributed to shareholders, and profitability performance measured by the Return on Investment. The selection of seventeen variables as potential indicators is partly based on previous research and partly based on the author's considerations. To determine which variables are included in the final model, a selection process ("from general to specific") is started using the Akaike Information Criterion. A panel data analysis with fixed effect models yields the coefficients using ordinary least squares techniques. In addition, a specification test is conducted to decide whether a random effect or fixed effect model is used. Finally a binary logit model is introduced in order to predict whether each measure of firm performance will beat the average value for the firms in the market. In order to conduct statistical analysis financial data of 9,854 companies for the time period from 1986 to 2004 are obtained from the Compustat (S&P) database and hereof 1,672 audited companies are kept in the sample.

Summarizing, the results indicate that companies with a low book-to-market ratio, an efficient working capital management, a small portion of liquidity, more equity and less debt, and high retained earnings for reinvesting purposes will have a better profitability performance measured by the return on investment. Further on companies with an unqualified auditor's opinion, less equity and more debt, few assets, and no retained earnings will have a better cash flow performance measured by cash dividends. Finally, companies with a low book-to-market ratio, efficient working capital, more equity and less debt, negative stock rating, few assets, high EBIT margin and high profitability will have a better market performance measured by the stock price. The results indicate that there exists a relationship between company performance and financial indicators as it was assumed in the hypothesis. Although some effects seem contrary and unreasonable (compared to previous studies) at least some of the indicators are explaining a company's performance quite well. When looking at the binary logit models it can be said that the profitability model seems to have a very good forecasting power and that the model is therefore specified well. All indicators in the final profitability model seem to represent the success of companies fairly well. When it comes to the cash flow model and the market model such a statement is more restricted and the predicting power of the models is not as good but still sufficient.

Abstract (German)

Basierend auf Daten von US-amerikanischen, börsennotierten Unternehmen soll ein Zusammenhang zwischen potentiellen Erfolgsindikatoren und dem Unternehmenserfolg gefunden werden. Es wird angenommen, dass gewisse allgemeine Faktoren existieren, welche für den Erfolg von Unternehmen entscheidend sind. Erfolg wird hierbei mittels drei unterschiedlicher Messgrößen definiert, nämlich anhand der Markt Performance gemessen mittels des Aktienkurses, der Cash Flow Performance gemessen mittels der ausgeschütteten Cash Dividenden und der Profitabilität Performance gemessen mittels des Return on Investment. Die Auswahl der siebzehn Variablen als potentielle Indikatoren basiert teilweise auf früheren Untersuchungen und teilweise auf Hypothesen des Autors. Um zu entscheiden welche erklärenden Variablen in den finalen Modellen enthalten sein sollen, wird ein Modellselektionsprozess gestartet, bei welchen die Prozedur „from general to specific“ mittels des Akaike Information Criterion angewendet wird. Eine Panel Daten Analyse mit fixed effect Modellen berechnet mittels der Kleinst-Quadrate Technik die Koeffizienten des Modells. Ein Spezifikationstest wird durchgeführt, um zu entscheiden ob ein fixed effect oder ein random effect Modell verwendet werden soll. Schließlich wird eine Logit-Analyse zur Überprüfung der Prognosequalität der ermittelten Beziehungen durchgeführt. Für die empirische Untersuchung stehen die Daten von 9,854 Unternehmen für die Jahre 1986 bis 2004 aus der Compustat (S&P) Datenbank zur Verfügung.

Zusammengefasst kann gesagt werden, dass in vorliegender Untersuchung Unternehmen mit einem niedrigen book-to-market ratio, einem effizienten Working Capital Management, wenig Liquidität, mehr Eigen- und weniger Fremdkapital und mehr einbehaltenen Gewinnen eine bessere Profitabilität Performance haben. Weiters haben Unternehmen mit einem uneingeschränkten Bestätigungsvermerk, wenig Eigen- und mehr Fremdkapital, einer kleinen Bilanzsumme und geringen einbehaltenen Gewinnen eine bessere Cash Flow Performance. Schließlich haben Unternehmen mit einem niedrigen book-to-market ratio, einem effizienten Working Capital Management, mehr Eigen- und weniger Fremdkapital, einem negativen Stock Rating, einer kleinen Bilanzsumme, einer hohen Umsatzrendite und einer hohen Profitabilität eine bessere Market Performance. Obwohl einige der Einflüsse der unabhängigen Variablen unschlüssig und im Widerspruch zu früheren Untersuchungen und zur bestehenden Literatur erscheinen, können doch die meisten Variablen den Erfolg eines Unternehmens plausibel erklären. Bei Betrachtung der Logit Modelle kann festgestellt werden, dass das Profitabilität Modell eine gute in-sample Prognosegüte hat, wohingegen die Prognosegüte des Cash Flow Modells und des Market Modells nicht ganz so gut ist, aber noch immer ausreichend.

Table of Content

1 Introduction

1.1 Structure

This chapter shall give a short outline about the structure and the content of this dissertation. Generally the dissertation can be divided into three main parts (i.e. economic background, statistical methodology, and empirical analysis). Before these main parts are presented in detail the research intention is summarized in the next subchapter 1.2.

Chapter 2, which is the first main part, outlines the relevant economic background for the current empirical study. It begins in subchapter 2.1 with a short review of the theories, which have been developed in the area of financial markets (i.e. explaining stock returns) and gives an overview about two main streams of the management literature, which are relevant for the ongoing study (concept of competitive advantage and the concept of the resource-based view). In subchapter 2.2 the history and the current situation of studies regarding this topic are outlined. In particular three different studies are chosen which are the background and the starting point for the present empirical study. In addition in this subchapter the further developments in terms of statistical methodology and business content of this current study in contrast to the referred ones are outlined. The subchapter 2.3 is concerned with the theory and the application in practice of different performance measures. The main valuation methods are presented and so are the different purposes for company valuation. In addition the performance measures, which have already been used in previous studies are reviewed. Based on what has been said so far as well as on extensive research the three different performance measures used in the ongoing study are presented in subchapter 2.4 in very detail. It is outlined why they are chosen, how they are calculated, and what their meaning is. In subchapter 2.5 the potential indicators, which are chosen for the ongoing study are introduced and discussed in very detail. The concept and the idea of the indicators are explained as well as the calculation and measurement. Moreover, it is outlined why they were chosen and what occasionally prior studies found out about their relationship to financial success of companies. In subchapter 2.6 finally three models are formulated, which are also called full models. Based on what has been outlined so far these full models contain all parameters (explaining indicators) and can be seen as the starting point for statistical testing.

In chapter 3, which is the second main part of this dissertation, the statistical methodology used in the current study is provided. First, in subchapter 3.2 the basic as-

sumptions of the multiple linear regression model are described as this method is the starting point. Second, in subchapter 3.3 the concept of panel data analysis is outlined. In addition the fixed and the random effect models are presented as well as a specification test. The Hausman specification test determines whether a fixed or a random effect model should be used. Third, in subchapter 3.4 the concept of a model selection process using the Akaike Information Criterion is explained. The applications as well as the advantages and limitations are also presented. Fourth, in subchapter 3.5 a short outline about the binary logit model will be given.

In chapter 4, which is the third main part of this dissertation, the procedure and the results of the empirical study are described. In subchapter 4.1 the data used in the ongoing study is presented and explained. In subchapter 4.2 the way how influential observations and outliers are treated is shown and subchapter 4.3 again shortly presents the statistical method used in the ongoing study. In subchapter 4.4 the empirical results of the current study are presented. It starts with some descriptive statistics and is followed by the detailed results of all three models. The model selection process is presented as well as the statistical outputs of the final models. Then the results are analyzed and compared to the hypotheses which have been drawn before conducting the study. In addition the results of the binary logit models are shown and interpreted. In subchapter 4.5 the results of the different models are summarized and compared. Moreover a final discussion is presented concerning the overall implications of the ongoing study as well as possible approaches for further studies.

Finally chapter 5 contains the bibliography, in chapter 6 the list of tables is shown, and in the appendix additional statistical output can be found.

1.2 Research Intention

The research intention of the ongoing study is to model a relationship between financial indicators and company performance. It has long been an interest to find out what the relevant factors are, which separate the more successful companies from the less successful ones. But not only in the science community a lot of research and studies have been done, also the so called practitioners and managers are eager to find out which success factors are crucial. Another important contribution to this subject is given by consulting companies, which are all the time trying to find out how to do business more successfully than others. In this context success will always be defined as financial success (specified in three different dimensions), because it can be assumed that this is the origin goal of every business. Although the term shareholder value is rarely used and applied nowadays (due to unreasonable critics), to be

honest it finally always comes down to the value which is generated for the shareholders. The only remaining question is how shareholder value is defined (e.g. cash flow, stock performance) and not if it is or should be the foremost goal of the company.

It is assumed that there do exist certain key factors which are (nearly always) relevant for the success of companies (= hypothesis). This means there shall exist some general principles, which are considered important when doing business in general. These key factors will of course not fully explain the success but to a decisive extent. These factors are believed to be sustainable ones, which means that they are relevant in different kind of economic situations and are also true in different industries. This restriction may seem pretty strong, but it has to be mentioned that only listed companies will be examined and so certain main criteria should be equivalent among them. In addition, it seems obvious that there will be of course a few companies or industries, which will not fit into this picture (e.g. funds) and therefore the rules would not apply. But the number of such companies is believed to be very small and therefore one could speak of general rules for all others.

When looking at this hypothesis it may seem obvious to some readers that such rules for doing business successfully do of course exist. However, the scientists as well as the practitioners do absolutely not agree on that. And even if they would agree on the argument that crucial factors do exist across (nearly all) companies, the remaining question would be which factors are the crucial ones. Probably the most convincing argument that this “formula for success” has not been found yet is simply the fact that there are still a lot of businesses performing poorly.

Based on theoretical research an empirical study across US-listed companies over a nineteen year time period shall find some of these key factors and model a relationship between these indicators and company performance. The indicators will of course not directly indicate a result; moreover they need to be interpreted. For example the current ratio, which is one potential indicator in the current study, is a proxy for liquidity and therefore if the coefficient of this ratio is significant in the model, liquidity would be seen as an important indicator.

In the beginning seventeen potential indicators have been defined, which are thought to be indicators of success. The choice of these indicators is partly based on previous studies and partly based on the author’s own considerations. Therefore on the one hand the effect of indicators, which have already been investigated is looked at and is compared to previous results, and on the other hand the effect of indicators, which are subject to a statistical analysis for the first time, is analyzed.

The performance of companies will be measured by three different variables, which represent three different dimensions of a company's performance. It is therefore another research intention to compare the results between these different performance models and analyze the results. In addition a comparison with previous studies shall be made, and conclusion shall be drawn whether a performance measure is suitable or not.

The potential indicators are assumed to have a significant effect on the different performance measures. In terms of market performance the assumed relationship between the potential indicators of success and the market performance is that when certain indicators are positive, the market will react to that and the share price will rise and vice versa. The relationship between the potential indicators and the cash flow performance is determined by the assumption that better indicators will lead to a higher profitability which in turn leads to higher cash flows and finally greater cash dividends. In short, better indicators shall lead to greater shareholder value in terms of cash dividends. When it comes to profitability it is assumed that the indicators will have a direct effect on the performance. Higher or better ratios will have a positive effect on the profitability performance. Probably this measure will present the most reliable results, as there are rarely any outside influences on the profitability of a company (compared to the two previous measures). However the profitability measure could be distorted due to certain accounting practices. Therefore the ongoing study will also be able to evaluate, which performance measures work best and how the results differ in respect of them.

The goal of the ongoing study is to model the relationship between some of the explanatory variables and the performance measures. As has been mentioned the study shall investigate already used variables and compare the results with previous ones. It is therefore another test of the results of previous ones. In addition, new variables are introduced, which may lead to interesting conclusions. Especially the effects of variables like rating and auditor's opinion will be interesting. The ongoing study may also be a starting point for further studies, where additional markets (i.e. countries) can be examined and compared to the present results.

2 Economic Background

2.1 Introduction

This subchapter shall provide the main economic background for the current study. The topics provided here are the basics for the hypotheses used in the ongoing study. First, a short review of the theories, which have been developed in the area of financial markets, is given. In particular, the research about explaining the behavior of stock returns is presented. Second, this chapter gives an overview about two main streams of the management literature, which are relevant for the ongoing study. They are the concept of competitive advantage and the concept of the resource-based view. These two concepts have substantially influenced the management style and shaped the corporate world of the twentieth century. They are included here because their underlying idea is somehow similar to the ongoing study; i.e. achieving sustainable competitive advantage through defining crucial factors of success.

2.1.1 Explaining Stock Returns

The theory of stock price starts with the Markowitz model, which is a single period model, where an investor forms a certain portfolio (Markowitz, 1952). Thereby it is the investor's goal to maximize the portfolio's expected return, given a certain degree (or level) of risk. The same would be true by minimizing the risk while an expected return is given. The risk is then measured by the variance (or standard deviation) of the portfolio's return, whereas the assumption of a single time period as well as assumptions regarding the investor's attitude towards risk have to hold. This can also be shown in a graph, where different portfolios based on the assumptions build a curve, which is the efficient frontier. Investors will select their individual portfolios along this curve, depending on their personal attitude towards risk.

In the 1960's based on the Markowitz model the researchers Sharpe (1964), Lintner (1965), and Mossin (1965) develop independently what eventually became the Capital Asset Pricing Model (CAPM). The underlying assumptions are the same as in the Markowitz model, however there are some additional remarks and further developments. The model assumes that there does exist a risk free rate, at which an investor can alternatively also invest. Therefore the efficient curve described above is not the most accurate way to determine which portfolio to choose. Moreover a straight line with the risk free rate as the intercept and a tangent to the efficient curve from the Markowitz model is now the new way to choose portfolios. This line is the capital

market line, which gives all combinations of the risk free rate and a risky portfolio. In market equilibrium, this is also an assumption and prerequisite in the CAPM, this risky portfolio is the market portfolio of all risky assets. The only risk an investor has finally to bear is the risk of the market portfolio itself, because an investor will combine the market portfolio and the risk free asset. The CAPM equation is therefore defined as

$$(1)\ E(R_j) = R_f + \beta_j [E(R_m) - R_f]$$

whereas $E(R_j)$ is the expected return on the asset j, $E(R_m)$ is the expected return on the market portfolio, R_f is the risk free rate, and β_j is the beta coefficient for the asset j. The beta coefficient measures how the individual asset j is varying when the market portfolio is varying. This is therefore the risk, which cannot be diversified by an investor. The expected return of any risky asset is a linear function of how this risky asset is co-varying with the market. Therefore when the beta is included in a model as an explanatory variable no other variable should be able to explain the differences in stock returns. Thus the beta is the sole indicator explaining stock returns.

The concept of the CAPM seems reasonable but some of the underlying assumptions of the model might be to unrealistic for the real world. It is assumed that all investors have the same information, which is costless to obtain, and all investors can borrow as much funds at the risk free rate as needed. Moreover, the model does not account for taxes or transaction costs. Therefore, some researchers propose further extensions of the CAPM, which should loosen these restrictions (e.g. Black, 1972).

Another further development of the CAPM is the Arbitrage Pricing Model (APT) by Ross (1976), whereas the main assumption is that there does not exist an arbitrage possibility in financial markets rather than assuming market equilibrium (as in the CAPM). Thereby it is assumed that certain factors exist, which are relevant for the difference between the expected and the actual values. These n factors are believed to vary together and so the firm specific deviations can be diversified. Therefore, the expected return of a variable is a linear function of its sensitivity to the n factors.

$$(2)\ E(R_j) = R_f + \beta_{j1} \lambda_1 + \beta_{j2} \lambda_2 + \ldots + \beta_{jn} \lambda_n$$

whereas $E(R_j)$ is the expected return on the asset j, R_f is the risk free rate, β_{jn} coefficient represents the sensitivity of asset j to risk factor n, and λ_n represents the risk premium for factor n. Therefore in the APT, in contrast to the CAPM, several (n) sources of systematic risk exist.

The Intertemporal Capital Asset Pricing Model (ICAPM) by Merton (1973) accounts for a multi period model, in contrast to the CAPM and APT, which are both single period models. Here it is assumed that the market equilibrium may change over time, and the investor is interested in hedging against negative developments. When an asset has high returns while others have low returns, this asset is wanted by investors (as a hedge) and so the price of this particular asset will rise. The ICAPM is very similar to the APT, but is different in terms of dynamics and that a direct link to the market portfolio (first factor) exists. It is defined as follows

$$(3)\ E(R_j) = R_f + \beta_{jm}\,\lambda_m + \beta_{j2}\,\lambda_2 + \ldots + \beta_{jn}\,\lambda_n$$

Finally, the Consumption Oriented Capital Asset Pricing Model (CCAPM) by Breeden (1979) is based on the concept of marginal utility of consumption. This means that more income (i.e. higher returns) is worth more in times when the aggregate consumption is low and vice versa. Therefore, investors will want assets with high returns in times of low aggregate consumption whereas this will lead to higher prices and lower expected returns. It is then defined as

$$(4)\ E(R_j) = R_f + \beta_{jc}\,[E(R_m) - R_f]$$

whereas β_{jc} measures the sensitivity of the return of the asset j to changes in aggregate consumption. β_{jc} is therefore the consumption beta of asset j, and thus the expected returns are a linear function of the consumption betas.

It can be said that the CAPM in spite of the relatively tight restrictions became the most important and widely used asset pricing model in the past and still has a major influence. Also in terms of empirical testing the CAPM received the greatest attention. However, the results are controversial, because some studies contradict the main assumption of the CAPM by showing that not only beta is relevant for stock returns (e.g. Basu 1977 and 1983; Banz 1981; Chopra, Lakonishok and Ritter, 1992; Bhandari, 1988; Jegadeesh, 1990; Fama and French, 1992).

2.1.2 Competitive Advantage

Basic economic theory says that in the absence of market imperfections, superior or abnormal returns of companies will be attacked by competitors and therefore will diminish over time. However, there are a number of potential strategies a firm may pursue in order to be successful and actually be more successful than others. Every outline concerning the topic of competitive advantage and therefore superior company performance has to start with one of the most important and influencing management

professors of the twentieth century. According to Porter (1985) a firm's relative position within its industry determines whether a firm's profitability is above or below the industry average. The only way to achieve above average profitability in the long run is the so-called sustainable competitive advantage. Put simply, competitive advantage enables the company to create above average value for the customers and thus achieves superior profits. There are two different main types of competitive advantage: cost leadership and differentiation. These two types of competitive advantage lead to three generic strategies for achieving above average performance in an industry when they are applied in practice: cost leadership, differentiation, and focus. The focus strategy can then again be pursued in two ways, namely cost focus and differentiation focus.

In cost leadership, a company tries to become the low cost producer in its industry. There are several possible sources of cost advantage, which vary across different industries. They may include economies of scale, proprietary technology, special access to raw materials, learning curve improvement and other factors. It should be the goal of a company to find and exploit all possible sources of cost advantage. If a firm can achieve that and sustain overall cost leadership, then the company is very likely to be an outperformer in its industry.

When pursuing a differentiation strategy a company seeks to be unique in its industry. The company focuses on one or more attributes that many buyers in an industry value as important and commits itself to meet those needs (e.g. product development to enhance product quality, features, deliverability, or image). The customers receive a higher value and therefore the company is able to achieve a superior price compared to similar products and competitors. This is only possible as long as the company has a unique standing in an attribute.

The principle behind the focus strategy relies on the choice that only a certain part within an industry is delivered. Therefore, the company selects a segment or a group of segments in the industry and outlines its goals and strategy in order to serve them. All other segments are thereby excluded and not served. As mentioned there are two possible ways how the focus strategy can be applied. On the on hand, in cost focus a firm tries to achieve a cost advantage in its target segment, while on the other hand in differentiation focus a firm tries to achieve differentiation in its target segment. The underlying prerequisite is that there do exist differences between the segments and that the company is able to serve the needs of one segment. Either the buyers will have unusual needs (differentiation focus) or the production or delivery system will be different (cost focus).

2.1.3 Resource-Based View

Another major management stream dealing with achieving sustainable competitive advantage is the resource-based view of the firm (e.g., Penrose, 1959; Wernerfelt, 1984). Actually, the concept of competitive advantage from Porter could be seen as one main starting point for the resource-based view (especially Porter's five forces model). According to the resource-based view (RBV), the company should more focus on the resource side than on the product side. A resource is anything, which could be a strength or weakness of a certain company and is a certain asset, which is tied semipermanently to the company (Caves, 1980). The resource based view states that companies are able to earn superior returns if they are able to obtain superior resources, which cannot be easily copied by competitors and therefore are not diffused throughout the industry.

The sustainable competitive advantage could therefore result from the inimitability, rarity, and non-tradability of these intangible as well as tangible resources. A firm should possess certain intangible resources that competitors cannot copy or buy easily and therefore achieve competitive advantage. There are several types of resources a firm could posses. Wernerfelt (1984) lists brand names, in-house knowledge of technology, employment of skilled personnel, trade contracts, machinery, efficient procedures, and capital. Hall (1992) lists the culture of the organization and the expertise of employees, suppliers, and distributors.

An underlying assumption of the RBV is that the resources and production capabilities are heterogeneous across different companies. Each productive factor and therefore each resource has a different level in terms of importance, whereas some are superior to others. If a company has such a superior resource, it will be able to produce more economically and/or it will be able to satisfy the needs of the customers better. According to Peteraf (1992), heterogeneity implies that due to varying capabilities companies are able to compete in the marketplace while achieving different results. If marginal resources are available, a company can only expect to breakeven, whereas companies with superior resources will be able to earn rents. This is true because these companies have lower average costs.

Barney (1991) states that heterogeneity among companies allow some of them to sustain competitive advantage. The RBV thereby focuses on the strategic choice as well as on identifying, developing and deploying of key resources in order to maximize returns. These key resources have to be valuable (i.e. improve efficiency or effectiveness), rare (i.e. possessed by a small number of competitors), imperfectly imi-

table (i.e. unique historical costs, causally ambiguous, social complex), and non-substitutable.

2.2 Previous Studies on this Topic

2.2.1 General

The following subchapters outline the history and the current situation of studies regarding this topic. The analysis of these past studies and their results is the background and the starting point for the present empirical study. It has to be said that there have been conducted many different types of studies, whereas in this context only three of them are presented in detail. They are chosen because of their importance to this specific subject. However, the results of some other major empirical studies are shortly presented when the indicators for the ongoing study are selected. Therefore an interested reader can use the references for detailed information on these studies. Finally in this chapter the further developments in terms of statistical methodology and business content of this current study in contrast to the referred ones are outlined.

Besides the more scientific studies from universities and scientists, which are presented in this context, there do exist some additional studies conducted by consulting companies either in cooperation with universities or alone. Although they are rare and sometimes their approach is not a highly scientific one, some of these studies have produced reasonable results. The reasons for synergies between consulting companies and universities seem to be obvious: The consulting companies try to stay at the edge of the development in strategic and other management issues by cooperating with universities. They benefit from the newest research developments, as well as the accumulated brainpower of many students and professors located at each and every university. On the other hand, these co-operations are very interesting for the universities too. Through the connection to the field they get insights, how their methods are implemented in real world. Moreover, it is also a financial matter, because very often the consulting companies sponsor certain projects or departments. As mentioned above, these co-operations are win-win situations for the participating parties. Among the consulting companies conducting such analyses are McKinsey, The Boston Consulting Group, Roland Berger and Accenture, only to mention the big ones. Due to the facts mentioned above it is why the author has tried in the present study to bring in some insights from his own consulting experience (regarding the performance measure as well as the potential indicators).

2.2.2 The Cross-Section of Expected Stock Returns

The first study “The Cross-Section of Expected Stock Returns” is the seminal work of Fama and French (1992), which is probably the most cited paper when it comes to explaining stock returns. The original purpose of this study is to test the central prediction of the asset pricing model developed by Sharpe, Lintner, and Black. The main prediction of this model is that the market portfolio of invested money is mean-variance efficient. This means that the expected returns of the securities are a positive linear function of their market ßs, which are the slopes in a regression of a security’s return on the market return, and that these ßs are able to more or less solely describe the cross-section of expected returns (expected returns are defined as stock price change within a certain period). Previous research has already highlighted the fact that this may not necessarily be the case and therefore other effects such as size, leverage, book-to market ratio, and earnings-price ratio have to be added in order to explain stock returns sufficiently.

The data are taken on the one hand from the return files from the Center for Research in Security Prices and on the other hand from the Compustat annual industrial files of income-statement and balance-sheet data, which leads to monthly data from 1962 to 1989 with an average of 2,267 stocks in the monthly regressions. Financial firms are excluded because it is assumed that the high leverage in their industry is not comparable to others and therefore would negatively influence the results. A time gap of 6 months is used between the fiscal year end and the date when the stock return is reported in order to make sure that the accounting variables are known before the stock returns are measured, which they want to explain.

To test the asset pricing model the cross sectional regression approach of Fama and MacBeth (1973) is used, whereby each month the cross-sections of stock returns is regressed on variables hypothesized to explain expected returns (e.g. ß or size). Then the time series means of the monthly slopes provide standard tests for whether different explanatory variables are on average priced. Each stock’s ß is derived by estimating the ßs for the portfolios and then these estimated ßs are assigned to each stock. For each year ten size portfolios are designed, because former studies indicated that size produces a wide spread of average returns and ßs. Moreover each of these ten portfolios is subdivided in other ten portfolios based on pre-ranking ßs for individual stocks. The ß is estimated as the sum of the slopes in the regression of the return on a portfolio on the current and prior monthly market return. Analysis of the portfolios brings evidence that the pre-ranking ß achieves its goal.

When stock portfolios are formed on size alone, the ß has the ability to predict average return as the asset price model says, but as size is nearly perfectly correlated to ß it is not clear where the effect comes from. In case when the size portfolios are subdivided on the basis of pre-ranking ßs, the strong relation between average returns and size remain, whereas the relation between average return and ß disappears (the average slope from the regressions of returns on ß alone is 0.15% per month and only 0.46 standard errors from 0).

The study also finds that there is a strong relation between average returns and book-to-market equity and this effect is seen even more powerful than the size effect. The combination of size and book-to-market equity finally leads to absorption of the effects of leverage and earnings to price on average returns. Thereby the regression uses the natural log of the leverage ratios (book assets to market equity and book assets to book equity) because previous tests have shown that this is a good form to capture leverage effects. In the case of the price to earnings a dummy variable is used when earnings are negative (because than they are no proxy for earnings forecast).

Summarizing the study finds that the relation between ß and the average return disappears during the sample period, even when only ß is used to explain average returns. Therefore the results of the study do not support the main prediction of the asset pricing model, namely a positive relation of average stock returns to market ßs. It is also not assumed that different approaches are likely to lead to results, which would strengthen or revive the asset pricing model. Moreover the study reveals a fairly strong relation between average return and size, earnings to price, and book-to-market equity when conducting a univariate analysis. When conducting multivariate testing there does exist a strong negative relation between size and average return, which is also robust to the inclusion of other variables. The same is found to be true for the positive relation between book-to-market equity and average return. While the underlying economic causes for this relation are not explained in detail, the main results of the study are straightforward.

2.2.3 Indicators of Successful Companies

The study “Indicators of Successful Companies” conducted by Johnson and Soenen (2003) is another main starting point for the current empirical research. The goal in this study is to identify the factors which are important for companies to achieve superior performance. Therefore monthly Compustat data from 1982-1998 for 478 companies are used. Thereby financial and utility companies are dropped at all and so are companies with one ore more missing values for the relevant variables.

Performance in terms of financial performance is measured using three different methods, whereas two are conventional ones and one is a more recent yardstick. First the Sharpe's ratio, which is related to the capital asset pricing model (as Sharpe is one of the main proponents for it), and is defined as the rate of return on a particular stock in excess of the risk free rate divided by the standard deviation of the returns on that stock during a certain time period. Second, Jensen's alpha, which is also based on the CAPM and where the realized rate of return on a security should be a linear function of the risk-free rate of return plus a risk premium that is a function of the security's systematic risk (i.e. beta), plus a random term (all during one time period). Third, the EVA (Economic Value Added), which is calculated as NOPAT (Net Operating Profit after Taxes) minus WACC (weighted average cost of capital) multiplied with the Capital Employed (CE). This is the amount of money remaining after all providers of capital have been compensated and is therefore sometimes called residual income. In the late 1990's it has been seen by a lot of people as the sole method that can be connected with the share price.

Ten different potential indicators are selected to explain superior performance, which are all based on previous research. Therefore hypotheses about there specific influences do exist, although the results are varying across the different studies. They are book-to-market ratio, size (measured by total assets), sustainable growth rate (earnings retention rate multiplied with the return on equity), capital structure (long term debt to total assets), liquidity (liquid assets to total assets), cash conversion cycle (days to sell inventory plus average collection period minus days to pay accounts payable), earnings volatility (standard deviation of annual differences in earnings divided by total assets), profitability (return on assets), research and development expenditure (research & development expenditure to sales), and advertising expenditure (advertising spending to sales).

A simple ordinary least squares regression model is used to examine which indicators have significant influence (in terms of p values) on the three performance measures. The indicators are "consecutively regressed" on the performance measures. When looking at these p values six indicators are significant at the one per cent level to explain successful performance. Four out of these six indicators are even highly significant across all three performance measures. They are size, sustainable growth rate, profitability, and cash conversion cycle.

In addition a binary logit model is introduced, which is used to predict the probability that the different measures of firm performance will beat the average value for the firms. The question is whether the performance of the single firm is below or above the market average. This is done by putting a dummy variable on the left side of the

model as dependent variable. This dummy variable is one if the value for the measure of firm success is greater than the average of all companies (and therefore has a performance above the market average) and zero if the value is smaller companies (and therefore has a performance below the market average). The model then predicts correctly when the predicted probability is greater than 0.5 and the dependent variable is one and vice versa. The model provides strong evidence that all three measures have a good forecasting power. Their total correct prediction lies between 65% for the Jensen's alpha and 80% for the EVA and the Sharpe's ratio.

2.2.4 Relationship between Innovativeness, Quality, Growth, Profitability, and Market Value

"Relationship between Innovativeness, Quality, Growth, Profitability, and Market Value" by Cho and Pucik (2005) is the third main reference point. The purpose of their study is to examine the relationship between innovativeness, quality, growth, profitability, and market performance, in particular how innovativeness and quality are related to a firm's financial performance. Therefore three year accounting and market data (1998 - 2000) from the Compustat PC Version (Research Insight Global) as well as non-financial data from Fortune magazine are obtained. Financial and Depository institutions are excluded (because their returns are regarded as not comparable) as well as U.S. subsidiaries of non-U.S. companies. One main point of this study is the inclusion of non financial data (i.e. quality and innovativeness).

Starting from a resource-based view of the firm it is argued that rarity and inimitability result in a sustainable competitive performance. The concept is that this sustainable advantage can only be achieved by a firm's capability of being innovative and delivering high quality products or services at the same time. Whereas innovation (also called exploration in this context) and quality (also called exploitation in this context) will probably have a trade off relation and it should be the management's goal to align their strategies to serve both dimensions. Thereby the main assumptions are that the higher the quality and the innovativeness are the higher the performance will be. The final hypothesis is that a firm's innovativeness and its product quality have a positive direct relationship with growth and profitability, which then leads to a greater market value. Innovativeness and quality is therefore measured by the Fortune survey instrument.

Performance is measured in three different ways: growth performance, profitability performance, and market value performance. Growth performance is measured by the three year compound annual growth rates of total assets, total revenues, and market capitalization. Profitability performance is defined by the return on assets

(ROA), return on equity (ROE), and return on investment (ROI). These performance measures are calculated by dividing the income before extraordinary items through the corresponding balance sheet item (i.e. assets, equity). The market-to-book ratio and Tobin's q ratio are used for market value performance. The market-to-book ratio is simply the ratio of stock price to book value per share and the Tobin's q ratio is the ratio of the market value of a firm's debt and equity to the current replacement cost of it assets.

First, three data techniques are used to handle missing values: a mean substitution technique to calculate the 3-year average, a pair-wise deletion technique to calculate correlation coefficients, and a list-wise deletion technique to calculate covariance coefficients for structural equation models. Outliers are detected and deleted by a process where one percent on either extreme side of the data was excluded until a normal distribution is obtained.

Structural Equation Modeling (SEM) is applied in a two step approach to examine the five models, which are derived theoretically. This procedure allows determining if and in what way the two latent variables of innovativeness and quality (factors) are related to growth, profitability and market value when being compared. As quality and innovativeness have a strong correlation (e.g. measured by the correlation coefficient) the error terms of innovativeness and quality of the same year are specified to be correlated in the structural equation model. The following test statistics are reported to evaluate the models: the root-mean-square error of approximation, which is seen as very sensitive in terms of misspecified factor loadings; the standardized root-mean-square residual, which is seen as very sensitive in terms of misspecified factor covariance; a goodness-of-fit- index; an adjusted goodness-of-fit- index; a non-normed fit index; and a comparative fit index.

Finally the SEM approach specifies the relations of the 14 observed measures (3 x growth, 3 x profitability, 2 x market value, 3 x innovativeness, 3 x quality) in 5 models and then specifies the relations between these five models. The results of the final model indicate that the reduction from the previous model is significant. However based on the parsimonious rule the previous model 5M is as good as this one (5F) and therefore the model 5M is selected. Summarized the main findings of the study are that companies, which can achieve to balance quality and innovativeness, will have better growth and profitability performance and in the end also have a superior market performance. It comes clear that not either quality or innovativeness is a driver of growth but both are important to be applied simultaneously.

2.2.5 Scope of the Ongoing Study

While the studies described above are defining financial success only as market value (current stock price) or as a market related measure (e.g. Sharpe's ratio) the ongoing study additionally takes into account a profitability measure and a cash flow measure. This concept is defined as a three dimensional approach where different areas ("internal" as well as "external") of company success are highlighted. This should also reduce the risk of a mono-performance measurement bias. In addition it accounts for the fact, that the stock price is not only determined by economic and company specific issues and therefore might not always represent the actual performance of a company.

In addition, regarding the performance measures the ongoing study only uses methods which can be calculated easily without needing too much sideline information. In contrast, to calculate for example the EVA Stern et al. (2001) and Stewart (1994) identify a total number of 164 issues that should be adjusted in order to eliminate distortions due to reported accounting results. The advantage of the measures used in the ongoing study is that they can be derived from the company's balance sheet without additional adjustments while showing a relatively high reliability.

The ongoing study is also intended to find out which indicators work for which performance measure. This will be an interesting point, especially when analyzing what kind of indicators are important in explaining stock returns on the one hand and profitability on the other hand. Conclusions should be made, whether there do exist trade off relations between the three performance measures and therefore between different strategies a company can pursue (e.g. boosting stock price versus increasing profitability).

In addition to financial data, which are used in most previous studies, also non financial data are gathered and analyzed in the ongoing study (e.g. credit rating). The big advantage of the non financial data used in the ongoing study is the relatively high objectivity of the variables. Whether a company gets a good or bad credit ranking from Standard & Poor's is rather dependent on a market analyst's opinion, than on detailed economic research. This can be seen in contrast to non financial data like quality or innovation, which are mostly measured by surveys among managers or customers in a small sample.

Moreover, lags are introduced in the model to account for time lags. This is especially important when it comes to components like research and development, advertising,

or capital expenditure, as it is assumed that the influence on the company performance is time delayed.

In terms of statistical testing, a panel regression with a fixed effect model is estimated to account for cross section specific effects. In panel regression these cross section effects can be captured in the constant term (fixed effect model) and can therefore be superior and thus lead to more reliable results. To test whether the fixed effect model is the appropriate statistical model to choose, a specification test (i.e. Hausman test) is conducted.

Another main advantage of panel regression is the size of the sample, which can be obtained. The final number of cross sections (i.e. companies) is 1,672 and the data are available for the time period from 1986 to 2004 (nineteen time periods). This leads to a total number of 31,768 observations, which increases the number of degrees of freedom dramatically. In a single cross section or time series model this number would rarely be possible. Of course due to missing observations and calculation issues there do not exist 31,768 observations for each of the twenty variables (seventeen explanatory variables and three dependent variables). But in contrast to some previous studies, which only pick the companies where all the data are available, in the ongoing study all 1,672 companies are kept in the sample. The program EViews, which is the statistical tool used in the ongoing study, can also handle unbalanced data and therefore many observations and degrees of freedom can be saved in advance. Hence the number of companies is about four times the number in "Indicators of Successful Companies" by Johnson and Soenen (2003).

When looking at comparable studies, most of them, if at all, are dealing with outliers quite straightforward. The common method is to simply exclude either a certain industry or a specific percentage of the data (e.g. 3% of each side). The approach of the ongoing study is to examine each variable and to set up a rule for every single one of them. The consequence of this procedure shall be, that only serious outliers, which would distort the picture are dropped and as much data as possible are remained in the data file.

Another important aspect, which will be attributed in the ongoing study, is the model selection process. In the beginning a full model is constructed, based on further empirical research (including all potential indicators). But in contrast to most comparable studies on this topic the ongoing study does not simply calculate the model and interpret the coefficients and their significance. A model search procedure is performed using the Akaike Information Criterion to determine the relevant variables. The principle behind this method is called "from general to specific". One advantage of this

technique is the possibility to find the “best” model in terms of this criterion among a set of candidates. This is especially true for an observational study, where despite extensive research it can not be determined with certainty a priori, which variables should be included and which ones left out.

As most studies dealing with similar topics Compustat data (Standard and Poor’s) are used for the required calculations in this context too. Actually Compustat data can be seen as a quasi standard when it comes to studies dealing with financial data and performance, although an access to such a wide range of data is often not easy to gain. One difference in the current analysis tough is that only audited companies are taken into the sample. The positive effect of this should be more reliable data, because the balance sheet is revised by an auditor. It is assumed, that simply the fact of being audited should enhance the quality and the reliability of the financial statements (although the past has shown that even the auditor’s themselves are involved in fraudulent or misleading accounting practices).

2.3 Search for the Best Performance Measures

2.3.1 General

This chapter is concerned with the theory of different performance measures and the application of these measures in practice. In the next subchapter the main valuation methods are presented and so are the different purposes of company valuation. In the preceding subchapter some of the performance measures, which have already been used in previous studies are reviewed.

In the science community as well as in the practice field there does not exist a common agreement of how a company is valued properly. This can simply be seen by the fact that so many different methods are used. The obvious metric for defining company performance is probably the stock price itself (Jensen and Murphy, 1990). That is why the concept of the ongoing study starts with the market performance measuring the stock price change. However the stock price may not be a perfect measure, because it is often driven by factors which are not under control of the companies’ executives (e.g. day trading and short term investing) (Milbourn, 1996). Therefore the stock price is influenced by irrational arguments which are not related to a company’s real performance to a certain degree. Moreover, it seems impossible to catch these irrational reasons and put them into any kind of model.

That is why a lot of methods have been developed in order to determine and measure the real value of a company. However, it has to be said that unlike price, which is objective, because someone has already paid it, value is always in the eyes of the beholder and therefore subjective (Hicks and Issac, 2000). A company may also have different values for different buyers due to economies of scale, economies of scope, or different perceptions about the industry and the company. Therefore when it comes to performance measures one has to distinguish between the value and the price of a company. It has been mentioned that the price does not necessarily represent the true performance of the company. On the other side the main advantage of the (stock) price is that someone has already paid it and therefore is a real (ex post determined) value in terms of money. The opposite is true for the valuation of companies where a theoretical calculation shall determine an amount of money, which is then defined as the value of the company (without having someone ever paid this value – and probably nobody ever will).

What has just been said lead to the fact that the value of companies can be measured in many different ways. One main reason is that the measurement method changes with the underlying assumptions and goals of any valuation. As has been mentioned above, value is always subjective and in the eye of the beholder. This means when searching for a proper performance measure the specific context of the valuation has to be looked at carefully. In respect of the specific context and the environment a certain performance measure shall be chosen. This argument makes clear that there cannot exist only one right performance measure, as each valuation has a different context. When valuing a company one therefore has to strive for a proper valuation method. In the ongoing study the author has followed this principle and has tried to find appropriate measures given the certain circumstances and goals of the ongoing study. They will be outlined in a further chapter.

2.3.2 Possible Valuation Methods

Before reviewing the most important valuation methods a brief outline concerning the different purposes of company valuation is given. First and foremost company valuation is needed in buying and selling operations, where the valuation will tell the buyer the highest price to pay, and the seller the lowest price at which he should be prepared to sell. Second, in the valuation of listed companies, where the valuation is used to compare the value obtained with the share's price on the stock market and to decide whether to sell, buy or hold the shares (e.g. book-to-market ratio). This is also important to compare several companies and to decide which securities the portfolio should consist of. Third, company valuation is used in public offerings to justify the

price at which the shares are offered to the public. Fourth, valuation is important in compensation schemes based on value creation, where the variable payment of executives is based on the value creation within a certain period. Sixth, the valuation of a company or business unit can be fundamental for identifying the main value drivers. Seventh, the valuation of a company or single business units is an important prior step when it comes to strategic planning and long term decision making (e.g. continue the business, sell, merge, milk, grow or buy others).

Thus, different firms, analysts, investors, bankers, and investment bankers employ different valuation methods due to different underlying situations and the results of these methods can vary enormously (the same is true for scientists and empirical studies in this field). Generally valuation methods can be divided into six groups: balance sheet oriented, income statement oriented, mixed oriented, cash flow (discounting) oriented, value creation oriented, and options oriented.

Balance sheet oriented methods try to determine the company's value by estimating the value of its assets. Therefore the value of a company is based on what has been generated in the past (as found on the balance sheet) and does not take into account the company's possible future development. This traditional method determines the value from a static point of view and does not take into account factors apart from the financial statements. Among the balance sheet oriented methods are the book value, the adjusted book value, the liquidation value, and the substantial value, but these methods are rarely used today. Their main disadvantage is the static and historic point of view. No investor is interested in buying and investing in a company's past achievements. Instead every rational investor is searching for prospering future outlooks.

In contrast to balance sheet-based methods, income oriented valuation methods try to determine the company's value through earnings, sales or other indicators found on the income statement. It is also common practice that so called multiples are used, which multiply a certain indicators (e.g. earnings, sales) and the result is then the company value. These multiples are widely used to compare companies within certain industries. Although this point of view takes into account the earnings and is therefore not static anymore, the future perspective is still not analyzed.

The mixed oriented valuation methods combine the two methods shown above. There exist simple measures such as Return on Capital Employed (ROCE) or Return in Investment (ROI) and Earnings Per Share (EPS) which are widely recognized indicators in a majority of textbooks and are indeed used in practice by investment analysts. However, these methods have also some disadvantages, because differences

in accounting standards, particularly across international borders, can substantially affect the calculated value. Therefore more complex ratios such as the Cash Flow Return on Investment (CFROI) have arisen, which are adjusting the Return on Investment calculation by including measures for inflation, asset age and differences in methods of depreciation. Generally it is clear that cash flow is preferable to profit in value assessment, because it is more difficult to be creative with cash flows than with asset values and ratios taken from balance sheets. However, one main drawback remains, namely that these measures are still based on historical accounting data and do not take into account future development. These methods are therefore only appropriate when someone is interested in the current situation of the company.

The cash flow oriented methods try to overcome this disadvantage by estimating the cash flows generated in the future and then discounting them at a discount rate equivalent to the specific flows' risk. It can be said that nowadays, the cash flow discounting method is among the widely used valuation techniques in practice. Finance researchers have long proposed that the value of a firm equals the net present value off all future cash flows (Rappaport, 1986). The main concept is that the value of a company is solely defined on how much cash flow is generated (and distributed) in the future and how much the present value of these cash flows is. However, one major drawback of this valuation method is that they are based on detailed forecasts, which have to be estimated and nobody knows if these planned cash flow will ever be available to shareholders. In addition, the discount rate is also subject to a high degree of variability and inaccuracy. Therefore these two parameters have to be determined carefully and argued sufficiently.

Value creation oriented methods are new and more complicated methods. Among them the probably most widely recognized is the Economic Value Added (EVA) which has been developed by Stern and Stewart (1994) and adopted by many leading international consulting corporations. The EVA is calculated by the difference between the capital employed and net operating profit multiplied with the weighted average cost of capital (Stewart, 1994). It is therefore the amount remaining after the company's shareholders and all other providers of capital have been compensated and thus is a real measure of value creation (or destruction). In this concept a company has not only to produce a profit, but this profit has to exceed a certain level in order to create value. The level is exactly the limit where all lenders of capital (equity and debt) are equally satisfied. In addition, further extensions to this method such as Market Value Added (MVA), Total Shareholder Return (TSR) have been developed. The MVA deducts shareholder's capital and debt from the total capital of the firm (including positive equity, loans, net earnings), whereas the TSR method is valuing the capitalization and dividends paid over a period of one year.

Finally, the option pricing theory is probably the newest valuation method, which is still very rarely used in practice. It goes back to the work of Black and Scholes (1973), who published the option pricing formula. The rare use of this concept in practice can be attributed to the fact that the concept is even more complex than the value creation concept and a practicable approach has not yet been introduced. In the science this concept is already frequently used, whereas in the practice of company valuation the use is still inconsiderable. In short, options price theory tries to estimate the value of a company by valuing future events, which will come true with a certain probability. The basic concept is therefore similar to the discounted cash flow method but much more complex.

2.3.3 Performance Measures used in Previous Studies

In the following a short outline will be given concerning performance measures used in previous studies when it comes to company valuation. Simmonds and Lamont (1996) use three different sets of performance measures (profitability, risk adjusted returns and growth) to measure value. Hitt and Hoskisson (1997) find that firm performance is measured by profitability ratios in most empirical studies where firm value and international diversification is under investigation. They argue that despite differences in accounting standards overall trends and analysis should not be affected too much by them.

Empirical studies also frequently use financial ratios for the valuation of companies (Kaplan and Ruback, 1995, Gilson, Hotchkiss and Ruback, 2000). The popularity of these methods can be attributed to its simplicity and availability compared to other company valuation methods like discounted cash flow techniques.

A lot of researchers investigating firm performance also use a variety of measures of profitability. Zajac, Kraatz, and Bresser (2000) use Return on Assets (ROA), Delios and Beamish (1999) use the Return on Equity (ROE), and the Return on Investment (ROI) is used by Busija, O'Neill, and Zeithaml (1997), Dess, Lumpkin, and Covin (1997), and Johansson and Yip (1994). Others use growth either as a sole measure of firm performance or in combination with profitability (Nohria and Ghoshal, 1994; Wiersema and Liebeskind, 1995; Woo, Willard, and Daellenbach, 1992).

As has been outlined before stock performance itself is also very often used in empirical studies to determine the value of a company (among others: Fama and French, 1992; Fama and French, 1998; Stattman, 1980; Rosenberg, Reid, and Lanstein, 1985; Chan, Hamao, and Lakonishok, 1991; Basu, 1983). Another ratio, which is a measure of a company's future performance potential, is the market to book ratio

and it is also used quite often (Combs and Ketchen, 1999; Farjoun, 1998; Keats and Hitt, 1988; Nguyen, Seror, and Devinney, 1990).

Further on, this matter raises the question if the different studies and their results are comparable at all. As it is impossible to negate this question, because this would lead to an absolutely insufficient situation, the answer is clear: of course there are ways how to compare the results. However, this does not mean that one can simply and naively contrast two studies and their results by saying in study A the indicator x was significant and in study B the indicator x was not significant. One has to analyze the context and the assumptions of these studies first, because they have a great impact on the measures used as well as on the results. Although this procedure seems obvious, most of the studies ignore that when comparing their results with former studies. When analyzing and comparing the studies, which have been presented above, this matter of fact is even more visible. Nearly all of these empirical studies have different performance measures. In addition, even in the cases when the measures seem to be similar, one has to admit that the definition and the calculation of these are by far not similar.

Having analyzed several studies (see above) it can be said that the outcome of an empirical analysis can depend heavily on the measures used. That is why this subject is addressed in more detail. Next the three parameters, which are used in the ongoing empirical study are presented in detail and it will be explained why they are chosen.

2.4 Performance Measures used in the Ongoing Study

2.4.1 General

Finally, it can be summarized that there does not exist one right or wrong performance measure or one right or wrong method to value a company (maybe there do exist more and less scientific methods). Neither does a common agreement exist what performance measures nor which method should be used (see above). And this is true for the endless purposes of company valuation in the practice field as well as in the economic science community. Looking back at the history and the development of various valuation methods it seems reasonable that even the current used yardsticks will not hold forever. What is important though is to analyze the goal of one study respectively the underlying assumptions. In retrospect of that, useful measures due to their specific context should be chosen carefully and then be applied. This makes clear that performance measures will vary from study to study. By the way,

this is again not only true for empirical scientific studies but also for the endless purposes of company valuation in the practice field.

One could argue now that there is no need anymore to get to know and understand the different valuation methods and its history. Moreover, the complete opposite is the case. One has to have a broad understanding of this matter to identify a reasonable measure for a particular valuation process.

Of course, one matter of fact remains, which can never be addressed sufficiently. The valuation of companies will never be objective, because as was outlined even the choice of a valuation method has a deep impact on the result. That is why this issue has to be always on the mind of the researcher as well as of the reader. Furthermore, the theoretical part of a study should explain in detail why exactly these measures were used and not others. This seems obvious but is sometimes missed out by researchers. In fact, some researchers seem to hide themselves behind performance measures used in previous studies without outlining why they are appropriate in the current study.

Having said that, it is obvious that the concept of the ongoing study does not claim to be perfect. Because this would mean that the results would be the same with different performance measures used. In fact, this will probably not be the case. Therefore, it is no surprise that when examining different previous studies on this topic the results vary significantly. Regarding the influence of liquidity on company performance compare for example Brealey and Myers (1996), Jensen (1986), and Johnson and Soenen (2003), where three different results were achieved (i.e. not significant, positively and negatively related). In addition, even if the performance measures are the same in different studies, different outcomes are not rare either. That is why all results should be looked at in retrospect of their methodology and data used and be treated with consciousness when referring to them. However, what can be said is that given the underlying assumptions the model used in the current study with its three measures seems reasonable and will present traceable results. Whereas this does absolutely not mean, that the results will be more significant in a statistical sense than maybe others would be. They shall only be more significant and true from an economic point of view (and in line with the presented hypothesis). That is why the selection of the performance measures was a major part in the current study.

Another prerequisite for the selection of performance measures was the possibility to account for different circumstances. Therefore only relative measures can be used. Otherwise, the comparison between two or more companies with different sizes or other criteria would not be possible.

Moreover it is important that the selected performance measures are more or less relevant for all companies in the pool. As the underlying pool in the ongoing study consists of current listed companies in the United States of America (more on this later), the data can be called quite heterogeneous in terms of industries, sizes, ages and other factors. Therefore the performance measures have to be somehow resilient to these factors.

Based on extensive research on this topic and in accordance with the assumptions of the ongoing study the following three different performance measures are chosen (i.e. market performance, cash flow performance, and profitability performance). These three performance measures represent three different dimensions of a company, as it can be assumed that the influencing variables have a different effect on certain performance measures. Thus three different models will be formulated and investigated. However, all three dimensions are representing in different ways the main goal of any listed company, i.e. creating shareholder value. These three different dimensions will also have interactions and interdependencies. In table one this performance model is pictured and afterwards explained in detail:

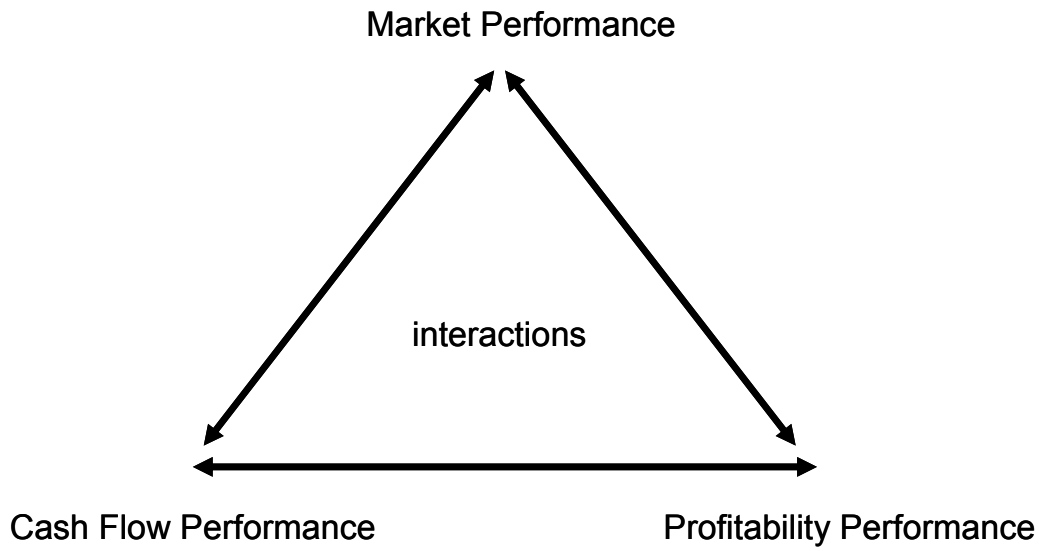

Table 1: Performance model; Source: own

2.4.2 Profitability Performance

The first performance measure is the profitability performance measured by the Return on Investment, which is calculated as followed:

$$\text{Return on Investmet } t_1 = \frac{\text{Income before Extraordinary Items } t_1}{\text{Invested Capital } t_1} \times 100$$

The Return on Investment (ROI) is a performance measure used to evaluate the efficiency of a company or to compare the efficiency of a number of different investments or companies. To calculate the ROI, the benefit (i.e. return) of an investment is divided by the cost of the investment; the result is expressed as a percentage. This measure is also used to examine how profitable a company works and how much capital is required to earn a certain amount of money. One main advantage of this ratio is that it can easily be compared within a group of companies. Although there are also industry specific factors, this ratio is a good instrument to evaluate companies, because it answers the question of how efficiently the invested money was employed. It is therefore nothing else than a quasi interest pay for the whole capital employed.

In practice the Return on Investment is very often seen as the key ratio among all ratios and has a very widespread use. But also in empirical studies the ROI is used quite often as a measure of profitability (e.g. Busija, O'Neill, and Zeithaml, 1997; Dess, Lumpkin, and Covin, 1997; Johansson and Yip 1994). The main reason is that this ratio takes into account nearly all factors of a company. Moreover the ratio can be subdivided in several other ratios and can be shown in a so called ratio tree. The most common description of this ratio tree was implemented by an American chemical company called DuPont in the 1920's (i.e. DuPont model).

The ROI represents the overall profitability of the company and is therefore the first performance measure used in the ongoing study. It is assumed that the indicators introduced in the ongoing study have a direct effect on the profitability. Higher or better ratios will have a positive effect on the profitability performance. Probably this measure will present the most reliable results, as there are rarely any outside influences on the profitability of a company. However there is one major drawback with this performance measure. The income as well as the assets may differ according to different accounting methods and interpretations used. Therefore this ratio might not always be comparable and it is not guaranteed that it always measures the real performance of a company. To account for this fact some restrictions concerning the selection of companies are made (more on that later). In addition, there does not exist a completely unbiased performance measure at all.

In terms of shareholder value this measure is responsible for the internal performance of the company. The profitability performance is called internal performance because it focuses only on the company specific performance and has nothing to do with the stock market or with direct flows to the shareholders. This dimension answers the question of how efficiently the invested money of the shareholders is em-

ployed. This is an important issue to the shareholders, especially when comparing returns across different stocks.

The ratio Return on Investment is calculated in the ongoing study as income before extraordinary items, divided by total invested capital, which is the sum of the following items: total long-term debt, preferred stock, minority interest, and total common equity. This is then multiplied by 100 (Standards & Poor's, 2002).

2.4.3 Cash Flow Performance

The second performance measure is cash flow performance measured by shareholder cash flow which is calculated as followed:

$$\text{Shareholder Cash Flow } t_1 = \frac{\textit{Cash}\ \text{Dividend } t_1}{\textit{Market}\ \text{Value } t_1} \times 100 .$$

This indicator measures the proportion of the sum of all dividends paid out to the shareholders in relation to the total market value (in t_1) and is also a percentage number. It is equivalent to the ratio dividend per share to stock price. This ratio is called shareholder cash flow in this context because it is the real flow of cash to the shareholders. Most of the time expected or realized earnings per share are chosen to compare stocks. This is done very often by investment bankers, analysts and investors. However, this procedure has one major drawback. The past has shown that the reported earnings will vary significantly from the amounts which are later distributed to the shareholders. This is not only true for real earnings per share but also for cash flow per share ratios. It is also common practice that the earnings and cash flow numbers are restated several times before their final value is presented on the balance sheet. The main disadvantage of the earnings numbers is that they may vary dramatically due to the valuation methods and accounting standards used. Not even to mention fraudulent practices, which have also been applied to a tremendous extent in the past and therefore have falsified results.

As mentioned cash dividends are in contrast to most earnings numbers the sum of all actually paid dividends. It is the cash flow generated by the company and distributed to the shareholders and can therefore (almost) never be subject to misspecification. Cash dividends represent a real value to the shareholder. That is also the main reason why this performance measure has been chosen. Especially recently the "cash flow is king" mentality has found broad support by many investors. Cash flow can (usually) only be generated when cash and therefore earnings are produced. Unlike the stock price, which is dependent on the stock market, cash dividends can be seen

as the inside perspective of the performance model. The company itself determines how much cash is generated (based on its performance) and how much of this cash is invested and how much is distributed to the shareholders.

This measure has not been widely used in empirical studies so far. However it is chosen because it is the second essential part (beside the stock performance) of a shareholder's real value. The relationship between the potential indicators and the cash flow performance is determined by the assumption that better indicators (i.e. ratios) will lead to a higher profitability which in turn leads to higher cash flows and finally greater cash dividends. In short, better indicators shall lead to greater shareholder value in terms of cash dividends.

However there exists also a drawback associated with this performance measure. The distributed cash dividends are certainly a real created value, which is a good proxy for the cash flow performance of a company. But this measure may not be reliable, because a company has mainly two possibilities in dealing with generated cash flow. Either the cash is ploughed back and invested or the cash is distributed to the shareholders. Imagine the case in which a company is able to generate a lot of cash flow but decides to plough back the whole amount due to whatever reasons. Although the company would have a good overall cash flow performance, this issue would not be captured by the ratio shareholder cash flow. On the other hand one could argue that this is exactly how it should be because shareholder cash flow is only about what the shareholder finally gets (in terms of cash). That is why despite a potential drawback this specific measure is chosen. And again, there does not exist a perfect performance measure without disadvantages.

The nominator of the fraction, cash dividends, represents the total amount of cash dividends for both common and preferred stock. This item includes arrearages from prior years paid in the current year, cash paid in lieu of fractional shares, dividends paid by companies acquired using the pooling of interest method, liquidating dividends or distributions, and partnership distributions. This item excludes cash value of stock dividends, dividends in kind (other than cash), minority shareholders' dividends, patronage dividends, and preferred dividend requirement paid in common stock. The item cash dividend contains a combined figure data code when the retained earnings schedule on the balance sheet presents an amount for cash dividends but no payments are represented on either the source and use of funds statement or statement of cash flows or the statement of changes (Standards & Poor's, 2002).

The figure market value in the denominator is calculated in the same way as explained in the next sub-chapter.

2.4.4 Market Performance

Finally, the third performance measure is market performance measured by the current market value which is calculated as followed:

$$\Delta\, Market\, Value\, \mathrm{t}_1 = \frac{Market\, Value\, \mathrm{t}_1 - \mathrm{Market\ Value\ t}_{-1}}{Market\ \mathrm{Value\ t}_{-1}} \times 100\ .$$

This indicator measures the increase or decrease of the price of a listed stock during one period of time (from t_{-1} to t_1) and is a percentage number. It therefore reflects the stock market and its expectations about the future developments of a company. As it is assumed that the stock market is the market closest to what is called in economics a perfect market, the stock price should reflect more or less the true present value of a company. The explanation is fairly simple: A great number of investors hold this stock at exactly the current price and do not want to sell it. On the other hand, even a much greater number of potential investors do not buy the stock at a higher price (even it is only a small fraction). The price of each stock is therefore seen as the most actual and appropriate measure of a company's value.

Although one has to admit that in the short run speculating and day trading will affect the stock price in a non-rational way, in the long run this speculating should be smoothed by the real value of the company. In general, it can be assumed that a stock is not a subject of speculating for a period longer than three to five years. Therefore the values of the nineteen year time series should represent the real value of the company. In addition, to avoid speculating and short term effects this measure is only collected and used on a yearly basis.

As mentioned, this performance measure is also meant to represent the future perspective of the company and should therefore include the future expectations in the model. This is because (long term) investors are buying a stock because they feel the money they have to pay is less worth than the value of the stock they will receive in return. That is the principle behind each sale, be it a car, food, clothes, or simply a stock. In terms of stocks, the rationale assumption is that the future of the company will be prospering and that is why the stock is bought today. Put simply, prospering either means a rising stock price or high future dividends. Therefore the future performance is priced in today. It is assumed that when certain indicators (e.g. ratios) are positive, the market will react to that and the share price will rise and vice versa. This is the assumed relationship between the potential indicators of success and the market performance.

The main reason why this market performance measure is chosen, is the wide spread use in previous studies (e.g. Fama and French, 1992; Fama and French, 1998; Stattman, 1980; Rosenberg, Reid, and Lanstein, 1985; Chan, Hamao, and Lakonishok, 1991; Basu, 1977 and 1983). Another advantage is the easy way to calculate it as well as the data availability. Moreover it is simply the price of the company and therefore has to have any economic meaning. In addition, in the performance model shown above the stock price shall reflect the outside perspective of the company. The perspective is called outside, because the movements of the stock price are determined by the stock market (i.e. the investors) and thus can never be influenced completely by the company's executives. The perspective is outside because the stock market is outside of the company. The market performance is the third dimension representing shareholder value, as the stock price is a key measure of a shareholder's asset. And even if the stock price is determined by irrational factors to some extent it is still a real value as it is the current price of the stock.

This data item provides a pre-calculated company-level market value based upon the sum of all the company's trading issues multiplied by their respective year end closing price. Therefore, market value is the same as market capitalization. It is based upon all of the company's shares and that is also why it is the most commonly used market value number. If a company has multiple issues of stock, all actively traded issues for the company are put into the calculation. For example, if a company has two classes of issues, A and B, that are actively traded, the company market value will be calculated as follows (Standards & Poor's, 2002):

MKVALM= [(Price Cl A * CSHOC Cl A) + (Price Cl B * CSHOC Cl B)]

From April 1998 forward, market value - monthly is based upon the month-end close price multiplied by the common shares outstanding – current issue as provided by FT Interactive Data. If the current common shares outstanding value is not available, the most recent quarterly value during the last four quarters is used. If no value exists in any of the previous four quarters, then the value for annual shares outstanding is used. Prior to April 1998, for each month, the month-end close price is multiplied by the appropriate current value for common shares outstanding. If the most recent current common shares outstanding is not available, then the next current value during the last four quarters is used. If no value exists in any of the previous four quarters, then the value for annual shares outstanding is used (Standards & Poor's, 2002). To calculate the year end stock prices the corresponding December prices have been taken.

2.4.5 Summary

It can be said that if different dimensions are taken into account when valuating a company the results will represent a closer estimate of the value (Hicks and Issac, 2000). That is why these three different measures were chosen, which represent three different dimensions of a company. These three dimensions shall represent the complete goal of each shareholder, because it fulfills the main ways of possible value creation. If all three performance measures are positive then dividends (i.e. cash flow) are obtained, the stock price is rising and the profitability is high. That would be the perfect company an investor is looking for. It will be interesting to examine if such indicators exist and how they are related.

As will be outlined later on, not in all cases the performance measures are expected to be influenced by potential indicators in the same direction. E.g., imagine the case in which a greater dividend payout to the shareholders would certainly boost the cash flow performance but probably hurt the future profitability performance, because the cash cannot be invested. In addition it can be expected, that some indicators will mainly influence only one or two of the three performance measures, whereas having absolutely no link to the third performance measure. A main point of interest will therefore be a comparison of the results in respect of their performance measures.

In terms of reliability of the results, the market performance will definitely have the most noise. Noise here represents effects that have a significant influence on the performance but can hardly be captured in a model (e.g. speculating, day trading). Therefore the specified market models might have a lack of reliability. However the stock price is kept in the study as a performance measure for two reasons. First, the widespread use in previous studies and second because the stock price will not be fully explained but at least to a decisive extent. The cash flow model will also be affected by some noise. Although the cash flow to the shareholders is real and creates value, the amount of this cash flow is not only influenced by the capability of generating cash flow but also by the dividend policy. Consider the case where cash flow is generated in the company, which would be considered positive, but no dividends are paid out to shareholders because all the money available is invested. Then the indicators would predict a good performance but the performance measure itself would have a poor performance. As it is assumed that this will not happen too often, this measure is also kept in the study. Having said that, the profitability performance is assumed to generate the most reliable results, because there will be the least noise compared to the two other measures. This would of course undermine the heavy use of this ratio in the practice field and suggest its further usage. However accounting issues might cause interference and lead to limited results.

To complete some final considerations concerning the different effects on the performance measures: Growth stocks will generally perform better in terms of market performance, because they are traded and held mostly because future growth is expected. In contrast value stocks will have better results when it comes to cash flow performance, because future earnings and dividends are more likely than exorbitant growth in stock price (Lakonishok et al, 1994).

2.5 Potential Indicators

Every rational investor (independent of his size) is interested in achieving long term wealth accumulation. And of course this wealth creation, also called shareholder value, should be above the average stock market performance and other investment possibilities with a similar risk type. This goal of investing is colloquially also called "putting money in winning bets". In the past there has been a nearly eternal search for winning stocks, both from economists and (financial) practitioners. Letting aside the short term view with all its critics and negative developments it has to be said that in the long run, not speculating but real value counts and also prevails. And it is assumed that certain indicators are relevant for creating this value and therefore are also driving stock returns (in terms of dividends and stock price) as well as pure company performance (in terms of profitability).

By the way, the rational investor described above is not only the typical investor, who invests his private capital at the stock market. Besides these typical "equity investor" also the banks and other money lenders are interested in "investing" in a successful company. This means, not only investors are interested in companies with a good track record but all participants of the economic process, which are also sometimes referred to as stakeholders. This includes employees as well as customers and suppliers only to mention a few.

As outlined in the beginning the writer assumes that there do exist several general factors which are (nearly always) relevant for the success of companies. The answer to the question "Why are some Companies more Successful than Others?" is not luck or chance but some key factors. These key factors will of course not fully explain the success but to a decisive extent. These factors are believed to be sustainable ones, which means that they are relevant in different kind of economic situations and are also true in different industries. Of course different factors will be differently important for the three performance measures used in the ongoing study, however some main trends should become obvious.

In this dissertation project, 17 different potential indicators are examined and chosen. These possible indicators can generally be separated in two groups. The first group consists of indicators, which have already been tested and looked upon in previous studies. These indicators will be discussed first. In the second part, also new indicators will be introduced. New in this context means, that there has not yet been conducted notable research on these indicators. But the writer assumes some of these may have a significant influence on the success of companies and that is why they are added in the ongoing study.

In the following subchapters, these single indicators are introduced and discussed in very detail. The concept and the idea of the indicators (and ratios respectively) are explained as well as the calculation and measurement. In terms of measurement the detailed information from the Compustat data guide is presented. Moreover, it is outlined why they are chosen and what occasionally prior studies found out about their relationship to financial success of companies.

It is important to mention here that also time lags are introduced in all three models. They are indicated by the negative numbers in the parentheses behind the specific indicators. Generally it can be said that in time series models there may be a certain time period between the impacts of an independent variable on the dependent variable. If this time period is sufficiently long lagged explanatory variables should be included in the model. Then the specification of a model's lag structure is a function of the time units of the data (Pindyck and Rubinfeld, 1998). As the current study uses panel data, which consists of a time series and a cross section component it seems reasonable to introduce such time lags for specific variables.

Finally, note that the potential indicators as well as the performance measures mentioned above are all relative measures (with one exception, i.e. size). These measures are either ratios or percentage changes of the underlying data. This means they can be compared within a pool of companies because their type accounts for different sizes. E.g., when it comes to the influence of research and development expenses, not the absolute amount is used but the ratio relative to sales. This ratio accounts for the fact, that smaller companies in terms of sales will definitely have less absolute R&D expenditures than bigger companies.

2.5.1 Indicator No. 1: Book-to-Market Ratio

The book-to-market ratio is used to find the value of a company by comparing the book value of a firm to its market value. Book value is calculated by looking at the firm's historical cost, also called accounting value. Market value is determined in the

stock market through its market capitalization and is determined by buyers and sellers of the stock using current information to determine whether to buy, sell or hold a stock. This ratio is widely used as a measure of a firm's growth opportunities and is therefore a proxy for expected earnings (Johnson and Soenen, 2003).

Basically, the book-to-market ratio attempts to identify undervalued or overvalued securities by taking the book value and dividing it by market value. If the ratio therefore is above one then the stock is seen as undervalued, and if it is less than one then the stock is seen as overvalued. This term can also be inversed to the market-to-book ratio.

The need for book value also arises when it comes to generally accepted accounting principles (GAAP). According to these rules, hard assets (like buildings and equipment) listed on a company's balance sheet can only be stated according to book value. This sometimes creates problems for companies with assets that have greatly appreciated. These assets cannot be re-priced and added to the overall value of the company.

This ratio is the most widely used variable when it comes to empirical research in this field. For example Fama and French (1992) show that the book-to-market ratio of individual stocks has the ability to explain cross-sectional variation in stock returns. Later Fama and French (1998) show that in the period from 1975 to 1995 value stocks have higher returns than growth stocks. This study includes companies not only from the United States but from all around the world. Chan, Hamao and Lakonishok (1991) find similar results when examining Japanese companies. However, two other researcher groups present contrary results concerning this ratio. Kothari and Shanken (1997) and Pontiff and Schall (1998) show that the Dow Jones Industrial Average book-to-market ratio has the ability to predict market returns but in a negative way. Most recently Johnson and Soenen (2003) find that the book-to-market ratio has a significant positive relation with Jensen's alpha. However, this ratio has a significantly negative effect on another performance measure used in the ongoing study, the Sharpe's ratio. As mentioned before, the results of studies in this field are very sensible and will be influenced by a number of external and internal factors (e.g. time period and database) as well as by the specific performance measure used.

The assumptions concerning the effect of this ratio are as followed. Value stocks have by definition a relatively high book-to-market ratio (so called blue chips) and will therefore have lower returns than growth stocks (with a low book-to-market ratio). Here the future potential of the growth stocks is being priced in. Therefore the book-to-market ratio should have a negative impact on the market performance. On the

other hand, the book-to-market ratio is expected to have a positive effect on the cash flow performance as well as on the profitability performance. The higher the ratio, which is mostly true for value stocks, the better the cash flow performance and the profitability.

In the present study the ratio (book-to-market) is calculated by the book value per share divided by the share price close. Book value per share is based on fiscal year-end data and represents common equity – at liquidation value divided by common shares outstanding. Share price close contains the absolute close market prices for each calendar month. Bid prices are reported for over-the-counter issues which are not traded on NASDAQ National Market System (Standards & Poor's, 2002). For the purposes of the ongoing study the close prices as of the end of the calendar year are taken.

2.5.2 Indicator No. 2: Size

Size is the second most publicized variable to explain stock returns. This indicator is measured in the ongoing study by total assets in millions of dollars. In previous studies also the market capitalization is used to measure size. Total assets are a very popular number for measuring the size of a company, because it can be easily taken from the balance sheet and represents the cumulated value of its past performance. However it has some drawbacks because it is especially dependent on how a company valuates its assets and therefore this variable may lack of comparability.

Company size is the second most publicized variable to explain company performance. For example Fama and French (1992) show that stock returns are negatively related to size. A similar result is provided by Banz (1981) and Basu (1983), who find that small stocks have higher returns than big stocks. Barber and Lyon (1997) reveal that the relation between size and security returns is also similar for financial and non-financial firms. Rouwenhorst (1999) shows that even in emerging markets stocks small stocks outperform large stocks. On the other hand Johnson and Soenen (2003) find that on average large companies have superior financial performances.

There do exist different approaches concerning the relationship between company size and financial success. On the one side it can be said that large companies have superior financial performance because of risk diversification, dominant market position, better access to capital markets and lower interest rates. Economies of scale and economies of scope are also mentioned in favor of large companies. Others argue that size is a disadvantage because of such factors as complexity, bureaucracy and inefficiencies. In this context size is expected to have a positive effect on the

profitability performance and the cash flow performance while having a negative impact on the market performance. This is assumed, because value stocks are expected to be larger and older ones, which have higher profitability and cash flows but lower stock growth (this approach is similar to approach presented in context with the previous indicator). Moreover the negative impact on the market performance is confirmed by the results of previous studies.

This item (size) represents current assets plus net property, plant, and equipment plus other noncurrent assets (including intangible assets, deferred items and investments and advances) (Standards & Poor's, 2002).

2.5.3 Indicator No. 3: Sustainable Growth Rate

For future growth, a company needs money to fulfill its investment plans. In this respect there are constraints and limitations regarding dividend payout and leverage. The sustainable growth rate is the highest growth rate a firm can maintain without increasing its financial leverage (because no liabilities have to be taken). It is the money which stays in the company and can be invested. It is therefore the part of the remaining cash flow which is not distributed to the shareholders. The sustainable growth rate is calculated by multiplying the earnings retention rate by the return on equity. This indicates that there are two ways how to increase the sustainable growth rate, namely by either increasing the profitability or by decreasing the dividend payout.

The higher the sustainable growth rate, the more financial flexibility the company gets to expand and therefore a higher rate is seen as better. The planned projects can be financed out of retained earnings and so the market (i.e. competitors) does not necessarily recognize the investment plans and the dependency on the market is less great. In addition the (negative) influence of the debt lenders (e.g. banks) can be minimized.

While the sustainable growth rate is helpful when analyzing whether a company's growth plan is realistic based on its profits, it is important to note that the sustainable growth rate does not evaluate whether a company has the opportunity to grow. If there is no market for the goods or the services produced, it does not matter how high a company's sustainable growth rate is. What the sustainable-growth equation says is that, given expansion opportunities, a company's growth is a function of the return it makes on its shareholders' equity and the portion of its earnings that it plows back into equity.

Johnson and Soenen (2003) find that companies with higher sustainable growth rates have superior financial performances. It is assumed that the sustainable growth rate has a positive effect on the cash flow performance as well as on the profitability performance, because more money can be reinvested (instead of distributed to the shareholders) which leads to a better performance in the future. Higher earnings will increase the Return on Investment as well as the cash dividends. This positive outlook should also have a positive impact on the market performance, because investors are expected to prefer companies with a better future performance. As these investments will probably not pay off in the same year a time lag of one year is introduced. In fact, the cash flow performance will (has to) even decline in a year with a high sustainable growth rate and therefore have a negative relation (when measured in the same period). This is due to the simple trade off relation between a high earnings retention rate and high cash dividends.

The earnings retention rate is income before extraordinary items minus cash dividends. This total is divided by income before extraordinary items and then multiplied by 100 (Standards & Poor's, 2002). Return on equity is income before extraordinary items - available for common, which is defined as income before extraordinary items and discontinued operations less preferred dividend requirements, but before adding savings due to common stock equivalents, divided by common equity as reported, which is defined as the common shareholders' interest in the company. This is then multiplied by 100 (Standards & Poor's, 2002).

2.5.4 Indicator No. 4: Profitability

Profitability is measured as Return on Assets and is displayed as a percentage figure. It is a ratio that measures how effectively or efficiently a firm uses its assets and is therefore a useful indicator of how profitable a company is relative to its total assets. It also shows how well the company is able to use their assets to generate earnings.

Return on Assets for public companies can vary substantially due to different criteria, but will be dependent across the industry they are in. This is why it is best to use this ratio as a comparative measure to compare against a company's previous Return on Assets or the Return on Assets of a similar company. Nevertheless this ratio is included in the ongoing study as an explanatory variable, because a general positive trend across all companies in the sample can be expected.

The assets of the company are comprised of both debt and equity. Both of these types of financing are used to fund the operations and the investments of the com-

pany. The Return on Assets ratio gives investors and analysts an idea of how effectively the company is converting the money available for investing into net income. The higher the ratio the better, as the company is earning more money on less invested money. An investor will look for an investment (i.e. company), where the return on his input is maximized.

The effectiveness with which capital (fixed assets, working capital, other assets) is employed is obviously important for the success of the company. It is obvious that the greater the return on assets, the better the performance of the firm will be. For different reasons (compare Indicator No 1. Size) it has to be assumed that it is more difficult for larger as well as dynamically growing companies to maintain a high return on their assets.

Johnson and Soenen (2003) find again that there does exist a positive relationship between return on assets and company performance. Also in this context an immediate positive relation between the Return on Assets and all three performance measures is expected. Higher profitability measured by this ratio should increase the overall profitability (ROI), the shareholder cash flow (cash dividends), and lead to a rise of the stock price (market value). The relation between the Return on Assets and the profitability measure seems obvious. Cash dividends shall be positively influenced because a higher profitability should lead to a higher overall cash flow which finally leads to a higher shareholder cash flow. Investors also appreciate high profitable stocks and so the market performance will increase as well.

Return on Assets is income before extraordinary items - available for common, divided by total assets, which is defined as the sum of current assets, net property, plant, and equipment, and other noncurrent assets. This is then multiplied by 100 (Standards & Poor's, 2002).

2.5.5 Indicator No. 5: Capital Structure

This indicator is measured by the relationship of long term debt to total assets and is a proxy for leverage. It is assumed that when external funds are borrowed (e.g. from banks) at a fixed rate, they can be invested in the company and gain a higher interest than the interest paid to the bank. The difference is a net profit for the shareholders and boosts therefore the Return on Equity. The reason for this possibility and the chief benefit of debt is the tax deductibility of interest expenses and therefore a cheaper source of funds than equity (Modigliani and Miller, 1963). Of course there is also a trade off involved. The primary costs are those associated with financial distress and the personal tax expense bondholders incur when they receive interest in-

come (Miller, 1977). Moreover, it can be said that firms have optimal debt-equity ratios, which are determined by trading off the benefits of debt with the costs. And these ratios are firm specific and will therefore vary across them. Concerning the effect of this indicator there exist different findings in the literature, which can be attributed to the trade off mentioned above.

An empirical study by Bhandari (1988) provides empirical evidence that the expected stock returns are positively related to the ratio of debt to equity. However Fama and French (1998) find no reliable evidence of the tax effects and actually find the opposite of the common knowledge, i.e. a negative relation between debt and firm value. High leverage and increases in leverage are bad news about value because at higher levels of debt, the stockholder-bondholder agency problems that arise when debt is risky predict a negative relationship between leverage and profitability. The findings of Johnson and Soenen (2003) do not provide evidence at all that there does exist a relationship (neither positive nor negative) between the capital structure and company performance.

In the ongoing study in line with the results of Fama and French (1998) a negative impact of debt on company performance is assumed. This should be true for all three performance measures. This is argued by the following facts: First, companies listed on major stock exchanges should become all money needed to make reasonable investments and therefore do not need too much debt. Of course, each company will have a certain amount of debt in the balance sheet but the question is to what degree. Smaller, not listed companies are expected to have a higher leverage because their access to the equity market is limited. Second, equity can probably be seen as a cheaper source of capital as no fix payments have to be made. Third, major influence from outside can be prevented as the goals of banks can differ from those of the shareholders.

This indicator (leverage) is measured by the relationship of total long term debt to total assets. In detail this concept is long term debt total divided by invested capital total, and multiplied by 100 (Standards & Poor's, 2002).

Total long term debt represents debt obligations due more than one year from the company's balance sheet date. This item includes purchase obligations and payments to officers (when listed as long-term liabilities), notes payable, due within one year and to be refunded by long-term debt when carried as a non-current liability, long-term lease obligations (capitalized lease obligations), industrial revenue bonds, advances to finance construction, loans on insurance policies, indebtedness to affiliates, bonds, mortgages, and similar debt, all obligations that require interest pay-

ments, publishing companies' royalty contracts payable, timber contracts for forestry and paper, extractive industries' advances for exploration and development, production payments and advances for exploration and development. This item excludes subsidiary preferred stock (included in minority interest), the current portion of long-term debt (included in current liabilities), accounts payable due after one year (included in liabilities other), accrued interest on long-term debt (included in liabilities other), customers' deposits on bottles, kegs, and cases (included in liabilities other), and deferred compensation. Long-term debt should be reported net of premium or discount. Standard and Poor's Compustat will collect the net figure (Standards & Poor's, 2002).

Total Assets represents current assets plus net property, plant, and equipment plus other noncurrent assets (including intangible assets, deferred items and investments and advances) (Standards & Poor's, 2002).

2.5.6 Indicator No. 6: Cash Conversion Cycle

The Cash Conversion Cycle (CCC) is a proxy for working capital management efficiency. It is the flow of cash from the suppliers to inventory to accounts receivable and back into cash. It is therefore an additive measure of the number of days funds are committed (i.e. tied) to inventories and receivables less the number of days payments are deferred to suppliers. It has been interpreted as a time interval between the cash outlays that arise during the production of output and the cash inflows that result from the sale of the output and the collection of the accounts receivable.

In their seminal paper, Richards and Laughlin (1980) presented this method of working capital analysis (cash conversion cycle) as a part of a broader framework of analysis known as the working capital cycle. The method claims to be superior to other forms of working capital analysis, which only rely on ratio analysis or a decomposition of working capital. The CCC is calculated by subtracting the payables deferral period (360/annual payables turnover) from the sum of the inventory conversion period (360/annual inventory turnover) and the receivables conversion period (360/annual receivables turnover). More recently, the number of days per year that appears in the denominator as 360 has been replaced by 365 to improve accuracy. Since each of these three components is denominated by some number of days, the CCC is also expressed as a number of days.

Johnson and Soenen (2003) show that the indicator cash conversion cycle is significant across all three performance measures (negative relation between length of

cash cycle and performance). Shin and Soenen (1998) report similar results whereas shorter cash conversion cycles are significantly associated with better performance.

Based on these previous results it is also assumed that in this context a shorter cash conversion cycle leads to a higher performance across all three measures. The better the working capital is organized, the better the profitability will be. This is due to the simple fact that a company does not only have to produce revenues but also have to make sure that these revenues are generated efficiently in terms of inventory and cash. A shorter cash conversion cycle means lower working capital and therefore the Return on Investment will increase (given certain fixed earnings). Working capital efficiency shall also lead to a better cash flow performance as well as a better stock performance. The positive effect (in an economical sense) on the cash flow performance is obvious as a shorter cash conversion cycle leads to a higher available cash flow.

In the ongoing study this concept is calculated by days to sell inventory plus average collection period minus days to pay accounts payable. Days to sell inventory is the average of the most current two years of inventories total. This is divided by the sum of cost of goods sold divided by 360. The average collection period is the average of the most recent two years of receivables total divided by the sum of sales (net) divided by 360. Days to pay accounts payable is accounts payable divided by the sum of inventories total plus cost of goods sold plus depreciation and amortization minus the previous value for inventories total minus the previous value for depreciation and amortization. This total is divided by 360 (Standards & Poor's, 2002).

2.5.7 Indicator No. 7: Research and Development Expenditure

Research and Development is a crucial input for a large number of firms. This is of course especially true for those operating in technology and science oriented sectors, but also for most other industries. The R&D expenditure itself is not really useful when analyzing companies because it does not account for different sizes. Therefore very often the so called R&D intensity is calculated, i.e. Research and Development expenditures to sales.

R&D expenditure is a measure of uniqueness because firms can produce and sell products that are different hence superior to the products of competitors (John, 1993). On the other side firms with low R&D intensity will sell products with close substitutes because their innovations can be easily duplicated. Therefore Research and Development can also be seen as a proxy for innovation, provided that the money is used (invested) wisely.

Chan et al. (2001) find no reliable evidence that support a direct link between R&D spending and stock returns. However, Johnson and Soenen (2003) find in their study that there exists at least a weak link to company performance (measured by EVA) but this effect is a negative one. Damanpour and Evan (1984) report a positive relationship between innovation and performance. Similarly, Subramanian and Nilakanta (1996) also find that innovativeness has a positive effect on performance when measured by return on assets. Aboody and Lev (2000) find that performance (measured by insider gains) is higher in companies with a relatively high R&D intensity.

Based on the convincing results of most previous studies it is assumed that Research and Development expenditure relative to sales has a positive effect on all three performance measures. When a company is able to be innovative trough Research and Development the profitability as well as the cash flow will rise. Investors are also expected to invest in attractive and innovative companies, which have a positive future perspective. Additionally, a time lag of two years is introduced to account for the gap between the date when the money is invested and the date when the results can be seen on the balance sheet, and on the stock price respectively.

Research and Development expenditure represents all costs incurred during the year that relate to the development of new products or services. This amount is only the company's contribution. Research and Development expenditure includes software expenses, and amortization of software costs. This item excludes customer or government-sponsored research and development (including reimbursable indirect costs), extractive industry activities, such as prospecting, acquisition of mineral rights, drilling, mining, etc., engineering expense routine, ongoing efforts to define, enrich, or improve the qualities of existing products, inventory royalties, and market research and testing (Standards & Poor's, 2002).

Sales represents gross sales (the amount of actual billings to customers for regular sales completed during the period) reduced by cash discounts, trade discounts, and returned sales and allowances for which credit is given to customers (Standards & Poor's, 2002).

2.5.8 Indicator No. 8: Advertising Expenditure

The concept of advertising expenditure is very similar to the R&D approach. It is assumed that effective advertising spending is a long term investment and has therefore an impact on future firm and product uniqueness. Moreover, advertising expenditure should be even more relevant for a company's success than R&D expenditure. As has been mentioned, R&D expenditure is particularly relevant for technology re-

lated sectors, whereas the level of awareness and a positive image is relevant for nearly all businesses. For the purposes of the ongoing study advertising spending is measured relative to sales.

Johnson and Soenen (2003) show evidence for a strong link between advertising and company performance. In line with these results it is also assumed that in the ongoing study a positive relationship between advertising expenditure and all three performance measures exists. The assumptions are the same as outlined above (indicator R&D expenditure). Again a time lag of one year is added, because the pay off will not be relevant in the current year.

Advertising expenditure represents the cost of advertising media (such as, radio, television, and periodicals) and promotional expenses and it is not available for banks (Standards & Poor's, 2002). Sales represents gross sales (the amount of actual billings to customers for regular sales completed during the period) reduced by cash discounts, trade discounts, and returned sales and allowances for which credit is given to customers (Standards & Poor's, 2002).

2.5.9 Indicator No. 9: Capital Expenditure

Capital expenditures are expenditures used by a company to acquire or upgrade physical assets such as equipment, property, and industrial buildings. In accounting, a capital expenditure is added to an asset account (i.e. capitalized), thus increasing the asset's basis. Similar to R&D and advertising expenditure, capital expenditure is also divided by sales.

An ongoing question in the accounting practice of every company is whether certain expenses should be capitalized or expensed. Costs that are expensed in a particular month simply appear on the financial statement as a cost that was incurred that month. Costs that are capitalized, however, are amortized over multiple years. Most ordinary business expenses are clearly either expensable or capitalizable, but some expenses could be treated either way, according to the preference of the company. Therefore they do not always have to be comparable.

To the reader's knowledge there have not been conducted any significant comparable studies dealing with this potential indicator. In this context it is assumed that a company which is investing in its physical assets and therefore building on its future will have a greater performance. This effect is believed to come into action one year after the corresponding expenses have been made. In the short run the influence will of course be a negative one, because higher capital expenses lower the profitability

as well as the cash flow. In the long run this relationship is expected to change inversely.

Capital expenditure represents cash outflow or the funds used for additions to the company's property, plant and equipment. It includes expenditures for capital leases, increase in funds for construction, and reclassification of inventory to property, plant and equipment. This item excludes capital expenditures of discontinued operations, changes in property, plant and equipment resulting from foreign currency fluctuations when listed separately, decrease in funds for construction presented as a use of funds, and property, plant and equipment of acquired companies (Standards & Poor's, 2002).

Sales represents gross sales (the amount of actual billings to customers for regular sales completed during the period) reduced by cash discounts, trade discounts, and returned sales and allowances for which credit is given to customers (Standards & Poor's, 2002).

2.5.10 Indicator No. 10: Auditor's Opinion

This variable is a code that indicates whether the auditor's opinion is qualified or unqualified. Generally it can be said that an audit is composed of the auditor's opinion, the organization's financial statements, notes to the financial statements, and supporting schedules, if any. It is the auditor's opinion that establishes the credibility of the organization. In fact, the auditor's primary function is to express an opinion about the financial statements of the organization.

While the auditor is responsible for his opinion, the organization itself has the primary responsibility for the remaining information presented in the audit (i.e., the financial statements, supporting schedules, and notes). The auditor will usually draft the financial statements and notes, but management is responsible for the information presented in those financial statements.

The first page of the audit is the auditor's opinion. The opinion includes an introductory paragraph, a scope paragraph, and an opinion paragraph. In addition, some opinions may include additional paragraphs called explanatory paragraphs. The introductory paragraph lists the types of financial statements being presented, the period covered, and states that management is primarily responsible for the information being presented. The scope paragraph outlines the auditing techniques used in the performance of the audit. It will also state that the auditor feels that his work provided a reasonable basis for the opinion. The opinion paragraph expresses the auditor's

views on the extent to which the financial statements fairly represent the organization's financial position. The different types of opinions that an auditor may express are described below.

It is obvious that it is not the auditor's opinion which will influence the performance of the company. Rather it is assumed that the chances are better for current and future developments when the financial statements reflect the true picture of the company. The past has shown that accounting tricks and fraud very often take place at companies, which are already in trouble or at least behind analysts' expectations.

The codes used in the Compustat database are as follows (Standards & Poor's, 2002):

Code	Description
0	Unaudited
1	Unqualified. Financial statements reflect no unresolvable restrictions and auditor has no significant exceptions as to the accounting principles, the consistency of their application, and the adequacy of information disclosed.
2	Qualified. Financial statements reflect the effects of some limitation on the scope of the examination or some unsatisfactory presentation of financial information, but are otherwise presented fairly. SPC assigns this code when a company is in the process of liquidating (even if opinion is not actually qualified) or when an opinion states that the financial statements do not present fairly the financial position of the company.
3	No Opinion. Auditor refuses to express an opinion regarding the company's ability to sustain operations as a going concern.
4	Unqualified with Additional Language. Auditor has expressed an unqualified opinion regarding the financial statements but has added explanatory language to the auditor's standard report.
5	Adverse Opinion. Auditor has expressed an adverse opinion regarding the financial statements of the company.

Table 2: Auditor's opinion - Categories; Source: Standard & Poor's, Compustat North America Data Guide

For reasons mentioned below only audited companies will be included in the study. Therefore all companies containing a "0" are excluded ex ante. To simplify matters the remaining 5 groups will be downsized to 2 groups. The first group contains companies which received an unqualified opinion about their financial statements and the second group contains all other companies. An unqualified opinion gets the dummy variable 1 and all other opinions get the dummy variable 2.

To the reader's knowledge there have not been conducted any significant comparable studies dealing with this potential indicator. The inclusion of the auditor's opinion shall be seen as an extension to previous studies and could therefore probably lead to new and better results. If the auditor expresses an unqualified opinion about the financial statements, a better financial outlook is assumed. The auditors do of course not rate the company in terms of profitability or something comparable but they simply express their opinion about the quality of the financial statements. The past has shown, that nearly all companies involved in creative accounting issues were faced with worse performance, which will in most cases have been the reason for this malpractice. The hypothesis in short is that if the auditor's opinion is unqualified a better performance is expected in the next fiscal year and vice versa.

2.5.11 Indicator No. 11: Current Ratio

The current ratio is a liquidity ratio that measures a company's ability to pay short-term obligations and it is also known as "liquidity ratio", "cash asset ratio" and "cash ratio". The ratio is mainly used to show a company's ability to pay back its short-term liabilities (debt and payables) with its short-term assets (cash, inventory, receivables). The higher the current ratio, the more capable the company is to pay its obligations. A ratio smaller than one suggests that the company would be unable to pay off its obligations if they came due at a specific point. While this shows the company is not in good financial health, it does not necessarily mean that it will go bankrupt - as there are many ways to access financing - but it is definitely not a good sign.

The current ratio can give a sense of the efficiency of a company's operating cycle or its ability to turn its product into cash. Companies that have trouble getting paid their receivables or have long inventory turnover can run into liquidity problems because they are unable to alleviate their obligations. Because business operations differ in each industry, it is sometimes more useful to compare companies within the same industry. Nevertheless this ratio is included here, because it is assumed that other things equal more liquidity is better than less. Of course there is a limit for the degree of liquidity, as when the cash would be better invested.

To the author's knowledge there have not been conducted any significant comparable studies dealing with this potential indicator, although the effects of liquidity in terms of cash have already been investigated. On the one hand Brealey and Myers (1996) argue that a high amount of liquidity is a good thing because it gives the company the possibility to make quick decisions for proper investments. On the other hand Jensen (1986) is pointing out that too much liquidity might not be good, because this may encourage managers to invest to easily in mature businesses or bad

acquisitions. The main reason for the inclusion of the current ratio is to test this specific ratio. The hypothesis is that a higher current ratio is leading to better performance, because in this case a company can ensure its liquidity all the time. This effect should be especially be true for the profitability performance. The effect should be seen in the same period.

This concept is current assets total, which represents cash and other assets that in the next twelve months are expected to be realized or used in the production of revenue, divided by current liabilities total, which represents liabilities due within one year, including the current portion of long term debt (Standards & Poor's, 2002).

2.5.12 Indicator No. 12: Quick Ratio

The quick ratio is a ratio very similar to the current ratio described above and is sometimes also referred to as the "acid-test ratio." It is an indicator of a company's short-term liquidity. The quick ratio measures a company's ability to meet its short-term obligations with its most liquid assets. Generally speaking, the higher the quick ratio, the better the position of the company in terms of liquidity.

The quick ratio is more conservative than the current ratio because it excludes inventory from current assets. Inventory is excluded because some companies have difficulty turning their inventory into cash. In the event that short-term obligations need to be paid off immediately, there are situations in which the current ratio would overestimate a company's short-term financial strength.

As with the current ratio to the reader's knowledge there have not been conducted any significant comparable studies dealing with this potential indicator. What has been outlined about liquidity in the previous chapter is also true here. The main reason for the inclusion of the quick ratio is to test this specific ratio. The hypothesis is again that a higher current ratio will lead to better performance, because the company can ensure a great amount of liquidity all the time.

Quick ratio is the sum of cash and equivalents, which represent cash and all securities readily transferable to cash, plus total receivables, which are claims against other collectible in money (within one year), divided by total current liabilities, which are liabilities due within one year (Standards & Poor's, 2002).

2.5.13 Indicator No. 13: Sales Percentage Change

This ratio is fairly straightforward and is the increase or decrease of the annual sales measured as a percentage. The concept behind this is that many practioners argue that growth is one of the key elements when it comes to sustainable success. It is assumed that earnings as well as free cash flow are moving simultaneously. The underlying condition is of course that the additional revenue is generated efficiently and that economies of scale and scope can be used. If the sales growth cannot be transformed to higher earnings than the performance measures will of course diminish.

Especially a lot of qualitative research and research from consulting companies has been done concerning this indicator stressing how important long term growth is (e.g. Mass, 2005; Nohria et al, 2003; Roland Berger Consultants, 2004). In the ongoing study a positive effect from sales growth on the performance measures is assumed. This is recorded with a one year time lag to account for the fact that first efforts have to be taken to generate new revenues and in the following year the efforts are paying off.

This concept is sales (net) divided by the previous year value of sales (net) minus one. This total is then multiplied by 100 (Standards & Poor's, 2002).

2.5.14 Indicator No. 14: EBIT Margin

This ratio is the percentage of sales left after subtracting the cost of goods sold and all other expenses, except taxes and interests. It provides a good opportunity to compare a company's return on sales with the performance of other companies in the same industry. It is calculated before income tax because tax rates and tax liabilities vary from company to company for a wide variety of reasons, making comparisons after taxes much more difficult. The interest payments are also excluded because the financing structure (leverage) should not influence the outcome. It is a measure of how efficiently a company is using its assets and how much sales is needed in order to produce a certain income.

Profit margins vary by industry, but all else being equal, the higher a company's profit margin compared to its competitors, the better. In some cases, lower profit margins represent a pricing strategy. Some businesses, especially retailers, may be known for their low-cost, high-volume approach. In other cases, a low net profit margin may represent a price war which is lowering profits, as was the case in the computer industry in 2000.

To the reader's knowledge there have not been conducted any significant comparable studies dealing with this potential indicator. The main reason for including the EBIT margin is its relative wide use in the consulting and management field, because it is easy to calculate and a good benchmark compared to other companies. The hypothesis is that a higher EBIT margin will lead to an immediate higher performance in all three dimensions. This should again be especially true for the profitability performance.

This ratio is operating income after depreciation annual (sales/net less cost of goods sold and selling, general, and administrative expense after deducting depreciation, depletion, and amortization) divided by net sales annual. This total is then multiplied by 100 (Standards & Poor's, 2002).

2.5.15 Indicator No. 15: Domestic Long Term Issuer Credit Rating (S&P)

The Standard & Poor's Issuer Credit Rating (ICR) is a current opinion of an issuer's overall creditworthiness, apart from its ability to repay individual obligations. This opinion focuses on the obligor's capacity and willingness to meet its long-term financial commitments (those with maturities of more than one year) as they come due (Standards & Poor's, 2002). It has to be said, that Standard & Poor's is one of the leading and most widely recognized companies providing worldwide credit ratings.

In the case of non-U.S. companies, the ICR is based on the local currency from the country of origin. Local currency credit ratings incorporate the critical consideration of country risks. The ratings measure the creditworthiness of the obligor but do not take into account the currency exchange or related uncertainties (Standards & Poor's, 2002).

The ICR is not a recommendation to purchase, sell, or hold a financial obligation issued by an obligor, as it does not comment on market price or suitability for a particular investor. An S&P corporate debt rating is a current assessment of the creditworthiness of an obligor with respect to a senior or subordinated debt obligation. This assessment may take into consideration obligors such as guarantors, insurers, or lessees. The ratings are based on current information furnished to Standard & Poor's from the issuer or other sources that it considers reliable. S&P does not perform an audit in connection with any rating and may, on occasion, rely on unaudited financial information. The ratings may be changed, suspended, or withdrawn as a result of changes in, or unavailability of, such information, or based on other circumstances (Standards & Poor's, 2002).

Standard & Poor's bases the ratings, in varying degrees, on the following considerations (Standards & Poor's, 2002):

- Likelihood of default (the capacity and willingness of the obligor as to the timely payment of interest and repayment of principal in accordance with the terms of the obligation)

- Nature of and provisions of the obligation

- Protection afforded by, and relative position of, the obligation in the event of bankruptcy, reorganization, or other arrangement under the laws of bankruptcy and other laws affecting creditors' rights

To provide more detailed indications of credit quality, S&P modify ratings from "AAA" to "CCC" with the addition of a plus sign (+) or minus sign (-) to show relative standing within the major debt rating categories (Standards & Poor's, 2002).

Code	Rating	Description
1	Unassigned	
2	AAA	The highest issuer credit rating assigned by Standard & Poor's, the AAA rating indicates an extremely strong capacity of the obligor to meet its financial commitments.
3	Unassigned	
4	AA+	"AA" indicates a very strong capacity to
5	AA	meet financial commitments, and differs
6	AA-	from the highest rating only in small degree.
7	A+	"A" indicates a strong capacity to meet fi-
8	A	nancial commitments, but it is somewhat
9	A-	more susceptible to adverse effects of changes in circumstances and economic conditions than obligors in higher-rated categories.
10	BBB+	"BBB" indicates an adequate capacity to
11	BBB	meet financial commitments. However,
12	BBB-	adverse economic conditions or changing circumstances are more likely to lead to a weakened capacity of the obligor to meet its financial commitments.
13	BB+	"BB" indicates less vulnerability in the near-
14	BB	term than other lower-rated obligors. How-
15	BB-	ever, the obligor faces major ongoing uncertainties and exposure to adverse business, financial, or economic conditions which could lead to an inadequate capacity to meet its financial commitment.

16	B+	"B" is more vulnerable than a "BB"-rated
17	B	obligor, but the obligor currently has the
18	B-	capacity to meet its financial commitments. Adverse business, financial, or economic conditions will likely impair the obligor's capacity or willingness to meet its financial commitments.
19	CCC+	"CCC" indicates that the obligor is currently
20	CCC	vulnerable and is dependent upon favor-
21	CCC-	able business, financial, and economic conditions to meet its financial commitments.
22	Unassigned	
23	CC	Currently highly vulnerable.
25	Unassigned	
27	D	Default. Standard & Poor's believes the default will be a general default and the obligor will fail to pay all or substantially all of it obligations as they come due.
28	Not Meaningful	
29	SD	Selective Default. Standard & Poor's believes the obligor has selectively defaulted on a specific issue but will continue to meet its obligations on other issues.
90	Suspended	

Table 3: Domestic Long Term Issuer Credit Rating (S&P) - Categories; Source: Standard & Poor's, Compustat North America Data Guide

The plus (+) or (-) sign in the AA to CC letter rankings demonstrate the issuer's relative standing within a major rating category. In order to conduct a statistical research the single rating codes have been reordered. Dummy variables starting from 1 for Rating AAA to 10 for the rating Selective Default have been introduced. The interpretation therefore is that a smaller value indicates a better long term outlook in terms of this ratio. Thereby the 10 main rating groups listed above have been maintained. All data points with the ratings "Unassigned" (1, 3, 22, 25), "Not Meaningful" (28) as well as "Suspended" (90) have been deleted.

To the reader's knowledge there have not been conducted any significant comparable studies dealing with this potential indicator. That is why the inclusion of credit ratings is also a further development in the ongoing study compared to previous investigations. As this rating is a measure of the obligor's capacity and willingness to meet its long-term financial commitments it is assumed that a better rating will lead to a better future performance. To account for this time lag the effect on the performance indicators is measured two years after the rating has been published. The market performance is probably the most likely to react in a significant positive way. But also

the cash flow performance and the profitability performance shall be influenced positively by a strong rating.

2.5.16 Indicator No. 16: Domestic Short Term Issuer Credit Rating (S&P)

The Standard & Poor's Issuer Credit Rating (ICR) is a current opinion of an issuer's overall creditworthiness, again apart from its ability to repay individual obligations. This opinion focuses on the obligor's capacity and willingness to meet its short-term financial commitments (those with maturities of one year or less) as they come due. However, it is not a recommendation to purchase, sell, or hold a financial obligation issued by an obligor, as it does not comment on market price or suitability for a particular investor (Standards & Poor's, 2002).

All other statements and outlines concerning the Standard and Poor's data which have been made above in terms of the long term issuer credit rating are also true here. That is why they are not repeated in this chapter.

Short-term Issuer credit rating range from A1+ (strong capacity to meet financial obligations) to C (currently vulnerable). Standard & Poor's assigns codes that correspond to the actual S&P commercial paper rating categories. The details concerning the codes and the rating are shown in the following table (Standards & Poor's, 2002).

Code	Rating	Description
101	A1+	Highest rating. The obligor's capacity to meet its financial commitment on the obligation is strong. Within this category, certain obligations are designated with a plus sign (+) to connote that the obligor's capacity to meet its financial commitments is extremely strong.
102	A1	
103	A2	Satisfactory capacity to meet financial commitments. Somewhat more susceptible to the adverse effects of changes in circumstances and economic conditions than obligors in higher-rated categories.
104	A3	Adequate protection parameters. However, adverse economic conditions or changing circumstances are more likely to lead to a weakened capacity of the obligor to meet its financial commitments.
105	B	Vulnerable. Significant speculative characteristics. The obligor currently has the capacity to meet its financial commitments. However, if faces major ongoing uncertain-

106	C	ties, which could lead to its inadequate capacity to meet its financial commitments. Currently vulnerable to nonpayment and is dependent upon favorable business, financial, and economic conditions for the obligor to meet its financial commitments.

Table 4: Domestic Short Term Issuer Credit Rating (S&P) - Categories; Source: Standard & Poor's, Compustat North America Data Guide

Similar to the long term credit rating the single rating codes have been reordered for statistical analysis purposes. Dummy variables starting from one for Rating A1+ to five for rating C have been introduced. Thereby the five main rating groups listed above have been maintained.

As with the long term rating also concerning the short term rating there have not been conducted any significant comparable studies. As this rating is a short term measure of the overall creditworthiness of a company a positive effect on the company performance is expected in the short term. Therefore in contrast to the long term rating a time lag of one year is introduced. A positive rating would indicate that the short term capacity of an obligor to meet its financial commitments is strong. When this is the case the market will definitely react positively. In addition a positive rating will lead to a better cash flow performance as enough liquidity is available. The profitability performance is finally a prerequisite for a good rating and therefore this relation shall also be positive.

2.5.17 Indicator No. 17: Common Stock Rankings (S&P)

A stock rating is an evaluation of a stock's past and future performance and its risk level as judged by a rating agency such as Standard and Poor's. A stock rating will usually tell the investor how the market value of a stock is related to what is believed a fair value for a specific stock. This comparison between the current market value and the fair value of a stock is based on an objective evaluation of the company. The greater the degree to which the fair value exceeds the market value, the more highly recommended (in terms of buying) this stock will be. In contrast, if the market value of the stock exceeds the fair value of the stock, then analysts will recommend selling this stock.

Many investors use stock ratings from analysts as guidance when making investment decisions. However, it is important to evaluate the methods and criteria that are used in the underlying rating process, because the applied techniques are mostly different and some of the analysts might not be competent. In addition, the past has shown

that often analysts (as well as investment banks and consulting companies) find themselves in a conflict of interest and therefore do not necessarily publish objective ratings. These conflicts of interest can occur if an analyst is investing (or hedging against) privately in the same stocks which he rates. Another issue would arise if the same company is rating and consulting another company at the same time, what is common practice on Wall Street. It is up to the reader's fantasy to imagine the outcome of such issues as this topic will not be closer discussed in this context. A good reference regarding this topic is "Take on the Street" (2002) from the former SEC chairman Arthur Levitt.

Common stock ranking is an appraisal of the past performance concerning the earnings and dividends of a stock and the stock's relative standing (as of a current fiscal yearend). Growth and stability of earnings and dividends are key elements in establishing Standard & Poor's earnings and dividends rankings for common stocks.

Standard & Poor's uses a computerized scoring system to compute basic scores for earnings and dividends, then adjusts the scores by a set of predetermined modifiers for growth, stability within long-term trend, and cyclicality. Adjusted scores for earnings and dividends are combined to yield a final score. The final score for each stock is measured against a scoring matrix determined by analyzing the scores of a large representative sample of stocks. Standard & Poor's codes, description of rankings, and the S&P ranking are presented below (Standards & Poor's, 2002).

Code	S&P Description	Ranking
7	Highest	A+
8	High	A
9	Above Average	A-
16	Average	B+
17	Below Average	B
18	Lower	B-
21	Lowest	C
22	In Reorganization	D
99	Liquidation	LIQ

Table 5: Common Stock Rankings (S&P) - Categories; Source: Standard & Poor's, Compustat North America Data Guide

In order to conduct statistical research with the data the code used by Standard & Poor's is converted to the following. The highest ranking (A+) gets the dummy variable 1, the next ranking (A) gets the dummy variable 2, and so on. Finally there exists a numerical series for the stock ranking from 1 to 9.

To the reader's knowledge there have not been conducted any significant comparable studies dealing with this potential indicator. As this ranking is an evaluation of a stock's past and future performance and its risk level this indicator should have a major influence on the market performance. This rating should reflect the current performance of the stock fairly well and therefore be a good indicator of stock performance. The relation between the ranking and the two other performance measure is also assumed to be a positive one.

2.6 Model Formulation

In this chapter finally three models are formulated, which will also be called full models. Based on what has been outlined in detail above these full models contain all parameters (explaining indicators) and can be seen as the starting point for statistical testing. Therefore the models contain on the one hand significant indicators from previous studies as mentioned above and on the other hand possible indicators which have not really been investigated in the past. The only difference between these three full models is the left hand side of the equation. On the left side the three mentioned performance measures make up separate models.

As will be outlined it is pretty difficult to determine one best model (i.e. determine the variables to include) because in the beginning there is probably more than one reasonable model. This is especially true for a multiple regression analysis compared to single regression model (Kleinbaum et al., 1987). When looking at previous studies and their differing results this seems even more evident. That is why the model selection in the ongoing study is done by the principle of general to specific and therefore the methodology of an information criterion is used. In general to specific modeling, empirical analysis starts with a general statistical model that captures the essential characteristics of the underlying dataset. Then, that general model is reduced in complexity by eliminating statistically insignificant variables, checking the validity of the reductions at every stage to ensure congruence of the finally selected model (Campos et al., 2005). The final model, which will be received, can than be seen as the best model in terms of the specific information criterion. Only significant variables are left in the final model. Nevertheless a priori thinking and research is of outmost importance to ensure a reasonable model to start from.

The market full model includes all seventeen potential indicators (explanatory variables) outlined above and is therefore described as follows

(5) mvc = c + ad(-1) + audit(-1) + btm + cap(-1) + ccc + cr + cs + csr + ebitm + ltcr(-2) + qr + rd(-2) + roa + sc(-1) + size + ssg(-1) + stcr(-1)

whereas mvc is market value change, c is the constant term, ad(-1) is the first lag of advertising expenditure to sales, audit(-1) is the first lag of auditor's opinion, btm is book-to-market ratio, cap(-1) is the first lag of capital expenditure, ccc is cash conversion cycle, cr is current ratio, cs is capital structure, csr is common stock ranking, ebitm is earnings before interest and taxes margin, ltcr(-2) is the second time lag of long term credit rating, qr is quick ratio, rd(-2) is the second lag of research expenditure to sales, roa is return on assets, sc(-1) is sales change, size is total assets, ssg(-1) is the first lag of sustainable growth rate, and stcr(-1) is the first lag of short term credit rating.

The cash flow full model includes again all potential indicators outlined above and is therefore described as follows

(6) dvpv = c + ad(-1) + audit(-1) + btm + cap(-1) + ccc + cr + cs + csr + ebitm + ltcr(-2) + qr + rd(-2) + roa + sc(-1) + size + ssg(-1) + stcr(-1)

whereas dvpv is cash dividend per share, and the indicators are the same as described above.

The profitability full model also includes all potential indicators outlined above and is therefore described as follows

(7) roi = c + ad(-1) + audit(-1) + btm + cap(-1) + ccc + cr + cs + csr + ebitm + ltcr(-2) + qr + rd(-2) + roa + sc(-1) + size + ssg(-1) + stcr(-1)

whereas roi is Return on Investment, and the indicators are again the same as described above.

In the table below the hypotheses regarding the influence of the potential indicators are summarized. They have already been explained in detail above. A plus ("+") indicates a positive relationship to the particular performance measure, whereas a minus ("-") indicates a negative relationship. As mentioned the hypotheses shown in the table are derived in part from previous studies and their results and in part from the author's own opinion. In addition, the number of time lags for specific indicators is shown in the right column.

Hypotheses of Full Models

		Performance Measure			
Indicator	*no*	Market Performance	Cash Flow Performance	Profitability Performance	time lag
Book to Market ratio	1	-	+	+	
Size	2	-	+	+	
Sustainable growth rate	3	+	+	+	1 period
Return on Assets	4	+	+	+	
Capital Structure	5	-	-	-	
Cash Conversion Cycle	6	+	+	+	
Research & Development	7	+	+	+	2 period
Advertising	8	+	+	+	1 period
Capital Expenditure	9	+	+	+	1 period
Auditor's Opinion	10	+	+	+	1 period
Current Ratio	11	+	+	+	
Quick Ratio	12	+	+	+	
Sales Percentage Change	13	+	+	+	1 period
EBIT Margin	14	+	+	+	
Long Term Credit Rating	15	+	+	+	2 period
Short Term Credit Rating	16	+	+	+	1 period
Common Stock Rating	17	+	+	+	

Table 6: Hypotheses of full models; Source: own

3 Statistical Methodology

3.1 General

This chapter provides the basics of the statistical methodology used in the current study. First, the basic assumptions of the multiple linear regression model are described as this method is the starting point for the analysis. Second, the panel data analysis including the fixed and random effect model is outlined. Third, the model selection process using the Akaike Information Criterion is explained. Fourth, a short outline about the binary logit model is given. For the sake of importance there are no derivations shown in this context. If the reader is interested in such derivations or for further details the cited books are a useful guidance.

3.2 Multiple Linear Regression

3.2.1 Introduction

Most empirical studies in economics and other social sciences try to determine whether a change in one variable causes a change in another variable (Wooldridge, 2001). The goal of a linear regression model is to model a linear relationship between one dependent variable y and one or more independent variables x_i. The dependent variable y is therefore a linear function of a series of independent variables x_i. It is an extension of straight-line regression, which involves only one independent variable. Generally, it can be said that for a given observed value of x (independent variable), many possible values of y (dependent variable) can be observed, which will differ randomly. To account for this fact a random error component ε is added (Pindyck and Rubinfeld, 1998).

There are two main reasons, why an error term is needed. First, the specified model is only a simplification of reality (as is the purpose of every model), and therefore cannot capture all determinants. If the effects of the omitted variables are small and do not interfere with the other independent variables in the model, it is reasonable to assume that the error term is random. Second, the data needed will frequently be difficult to measure and most of the times not be complete. Given these two facts, the relationship in a regression model may be seen as a stochastic one. Then, for every value x exists a probability distribution of ε and therefore a probability distribution of all y's (Pindyck and Rubinfeld, 1998).

The multiple regression can be written as:

(8) $y_t = \alpha + \beta_1 x_{1t} + \beta_2 x_{2t} + ... + \beta_k x_{kt} + \varepsilon_t$, t = 1, 2, ..., T

whereas y_t is the dependent (random) variable, β_t are fixed regression coefficients that need to be estimated, x_{kt} are the different independent (fixed) variables in k, α is he constant term, or intercept, and ε_t is the error term in t.

This regression model is a so called time series regression model. Hereby different independent variables are used to explain the dependent variable over time t but with only one cross section involved. The opposite is the so called cross sectional regression model, where several cross sections are observed only once. The only difference between these two models is the index, either i or t. When there are time series components as well as cross sections than the method to be used is panel data analysis, which will be explained in greater detail in the next chapter.

Besides other assumptions, there are three main assumptions of the multiple regression model, which will be shown and explained in the following in detail (Pindyck and Rubinfeld, 1998):

Assumption 1: The correct model specification is given by Equation (8).

Assumption 2: The x's are nonstochastic. In addition, no exact linear relationship exists between two or more of the independent variables.

Assumption 3: a) The error term has an expected value of zero and constant variance for all observations.

b) Errors corresponding to different observations are independent and therefore uncorrelated.

c) The error variable is normally distributed.

The first assumption is fairly essential and indicates that a model specification is possible at all and that the model can be defined as shown in equation (8). It is presumed that y is related to the x's. When this assumption does not hold further statistical analysis makes no sense.

3.2.2 Multicollinearity

If a linear relationship exists between two or more of the independent variables (opposing to assumption 2), than the independent variables are called perfectly collinear. In this case it is not possible to interpret (or even define) the regression coefficient, because it is impossible to assign the contribution of the overall effect of those variables to each single one. Because it is impossible to calculate least squares estimates perfect collinearity is easy to discover, while in practice one has to deal with a more complicated matter (Pindyck and Rubinfeld, 1998).

Independent variables sometimes have a high but not a perfect degree of multicollinearity, in other words when two or more independent variables are highly but not perfectly correlated. Then, it will be possible to obtain least squares estimates of the regression coefficients, but the interpretation of the results is difficult. The issue of multicollinearity is serious and probably even inevitable in data regarding social sciences studies. One indicator for multicollinearity is a high R-squared, which would indicate that the model has explained much variance, although one or all of the predictors in question are insignificant (Pedhazur and Schmelkin, 1991).

The issue of multicollinearity is shown in the following for the two variable case. When analyzing the variances of the estimated parameters, which is shown in equation (9), one can see the influence of correlation.

$$(9)\ Var\hat{\beta}_1 = \frac{s^2}{\sum x_{1t}^2 \left(1 - r^2\right)}$$

The denominator contains the term $(1 - r^2)$ and when there is high correlation this term will become small and therefore lead to high estimated variances. While the estimated coefficients will not be biased, the estimated variances are large and therefore the decisions based on this model will not be reliable. In cases when the correlation of two variables is influencing the results and would lead to a poor model it is reasonable to drop one of the variables. Having said that, a very simple but common method to detect multicollinearity is examining the standard errors of the coefficients. The standard errors are looked at before and after variables with potential multicollinearity are dropped. If one can see a decline in standard errors multicollinearity will probably be the case. In addition, a relatively high covariance between the estimated parameters would be associated with a high degree of multicollinearity (Pindyck and Rubinfeld, 1998).

There does also exist another statistical method to detect multicollinearity, i.e. the variance inflation factor (Neter, Wasserman, and Kutner, 1985). The variance inflation factor measures the impact of collinearity among the X's in a regression model. It expresses the degree to which collinearity among the predictors degrades the precision of an estimate. This is done in a two step procedure: First, models for all explanatory variables are computed, so that the right side consists out of all other explanatory variables. Then, the R-squared value of each model is looked at. Second, the variance inflation factor for each dependent variable is computed by calculating $(1\text{-}R^2)^{-1}$. If the variance inflation factor values of certain variables are greater than a certain level (e.g. seven) collinearity is likely.

3.2.3 Heteroskedasticity

If the error term has constant variance (in accordance with assumption 3), it is called homoscedastic and if the variance is changing, it is called heteroskedastic. The expected value of the error term is zero. Heteroskedasticity might arise if the researcher is examining a cross section of firms in an industry. E.g., it seems reasonable, that error terms associated with large firms will have greater variance than those associated with small firms. The assumption that errors corresponding to different observations are independent is important for both time-series and cross-section studies. To account for heteroskedasticity a panel data model will later be introduced, which can handle changing variance of the error term.

3.2.4 Estimating Coefficients

To estimate the coefficients of a multiple regression model the ordinary least square procedure, can be used (Pindyck and Rubinfeld, 1998). Therefore the following three variable model is presented:

(10) $y_t = \alpha + \beta_1 x_{1t} + \beta_2 x_{2t} + \varepsilon_t$, t = 1, 2, …, T

The least square technique is equivalent to searching for parameter estimates, which minimize the error sum of squares (ESS), defined as

(11) $ESS = \sum \hat{\varepsilon}_t^2 = \sum (y_t - \hat{y}_t)^2$ where $\hat{y}_t = \hat{\alpha} + \hat{\beta}_1 x_{1t} + \hat{\beta}_2 x_{2t}$

This can be done by finding the values of α, β_1, and β_2, which minimize the error sum of squares.

In this three variable model, the coefficient β_1 measures the change in y associated with a unit change in x_1 on the assumption that the variable x_2 is held constant. Likewise the coefficient β_2 measures the change in y associated with a unit change in x_2 with x_1 held constant. It is crucial to the interpretation of the coefficients that the assumption of constant remaining explanatory variables holds. For each data point, the regression residual is the difference between the actual values and fitted values of the dependent variable, which have been calculated trough the OLS technique.

The major conceptual limitation of all regression techniques is that one can only ascertain relationships, but never be sure about underlying causal mechanisms. In addition, it is important in making causal inferences, to avoid spurious correlation. Spurious correlation arises when two variables are closely related but bear no causal relationship because they are both caused by a third, unexamined variable (Rubinfeld, 2000). These limitations seem obvious, but they are sometimes overlooked or forgotten by researches. That is why extensive theoretical research has to be done prior to model and test a relationship with regression techniques. Moreover, it is important to add only predictor variables in a limited way and not simply including as many variables as one can think of as predictors. This problem is compounded when in addition the number of observations is relatively low. Most authors recommend that one should have at least 10 to 20 times as many observations as one has variables, otherwise the estimates of the regression are probably very unstable and unlikely to replicate.

3.3 Panel Data

3.3.1 Introduction

In different science communities, there has long been an interest to examine either the time or the space dimension. However, these two dimensions have not really been combined extensively in empirical research. Recently quantitative methods have emerged, which try to cope with the time as well as space dimension and examine these dimensions simultaneously. These methods are often referred to as pooled data analysis, pooled time series and cross section analysis, or simply panel data analysis (It is important to mention here that panel analysis in this context is not confused with panel research in survey studies).

It can be said that when the number of cross section units is greater than the temporal units (n > T), the pool is often called “cross-sectional dominant”. Conversely, when there are more temporal units than cross section units (T > n), the pool is called “tem-

poral dominant" (Stimson, 1985). Generally speaking, pooled analysis is more time oriented and panel analysis is more cross section oriented.

Panel data sets provide a good environment for researchers to investigate issues, which could not be studied in either cross-sectional or time series settings alone. Therefore the combination of time series with cross-sections can enhance the quality and quantity of data in ways that would be impossible using only one of these two dimensions (Gujarati, 2003). Moreover the number of observations increases and so does the degrees of freedom. This allows estimating more fully specified models. In addition, pooling allows to control the effects of exogenous shocks common to all cross sections (by controlling for time effects) and to reduce the omitted variable bias (by controlling for cross section effects) (Hausman, 1978).

As mentioned above it can be said that panel data sets are more oriented toward cross section analysis. In a typical panel data study, there are a large number of cross-sectional units but only a relatively small number of time series observations. They are typically wide in the sense of the total number of cross sections but short in respect of their time units. The same arguments are true in case of the current study. Nearly 1,700 units (i.e. companies) are observed over 19 time periods (i.e. yearly) – more on that later.

In such a panel data analysis, therefore the main focus is usually on the issue of heterogeneity across cross-sectional units (although, as will be shown, also time specific factors can be a point of interest). Heterogeneity means, that there are certain individual effects for individual units and the focus is to capture and investigate these individual effects.

3.3.2 Panel Analysis Equation

The following two-variable model is considered first:

(12) $y_{it} = \alpha + \beta x_{it} + \varepsilon_{it}$, for i = 1, 2, . . ., n and t = 1, 2, . . . , T

where n is the number of the cross sections and T is the number of time periods. In this model the variable y is being explained by the variable x. It has to be said, that the use of only one explanatory variable does not limit the results provided in these chapters. There are three main approaches to estimate such pooled models, the constant coefficients model, the fixed effects model and the random effects model (Pindyck and Rubinfeld, 1998).

The first type of panel model has constant coefficients, referring to both intercepts and slopes. It therefore does not account for heterogeneity. In the event that there is neither a significant cross section nor significant temporal effect, it is possible to pool all of the data and run an ordinary least squares regression model. Therefore, all other classical error term assumptions also have to hold. Although most of the time there are either cross section or temporal effects, there are occasions when neither of these are statistically significant. If this is true one large pooled regression with n x T observations can be run and then there will be (n x T) - 2 degrees of freedom (because the estimation uses up two degrees of freedom). This type of estimation is among the simplest techniques and as mentioned there are very tight restrictions necessary when it is used. This model is sometimes also simply called the pooled regression model.

As it is often not reasonable to assume that the slope as well as the intercept is constant there has been a development of different techniques, which try to cope with these circumstances. Among these, the two most important are the fixed effect model and the random effect model, which will be explained in greater detail below.

The main difference between the fixed and the random effect model is whether the unobserved component (i.e. individual effect) in the model is treated as a random effect or a fixed effect. In the traditional approach the unobserved component is called a random effect when it is treated as a random variable and a fixed effect when it is treated as a parameter which is estimated for each cross section observation. However, in case of a large number of cross sections, it almost always makes sense to treat the unobserved effects as random draws from the population. In the modern econometric approach the random effect is then synonymous with zero correlation between the observed explanatory variables and the unobserved effect. In contrast the fixed effect does not necessarily mean that the unobserved component is being treated as non random. Moreover it means that the unobserved component is allowed to be correlated with the explanatory variables (Wooldridge, 2002).

3.3.3 Fixed Effects Models

As mentioned the basic idea behind this model is, that when it comes to a least squares pooling procedure the assumption of a constant intercept may be unreasonable. It is assumed that the differences across cross sectional units and time units can be captured in differences in the constant term. Therefore dummy variables are introduced, which allow the intercept to vary over time and over cross sections. Because these i-1 dummy variables are used to designate the particular cross section or time unit, this model is sometimes also called the Least Squares Dummy Variable

model. If the slope would vary too (for both the time and the cross section), pooling would be inappropriate because each cross section would be a distinct model (Pindyck and Rubinfeld, 1998).

The first possible type of fixed effect model has constant slopes but intercepts that differ according to the cross-sectional unit — for example, the company. Although there are no significant temporal effects, there are significant differences among companies in this type of model. While the intercept is cross-section specific and in this case differs from company to company, it does not differ over time.

(13) $y_{it} = \alpha + \alpha_1 w_i + \beta x_{it} + \varepsilon_{it}$, for i = 1, 2, . . ., n and t = 1, 2, . . . , T

where w is 1 for the i-th cross section and 0 otherwise.

The second type of fixed effects model has constant slopes but intercepts that differ according to time. In this case, the model would have no significant country differences but might have autocorrelation due to time-lagged temporal effects. The residuals of this kind of model may have autocorrelation in the process. In this case, the variables are homogenous across the countries. We could account for the time effect over the t years with T-1 dummy variables on the right-hand side of the equation. The whole model could then be written as

(14) $y_{it} = \alpha + \alpha_1 z_t + \beta x_{it} + \varepsilon_{it}$, for i = 1, 2, . . ., n and t = 1, 2, . . . , T

where z is 1 for the t-th time period and 0 otherwise.

Finally there is a fixed effects model where the slope coefficients are constant, but the intercept varies over country as well as time. This would be a regression model with i-1 country dummies and t-1 time dummies. This model consists of the two previous models and could be specified as a full model as follows:

(15) $y_{it} = \alpha + \alpha_1 z_{it} + \alpha_2 w_{nT} + \beta x_{it} + \varepsilon_{it}$, for i = 1, 2, . . ., n and t = 1, 2, . . . , T

Where w is 1 for the i-th cross section and 0 otherwise and z is 1 for the t-th time period and 0 otherwise. There has been added (n - 1) + (T - 1) dummy variables to the model and the remaining two have been left out, because otherwise this would have led to perfect collinearity among the explanatory variables.

The decision to add dummy variables can be made on the basis of statistical testing. The goal of the test is to compare the error sum of squares of the ordinary least

squares model with the fixed effect model. One should expect that the error sums of squares are higher for the ordinary least squares model, because this model includes more parameter restrictions (i.e. the intercepts are not varying over time or cross sections). This means it depends on whether the increase in the error sum of squares is significant or not when the restrictions are added. If they are not significant the ordinary least squares model can be used, otherwise the covariance model has to be used. The appropriate test is an F-test and is described as follows (Pindyck and Rubinfeld, 1998):

$$F_{N+T-2,NT-N-T} = \frac{(ESS_1 - ESS_2)/(N+T-2)}{(ESS_2)/(NT-N-T)} \quad (16)$$

where ESS_1 are the error sum of squares using the ordinary least squares techniques and ESS_2 are the error sum of squares using the fixed effect model. If the intercept restrictions are correct the null hypothesis will be true and therefore the F statistic would follow a F distribution and vice versa.

Because fixed effects estimators depend only on deviations from their group means, they are sometimes referred to as within-groups estimators. If the cross-sectional effects are correlated with the regressors, then the cross-sectional effects will be correlated with the group means. In this case ordinary least squares estimation on the pooled sample would be inconsistent, even though the within-groups estimator would be consistent (Davidson and MacKinnon, 1993).

There are several drawbacks associated with the use of the fixed effects models. The fixed effects models may frequently have too many cross-sectional units of observations requiring too many dummy variables for their specification. Too many dummy variables may lead to a model with an insufficient number of degrees of freedom for adequately powerful statistical tests. Moreover, a model with many such variables may be plagued with multicollinearity, which increases the standard errors and thereby worsen the statistical power of the model to test parameters. If these models contain variables that do not vary within the groups, parameter estimation may be precluded. Although the model residuals are assumed to be normally distributed and homogeneous, there could easily be cross sections specific (groupwise) heteroskedasticity or autocorrelation over time that would further affect estimation negatively.

However, the one big advantage of the fixed effects model is that the error terms may be correlated with the individual effects. If group effects are uncorrelated with the group means of the regressors, it would probably be better to employ a more restrictive parameterization of the panel model. The fixed effect model is used when the

number of cross sections is relatively small and the sample exhausts all cross section units. In such situation the Least Dummy Variable method generates unbiased estimators.

3.3.4 Random Effects Models

As mentioned above, the inclusion of the dummy variables represents a lack of knowledge about the model. Therefore this lack of knowledge will be described trough the disturbance term. If the random effects model depends on both the cross-section and the time series within it, the error components (sometimes also referred to as variance components) models are referred to as a two-way random effects model. In that case, the error term should be uncorrelated with the time series component and the cross-sectional (group) error and not be autocorrelated. The orthogonality of these components allows the general error to be divided into cross-sectional specific, temporal, and individual error components. The random effect model can therefore be written as (Pindyck and Rubinfeld, 1998):

(17) $y_{it} = \alpha + \beta x_{it} + \varepsilon_{it}$, for i = 1, 2, . . ., n and t = 1, 2, . . . , T

(18) $\varepsilon_{it} = u_i + v_t + w_{it}$

where the component, u_i, is the cross-section specific error. It affects only the observations in that group. Another, v_t, is the time-specific component. This error component is peculiar to all observations for that time period, t. The third term w_{it} affects only the particular observation and is the combined error component. These models are sometimes referred to as two-way random effects models (SAS, 1999).

The difference between the fixed effect and the random effect model can be seen by the fact that the intercept terms in the random effect model is divided into two random variables (cross section and time series). If these both variables are assumed to be normally distributed, than a number of degrees of freedom can be saved and therefore this model will be more parsimonious. The interesting parts therefore are only the mean and the variance of the error components.

When assuming that the mean effect of the time series and the cross sections variables is included in the intercept term and that the random deviations about the mean are equated to the error components (u_i and v_t) the random effect model is derived from the fixed effect model. This will be illustrated now by assuming that there is no time series component in the error term. This simplification is made because it is then easier to show the relationship that way. As outlined before the use of the random

effect model presumes that there is no difference in the intercept, while in the fixed effect model the use of dummy variables allows for such shifting in the intercept. In the random effect model the cross section term u_i would have a mean α_u and variance σ_u^2 and the combined error term w_{it} has mean 0 and variance σ_w^2. These assumptions are equivalent to the assumption that the error component has variance $\sigma_u^2 + \sigma_w^2$, because

(19) $\text{Var}(\varepsilon_{it}) = \text{Var}(u_i) + \text{Var}(w_{it}) = \sigma_u^2 + \sigma_w^2$.

The use of a constant term in the equation will account for the effect of the mean of the normally distributed intercepts α_u. In the case of time series intercepts as well, which are normally distributed with mean α_v and variance σ_v^2, the mean effect of the random intercepts α_v will also be picked up by the constant term. Then the error term would consist of three components and would have variance

(20) $\text{Var}(\varepsilon_{it}) = \sigma_u^2 + \sigma_v^2 + \sigma_w^2$.

The equation above shows the relationship between the random and the fixed effect model. If the cross section error component term (σ_u^2) as well as the time series error component term (σ_v^2) are 0, the error term only consists of a single combined disturbance term and the ordinary least squares regression can be applied to pool the data (Pindyck and Rubinfeld, 1998).

The main focus when it comes to panel data is efficiency, as different estimation techniques will provide unbiased and consistent parameter estimates. Therefore random effect models using a so called generalized least squares (GLS) regression are more efficient than models using a covariance estimation process. The GLS estimation weights observations in inverse relationship to their variance. Since the error component variances are generally not known the weighting happens in a two stage process. First, a simple ordinary least squares technique is run on the entire data set and then the obtained residuals are used to calculate sample estimates of the variance components. Second, the estimated variances are used to obtain the generalized least squares parameter estimates (Pindyck and Rubinfeld, 1998).

3.3.5 Specification Test between Fixed and Random Effect Models

The key consideration when it comes to choosing between a random effects approach and a fixed effects approach is whether the unobserved component (i.e indi-

vidual effect) and the observed component (i.e. x_{it}) are correlated. Therefore it is necessary to have a method to test this assumption. Hausman (1978) proposed a test which is based on the difference between the random effects and the fixed effects estimates. The fixed effect model is consistent when the unobserved effect and the regressors are correlated, while in such a case the random effect model is inconsistent. Therefore a statistically significant difference is interpreted as evidence against the random effect model (Wooldridge, 2002).

The Hausman specification test is the classical and probably most widely used test in econometrics of whether the fixed or random effects model should be used. The underlying idea of the Hausman test is to compare two sets of estimates, one of which is consistent under both the null and the alternative hypothesis and another which is consistent only under the null hypothesis. A large difference between the two sets of estimates is taken as evidence in favor of the alternative hypothesis (EViews, 2004). As mentioned the research question therefore is whether there is a significant correlation between the unobserved random effects and the regressors. If there is no such correlation, then the random effects model may be more powerful and parsimonious. If there is such a correlation, the random effects model would be inconsistently estimated and the fixed effects model would be the model of choice.

The test for this correlation is a comparison of the covariance matrix of the regressors in the fixed effect model with those in the random effects model. The null hypothesis is that there is no correlation. If there is no statistically significant difference between the covariance matrices of the two models, then the correlations of the random effects with the regressors are statistically insignificant (Pindyck and Rubinfeld, 1998). In such a case the random effect model will be chosen.

The choice between the random and the fixed effect models rests on two main considerations, one logical and another statistical. The logical consideration is whether the individual effects can be considered random or not. The statistical consideration is then to compare the bias and the efficiency of the two estimators with estimating the slope coefficients (Hausman, 1978).

The equivalent test in the regression format is then to test α = 0 from doing least squares on (Hausman, 1978)

$$\breve{y} = \breve{X}\hat{\beta} + \tilde{\tilde{X}}\alpha + \upsilon \tag{21}$$

whereas $\breve{y}$ and $\breve{X}$ are the γ transformed random effects variables while $\tilde{\tilde{X}}$ are the deviations from means variables from the fixed effect specification. γ is the appropri-

ate estimator for the random effect model (generalized least squares) and is expressed here as (Hausman, 1978)

$$\gamma = 1 - \left(\frac{\sigma_\varepsilon^2}{\sigma_\varepsilon^2 + T\sigma_\mu^2}\right)^{\frac{1}{2}} \quad (22)$$

3.3.6 Model Estimation

Models have to be estimated by methods that handle the problems concerning them. A constant coefficient model with residual homogeneity and normality can be estimated with ordinary least squares estimation (OLS). As long as there is no groupwise or other heteroskedastic effects on the dependent variable, OLS may be used for fixed effects model estimation as well (Sayrs, 1989). As mentioned OLS to be properly applied, the errors have to be independent and homoskedastic (Davidson and MacKinnon, 1993). The appropriate estimator for random effect models, and therefore to deal with heteroskedasticity, is usually generalized least squares (Hausman, 1987). As mentioned above also fixed effects models with group wise heteroskedasticity cannot be efficiently estimated with OLS. If the sample size is large enough, even with autocorrelation in the error term, feasible generalized least squares can be used. Random sampling and maximum likelihood iterated by generalized least squares have also been used (Greene, 2002).

3.4 Model Selection – Information Criteria

3.4.1 General

In the ongoing study, one objective is to assess whether the effect of one variable is sufficiently important to include this variable in the model in order to make better predictions or to delete this variable. This is an issue of model selection, which is often the case in observational studies, where a number of variables are believed to explain a given pattern. It cannot be determined for sure a priori whether to exclude or include a certain explanatory variable. Therefore model selection techniques give a good guidance in choosing the best model among a set of models.

One alternative approach, which is trying to give guidance in model selection, was developed in the early 1970's and rests on Akaike's information criterion (Akaike, 1973 and 1974). The framework is also known as the information-theoretic approach, as it has arisen from information theory. Because information theory per se goes be-

yond the scope of this dissertation, the reader should read Kullback and Leibler (1951), and Cover and Thomas (1991) for further discussions on the issue. It can be said that there has been a trend towards information criteria when it comes to model selection in recent years.

Generally speaking three principles dominate the ability to make inferences in the sciences (Burnham and Anderson, 2001): First, simplicity and parsimony, second several working hypotheses, and third strength of evidence. Simplicity and parsimony is a concept based on Occam's razor, which suggests that the simplest explanation is probably the most likely. Parsimony is particularly evident in issues of model building, where the investigator must make a compromise between model bias and variance. In this context, bias corresponds to the difference between the estimated value and true unknown value of a parameter, whereas variance reflects the precision of these estimates. A common measure of this precision is the standard error of the estimate. Thus, a model with too many variables will have low precision whereas a model with too few variables will be biased (Burnham and Anderson, 2002). Thereby parsimony seeks the right balance between these two effects. The principle of multiple working hypotheses consists of first testing a hypothesis. Then according to the results, a new hypothesis is formulated to test with a new experiment (Chamberlin, 1965). Third, the strength of evidence requires an indication of which model is the best among those being considered and a measure of the strength of evidence for each model. Information-theoretic approaches take into account all three principles mentioned above, which make them quite attractive.

3.4.2 AIC

Before engaging in the construction of a model (e.g. a linear regression model or any generalized linear model), the researcher has to realize that there are no true models. In fact, models can only approximate reality. The question then is to find which model would best approximate reality given the data that have been gathered. This means the goal is trying to minimize the loss of information. As mentioned above Kullback and Leibler addressed these issues and developed a measure, the so-called Kullback-Leibler information, to represent the information lost when approximating reality (i.e., a good model minimizes the loss of information) (Kullback and Leibler, 1951). Two decades later, a Japanese scientist named Akaike proposed using Kullback-Leibler information for model selection (Akaike, 1974). In particular, he developed an information criterion which estimates the Kullback-Leibler information, namely the Akaike information criterion (AIC), which is defined as (EViews, 2004)

(23) $$AIC = -2\frac{l}{T} + 2\frac{k}{T}$$

where T is the number of observations and k is the number of estimated parameters included in the model (i.e. number of variables as well as the intercept and the error term). The log-likelihood l of the model given the data reflects the overall fit of the model (smaller values indicate worse fit) and the information criteria are computed using the full system log likelihood. The log likelihood value assuming a multivariate normal (Gaussian) distribution is (EViews, 2004)

(24) $$l = -\frac{Tm}{2}(1+\log 2\pi) - \frac{T}{2}\log\left|\hat{\Omega}\right|$$

where

(25) $$\left|\hat{\Omega}\right| = \det\left(\sum_i \hat{\varepsilon}\hat{\varepsilon}'/T\right)$$

and m is the number of equations. It is important to note that these expressions are only strictly valid when there are equal numbers of observations for each equation. When the system is unbalanced, the statistical tool used in the ongoing study (EViews) will replace these expressions with the appropriate summations.

In itself, the value of the AIC for a given data set has little to no meaning. The AIC value becomes interesting when it is compared to the AIC values of a series of models specified a priori. The model with the lowest AIC is then considered the best model among all models in terms of the information criterion. Therefore the model with the smallest AIC value is chosen as the final model. If only poor models are considered, the AIC will select the best of the poor models. This highlights the importance to determine a set of candidate models based on previous investigations, as well as knowledge of the system under study. After having specified the set of plausible models the researcher can estimate the models and compute the corresponding AIC values. The models can then be ranked from best to worse (i.e. low to high AIC values).

The principle for model selection used in the ongoing study is from general to specific. In general to specific modeling, empirical analysis starts with a general statistical model that captures the essential characteristics of the underlying dataset. Then, that general model is reduced in complexity by eliminating variables, checking the validity of the reductions at every stage to ensure congruence of the finally selected model (Campos et al, 2005).

Chen and Ni (1989) address the issue of model selection related to multiple regressions and therefore distinguish three common procedures of stepwise regression with two different model selection criteria, i.e. Akaike's AIC and the Bayesian information criterion (BIC). The first procedure is forward selection, where, given a set of r – 1 regressors, the r-th response with the best (i.e. lowest) value of the information criterion among the remaining potential regressors is included. The second procedure is backward elimination, where given a set of r regressors, all models with r-1 regressors are investigated and compared according the model selection criterion. The third procedure is finally exhaustive search, where given a number of r regressors, the best model is searched for by looking at all possible models out of these r regressors. Especially the AIC yields over-consistent solutions with the later two procedures. Summarized, if all potential regressors of a multiple regression model are known, the model selection process using the BIC is consistent by choosing the correct model (with probability 1). Nevertheless in the ongoing study the AIC with a backward elimination procedure (i.e. from general to specific) is chosen.

3.4.3 Advantages and Limitations

As mentioned the AIC is not a hypothesis test and does not have a p -value. In contrast, conventional model selection approaches such as backward, forward, or stepwise selection procedures are generally based on hypothesis tests, where at a certain p -value, a variable is included or excluded. These techniques often exhibit different conclusions depending on the order in which the models are computed, whereas the AIC approach gives consistent results and is independent of the order in which the models are computed (Burnham and Anderson, 2002).

The AIC provides an objective way of determining which model among a set of models is most parsimonious and therefore should be chosen. The concept of AIC is founded on solid statistical principles (i.e. maximum likelihood), while it is still easy to calculate and interpret. The greatest strength of the AIC is its potential in model selection (i.e. variable selection), because it is independent of the order in which models are computed.

However, there are also drawbacks associated with the AIC approach. First, a model is only as good as the underlying data. In addition, the conclusions will depend on the set of candidate models specified before the analysis is conducted. The final selected model will only be the best model among these set of models which have been considered. So it does not necessarily mean that the final selected model is the true model.

3.5 Binary Logit Model

Binary logit models are models in which the dependent variable involves two qualitative choices. They are also called binary choice models in contrast to multiple choice models where three or more mutually exclusive alternatives exist. If in a regression model one or more of the explanatory variables are binary, one can easily add dummy variables (as will be done in the ongoing study). When the dependent variable is binary the application is more complex, but this will not be the case in the current study. The main task when it comes to binary logit models is to predict whether an event is true or not and therefore find a relationship between a set of attributes (e.g. indicators) describing an individual (e.g. company) and the probability that the individual will act in a certain way (e.g. performance measure) (Pindyck and Rubinfeld, 1998).

The logit model is based on the cumulative logistic probability function and is specified as follows (Pindyck and Rubinfeld, 1998)

(26) $P_i = F(Z_i) = F(\alpha + \beta X_i) = \frac{1}{1+e^{-Z_i}} = \frac{1}{1+e^{-(\alpha+\beta X_i)}}$

whereas P_i represents the probability that an individual will make a certain choice (or react in a certain way), while the X_i are given.

This model can be estimated by converting Equation (26) to finally get

(27) $$Z_i = \log\frac{P_i}{1-P_i}$$

or

(28) $$\log\frac{P_i}{1-P_i} = Z_i = \alpha + \beta X_i$$

The dependent variable is the logarithm of the odds that a particular choice will be made. The problem of predicting probabilities within a (0, 1) interval is transformed to a problem of predicting odds of an event's occurring within the range of real line. As the slope of the cumulative logistic distribution is greatest at P = 0.5, changes in independent variables will have their greatest effect on the probability of choosing a given option at the midpoint of the distribution.

In the case of P_i is equal to 0 or 1 the log of the odds will be undefined and thus the application of OLS estimation to equation (28) seems inappropriate. Then the logit model is estimated by using an estimate of the probability of a given choice for each group by identical individuals (P_i).

$$\log\frac{P_i}{1-P_i} = \log\frac{r_i/n_i}{1-r_i/n_i} = \log\frac{r_i}{n_i-r_i} = \alpha + \beta X_i + \varepsilon_i \tag{29}$$

This equation is linear in the parameters and can be estimated using ordinary least squares. The results improve when the level of X increases, while they may be biased when samples are small.

This grouping procedure can also be used with individual observations and than the logit model will be estimated (in a three variable case) as

$$\log\hat{Z}_i = \alpha + \beta_1 X_1 + \beta_2 X_3 + \varepsilon_i \tag{30}$$

In these cases there can arise problems of heteroskedasticity when using ordinary least squares estimation and therefore the use of weighted least squares, where each observation is multiplied by a weight, is suggested.

4 Empirical Study

4.1 Data

The data used in the ongoing study is obtained from the Compustat North America database (Standard & Poor's). The file used for the ongoing study includes the financial statements and about 150 ratios of all current US-listed companies on a monthly, quarterly or yearly basis. The total number of companies is 9,854 and the data is available from 1986 to 2004. This file is obtained from the research center at Humboldt University in Berlin. The writer has been invited as a guest researcher to the Collaborative Research Center 649 and was able to obtain the data as well as conduct all necessary calculations on site. It can be said that obtaining access to the Compustat database is one crucial success factor for the ongoing study, because this database is a very rare source of reliable long term company information. Additionally, most comparable studies are using the same database and therefore Compustat can also be seen as a quasi standard in empirical analysis in this field.

Since presentations of financial data and reporting methods vary among companies and industries, Compustat uses standardized data definitions and collection procedures to ensure consistent data. Therefore also money managers, investment bankers, corporations, financial institutions, consultants, and governments are among the users of the large database.

Due to possible seasonal effects, which are not wanted and not subject of the ongoing study, only data on a yearly basis are used. Another reason for that is that certain information is not available on a monthly basis. Therefore nineteen observations (i.e. years) exist for each variable. Moreover, as some calculations need the previous one or two time periods to calculate the ratio (e.g. market performance), finally seventeen observations will be left, which represent the years 1988 – 2004.

In a first step only companies, which have been audited for the certain 19 year period, are included in the study. This selection leaves 1,672 companies in the pool. The main reason for picking only these companies is that at least their financial statements are assumed to be somewhat close to the truth. As it is common knowledge that different accounting practices and tricks are used to obtain desirable results, this is especially true for listed companies. They are almost always under pressure to produce and report certain results to satisfy analysts and in retrospect their shareholders or potential investors. Of course this is only short term thinking and is therefore not even desirable for most investors. It has to be mentioned here that most investors are

by far long term investors rather than day traders. But this topic is beyond this dissertation and therefore will not be discussed further.

However, the positive effect of audited companies should be more reliable data, because the balance sheet is revised annually by an auditor. It is assumed, that simply the fact of being audited should enhance the quality and the reliability of the financial statements. It should be assumed that when a company is audited the financial statements are reflecting more or less the real financial situation of the company. Of course one could argue, that referring to Arthur Andersen and the Enron case (among others), the auditors are not always taking their responsibility seriously enough. This will certainly be true in some cases, but for the purposes of the ongoing study the validity of the data should be sufficient. Moreover, the audited reports should reflect the real situation at least more than non audited statements. In addition, a detailed look at the remaining companies has shown that the number of overall observations is not increasing significantly when testing all companies. This is true because when a company is not audited also a lack of data in one or more years is evident. This matter will be addressed below.

Some previous studies have used a time gap of 3 to 6 months between the fiscal year end and the date when the stock return is recorded; e.g. Fama and French (1992), and Basu (1983), arguing that the accounting variables should be known before the stock returns they want to explain. However, in the current case this does not seem reasonable, because all listed companies at a certain size will report quarterly statements and other different types of forecasts. Therefore it is assumed that at fiscal year end nearly all necessary information is available to investors and so no time gap is needed. This is true for all variables except the ones where lags are added. In these cases the lags are introduced in the market model (in the same way as in the other two models).

4.2 Excluding Observations

This chapter will provide information concerning the method and the specific procedures related to the exclusion of certain observations from the original dataset used in the ongoing study. In most empirical studies influencing observations are a potential source of bad results. This is especially true for estimation procedures where the ordinary least square method is used, because the slope as well as the intercept is very sensitive to data points which lie far from the true regression line. These data points may be called outliers and they should be removed if they are due to a measurement error or if there exist plausible arguments for excluding them. However they

have to stay in the data if these "outliers" represent important information about the relationship under investigation. That it is why outliers should not be thrown away without further analysis. Indeed, the potential observations should be examined carefully to find arguments for excluding or including them (Pindyck and Rubinfeld, 1998).

As has been said most comparable studies, if at all, are dealing with outliers quite straightforward. The common method is to simply exclude either a certain industry or a specific percentage of the data (e.g. 1% of each side). See for example Cho and Pucik (2005), Fama and French (1992), and Fama and French (1998). The approach of the ongoing study is to examine each variable and to set up a rule for every single one of them. The consequence of this procedure shall be, that only real outliers, which would distort the real picture are dropped and therefore all necessary data remained in the model. In addition a great number of observations and therefore degrees of freedom shall be saved. As it would be nearly impossible to evaluate each single potential outlier of all 20 variables (the number was about 30,000 observations in total), they are split into groups, which are then analyzed. The criteria and the deletion process are shortly outlined in the following.

The analysis is done in a two step procedure. First potential outliers are detected and looked at to make sure if there is enough evidence for excluding them. The search for and the detection of potential outliers is conducted in Microsoft Excel. Each variable is looked at and reasonable boundaries are set up. Second, descriptive measures such as mean, median, quartiles and other statistics of the variables are analyzed in terms of their values before and after dropping the data points. The table below shows a summary of the deletion process.

Excluding Observations

		Data points excluded		***Data points included***	
Indicator	*no*	total number	in percent	total number	in percent of total
Book to Market ratio	1	**1329**	**4,59%**	**27600**	**86,88%**
Size	2	**0**	**0,00%**	**31768**	**100,00%**
Sustainable growth rate	3	**8578**	**29,09%**	**20906**	**65,81%**
Return on Assets	4	**283**	**0,89%**	**31386**	**98,80%**
Capital Structure	5	**496**	**1,89%**	**25702**	**80,91%**
Cash Conversion Cycle	6	**1005**	**3,44%**	**28209**	**88,80%**
Research & Development	7	**462**	**3,35%**	**13322**	**41,94%**
Advertising	8	**42**	**0,46%**	**9092**	**28,62%**
Capital Expenditure	9	**480**	**1,66%**	**28474**	**89,63%**
Auditor's Opinion	10	**0**	**0,00%**	**31768**	**100,00%**
Current Ratio	11	**112**	**0,40%**	**28175**	**88,69%**
Quick Ratio	12	**121**	**0,42%**	**28489**	**89,68%**
Sales Percentage Change	13	**594**	**1,92%**	**30390**	**95,66%**
EBIT Margin	14	**794**	**2,55%**	**30334**	**95,49%**
Long Term Credit Rating	15	**0**	**0,00%**	**9080**	**28,58%**
Short Term Credit Rating	16	**0**	**0,00%**	**4324**	**13,61%**
Common Stock Rating	17	**0**	**0,00%**	**21251**	**66,89%**
Return on Investment	18	**980**	**3,08%**	**30788**	**96,92%**
Cash Dividend per Share	19	**60**	**0,19%**	**31708**	**99,81%**
Market Value Change	20	**107**	**0,38%**	**28155**	**88,63%**

Table 7: Excluding observations; Source: Standard & Poor's; Compustat North America

When looking at the percentage number in the right column (i.e. “in percent of total”) one can see the percentage of data points included in the study relative to the possible total number (i.e. 31,768). The possible overall number of observations is calculated by multiplying the number of companies left in the sample (i.e. 1,672) with the number of time periods (i.e. 19). It comes clear that there exist two reasons why this number can be lower than the potential overall number of 31,768 observations. First, because there are ex ante only a limited number of observations available from the database. This subject will be addressed below. Second, because within the outlier deletion process some of these observations are dropped. This can be seen in the second column (i.e. “in percent”). All except one variable lose only a small fraction of their observations (i.e. between zero and five percent of the total number). This number can be regarded as small because in comparable studies up to 10% are dropped without comments or further restrictions. However one variable (i.e. sustainable growth rate) loses about a third of its observations when the deletion process is conducted. The main reason for this large number of outliers is the fact that this is a ratio which only makes sense when it is positive. Therefore all negative observations have to be excluded. In this respect the high number of excluded observation makes sense and so the variable can be kept in the model.

The main criteria for excluding observations from the dataset are described in the following. As has been mentioned in context with the sustainable growth rate all points are dropped, where the ratio makes no sense or where the number is simple not valid. The reason for such numbers is the fact that most ratios are not available in the Compustat file and therefore have to be calculated separately. The ratios are then computed using a predetermined formula. And these ratios only make sense if the figures involved are reported correctly. If for example one item in a ratio calculation is missing then the calculation an therefore the ratio makes no sense. Another main criterion is the fact that for example some funds are in the database, which have a lot of assets but actually no revenues. The same is true for holdings and other firm structures, which are only constructed for legal purposes. In these cases the numbers do not really represent the real situation of the companies. The goal of the deletion procedure conducted here is to provide data yielding a good proxy of the real life situation.

4.3 Statistical Methods

As has been outlined in previous chapters there do exist generally two main methods to deal with panel data analysis (i.e. random and fixed effect models). There are advantages as well as drawbacks for both methods when applied. In this context due to

the specific circumstances and in respect to the available data the fixed effect model has been chosen. This is justified because the Hausman test shows for all models a clear significance for the fixed effect models (more on that later). Moreover it is assumed that none of the explanatory variables is endogenous and therefore correlated with the disturbance term. And if there is no simultaneity, ordinary least squares should generate efficient and consistent parameter estimators (Pindyck and Rubinfeld, 1998; Hausman, 1978). That is why a fixed effect model accounting for cross section effects is estimated using ordinary least squares. Then the coefficients are looked at and analyzed.

4.4 Empirical Results

4.4.1 Descriptive Statistics

Before the results of the regression analysis are shown, explained, and analyzed in detail in the following chapter a few descriptive statistics are presented for information purposes. The data were taken from the Compustat North America database, corrected for outliers, and then transformed variables were computed in Microsoft Excel. First, table eight summarizes the firm size by sales of all companies in the sample for fiscal year 2004 (i.e. 1,762). This item represents gross sales (the amount of actual billings to customers for regular sales completed during the period) reduced by cash discounts, trade discounts, and returned sales and allowances for which credit is given to customers (Standard & Poor's, 2002).

What can be said about the distribution is that about a quarter of the companies in the sample have less than U.S. $ 50 millions in sales, another quarter of the companies has between U.S. $ 50 millions and U.S. $ 500 millions, 10% of the companies have between U.S. $ 500 millions and U.S. $ 1 billion and another quarter of the companies has between U.S. $ 1 billion and U.S. $ 10 billions. All companies greater than U.S. $ 10 billions (about 10%) can be seen as real blue-chips companies.

firm size by sales* (fiscal year 2004)	**number of firms** (absolute)	**total sample** (percentage)
less than $0,05	437	26,14%
$0,05-$0,1	114	6,82%
$0,1-$0,2	129	7,72%
$0,2-$0,3	83	4,96%
$0,3-$0,4	76	4,55%
$0,4-$0,5	58	3,47%
$0,5-$1	158	9,45%
$1-$5	340	20,33%
$5-$10	103	6,16%
$10-$20	82	4,90%
$20-$50	58	3,47%
$50-$100	17	1,02%
larger than $100	14	0,84%
data not available	3	0,18%
total	**1672**	**100%**

*U.S. $ billions

Table 8: Firm size by sales in billions U.S. $; Source: Standard & Poor's; Compustat North America

Second, table nine shows firm size reported by total assets of all companies in the sample for fiscal year 2004. This item represents current assets plus net property, plant, and equipment plus other non-current assets (including intangible assets, deferred items and investments and advances) (Standards & Poor's, 2002).

The companies are split into the same categories as before (firm size by sales) and the numbers presented are again U.S. $ billions. An interesting thing to point out is that both tables may follow a very similar distribution when examining the two tables. A simple chi square test is conducted, where generally the hypothesis is tested whether or not two different samples are different enough in some characteristics or aspect of their behavior (i.e. alternative hypothesis). The test reveals an interesting outcome, namely that at the five percent level the null hypothesis is rejected and therefore the two distributions are not equal (chi square value with twelve degrees of freedom of 21.03 vs. empirical chi square of 29.95). Although the distributions of the two variables do not follow the same trend in a statistical sense, they can be seen very similar in a qualitative sense. In addition, it might be possible that in case of a different classification the two samples follow the same trend.

This may be an indicator that firm size measured by total assets and firm size measured by sales are closely related to each other. Generally speaking, in order to produce more sales more assets are needed. Of course this will not be true for all companies, because different industries have different requirements and characteristics, but when it comes to US-listed companies the argument of a similar distribution seems reasonable. This relation will probably be more true in countries, where the

company law allows for more flexibility in terms of accounting of assets in general and intangible assets in particular (e.g. US-GAAP).

firm size by total assets* (fiscal year 2004)	**number of firms** (absolute)	**total sample** (percentage)
less than $0,05	410	24,52%
$0,05-$0,1	119	7,12%
$0,1-$0,2	130	7,78%
$0,2-$0,3	89	5,32%
$0,3-$0,4	53	3,17%
$0,4-$0,5	43	2,57%
$0,5-$1	180	10,77%
$1-$5	337	20,16%
$5-$10	106	6,34%
$10-$20	89	5,32%
$20-$50	72	4,31%
$50-$100	17	1,02%
larger than $100	27	1,61%
data not available	0	0,00%
total	**1672**	**100%**

*U.S. $ billions

Table 9: Firm size by total assets in billions U.S. $; Source: Standard & Poor's; Compustat North America

Third, table ten shows firm size reported by the total number of employees of all companies in the sample for fiscal year 2004. This item represents the number of company workers as reported to shareholders, whereas by some firms it is reported as an average number of employees and by some as the number of employees at yearend. If both are given, the yearend figure is used. This item includes all part-time and seasonal employees, all employees of consolidated subsidiaries, both domestic and foreign and this item excludes contract workers, consultants, and employees of unconsolidated subsidiaries (Standards & Poor's, 2002).

firm size by employees (fiscal year 2004)	**number of firms** (absolute)	**total sample** (percentage)
less than 10 employees	95	5,68%
10-100	208	12,44%
100-500	263	15,73%
500-1000	120	7,18%
1000-5000	366	21,89%
5000-10000	167	9,99%
10000-20000	114	6,82%
20000-30000	64	3,83%
30000-40000	42	2,51%
40000-50000	37	2,21%
50000-100000	72	4,31%
100000-150000	24	1,44%
150000-200000	13	0,78%
more than 20000	21	1,26%
data not available	66	3,95%
total	**1672**	**100%**

Table 10: Firm size by employees; Source: Standard & Poor's; Compustat North America

Fourth, table eleven reports the firms by their economic sector of all companies in the sample for fiscal year 2004. This code is used to identify all companies in any of the broad economic industry groups, whereas it represents the most current sector (Standards & Poor's, 2002). For detailed information concerning the economic sectors the reader is forwarded to the Standard & Poor's manual.

firms by economic sector (fiscal year 2004)	**number of firms** (absolute)	**total sample** (percentage)
Materials	152	9,09%
Consumer Discretionary	315	18,84%
Cosnumer Staples	113	6,76%
Health Care	172	10,29%
Energy	123	7,36%
Financials	154	9,21%
Industrials	329	19,68%
Information Technology	261	15,61%
Telecommunication Services	30	1,79%
Utilities	23	1,38%
Transportation	0	0,00%
total	**1672**	**100%**

Table 11: Firms by economic sector; Source: Standard & Poor's; Compustat North America

In table twelve all twenty variables are summarized.

dependent and independent variables

abbreviation	explanation	dependent/independent
AD	advertising expenditure to sales	independent
AUDIT	auditor's opinion	independent
BTM	book to market ratio	independent
CAP	capital expenditure to sales	independent
CCC	cash conversion cycle	independent
CR	current ratio	independent
CS	capital structure	independent
CSR	common stock rating	independent
DVPV	cash dividend per share	dependent
EBITM	earnings before interest and taxes margin	independent
LTCR	long term credit rating	independent
MVC	market value change	dependent
QR	quick ratio	independent
RD	research expenditure to sales	independent
ROA	return on assets	independent
ROI	return on investment	dependent
SC	sales change	independent
SIZE	total assets	independent
SSG	sustainable growth rate	independent
STCR	short term credit rating	independent

Table 12: Dependent and independent variables used in the ongoing study; Source: own

Finally, in table thirteen the descriptive statistics of all 20 variables – dependent and independent -, which are used in the current empirical study, are summarized.

	AD	AUDIT	BTM	CAP	CCC
Mean	0.034	1.277	0.703	0.080	88.556
Median	0.019	1.000	0.530	0.041	77.822
Maximum	0.450	2.000	9.988	0.999	499.512
Minimum	1.08E-05	1.000	9.70E-05	5.52E-05	-362.258
Std. Dev.	0.044	0.447	0.694	0.119	89.459
Skewness	3.429	0.994	4.019	3.628	0.479
Kurtosis	19.375	1.989	30.596	19.224	6.001
Sum	316.363	40577.00	19426.68	2288.520	2498089
Sum Sq. Dev.	18.295	6366.33	13310.30	409.006	2.26E+08
Observations	9092	31768	27600	28474	28209

	CR	CS	CSR	DVPV	EBITM
Mean	2.788	34.252	4.895	0.013	6.866
Median	1.910	30.627	5.000	0.000	7.673
Maximum	49.612	199.644	9.000	0.599	197.700
Minimum	0.000	0.004	1.000	0.000	-199.553
Std. Dev.	3.570	26.972	1.661	0.029	26.847
Skewness	6.008	1.354	-0.607	7.023	-2.108
Sum	78557.94	880348.2	104035.0	439.891	208291.4
Sum Sq. Dev.	359098.6	18697807	58660.09	27.852	21864246
Observations	28175	25702	21251	31708	30334

	LTCR	MVC	QR	RD	ROA
Mean	3.821	25.760	1.980	0.073	0.004
Median	4.000	8.661	1.112	0.035	3.755
Maximum	10.000	991.288	49.737	0.998	184.591
Minimum	1.000	-99.951	0.000	5.55E-05	-199.430
Std. Dev.	1.339	87.071	3.436	0.115	21.680
Skewness	0.352	4.138	6.764	4.097	-3.199
Sum	34702.00	725288.0	56434.19	975.282	145.676
Sum Sq. Dev.	16295.68	2.13E+08	336440.6	178.713	14752675
Observations	9080	28155	28489	13322	31386

	ROI	SC	SIZE	SSG	STCR
Mean	3.548	10.272	4.31E+09	0.120	1.434
Median	5.799	7.435	1.96E+08	0.101	1.000
Maximum	98.806	199.719	1.48E+12	0.992	5.000
Minimum	-99.883	-99.996	0.000000	1.42E-05	1.000
Std. Dev.	18.218	30.392	2.70E+10	0.104	0.628
Skewness	-1.763	1.300	22.642	2.809	1.486
Sum	109249.4	312180.4	1.37E+14	2528.831	6201.000
Sum Sq. Dev.	10218354	28070372	2.32E+25	228.011	1706.215
Observations	30788	30390	31768	20906	4324

Table 13: Descriptive statistics of all variables; Source: Standard & Poor's; Compustat North America

Table thirteen reveals some interesting output. First the means (average value) and medians (middle value) of most variables give an interesting overview about the companies examined in the ongoing study. This is especially valuable for practioners, who are always searching for benchmark data to compare financial indicators of different companies. However it is important to note, that in the case of distributions with two tops, as might be the case for some variables, the means are not useful measures. Additionally, one has to state that these data have been collected from companies of different industries and across 19 years and is therefore not applicable for the average company. However, it could be exactly this mixture which gives the output an interesting touch. The minimum and maximum values of each variable are also interesting to examine. The standard deviations as a measure of the spread of the data as well as the skewness as a measure of the distribution are also reported.

Finally the number of observations is shown which have been addressed shortly above. Most of the variables have about 30,000 observations, which means that for nearly all companies and during the whole period the data are available. Than there are some variables with 20,000 to 25,000 observations, whereas these numbers are due to missing observations and the calculation of ratios. Three out of twenty variables have a significantly lower number of observations. They are advertising (9,092), long term credit rating (9,080), and short term credit rating (4,324). For reasons beyond the author's knowledge most companies are not rated during the whole period, which leads to this small number of observations. A possible explanation would be that required data for the ratings were for whatever reasons not available in these periods. In addition also the advertising numbers are relatively rare in the dataset. Because small numbers of observations could limit the findings of the study, this issue will be accounted for when conducting statistical testing. This will be outlined below.

4.4.2 Profitability Model

The full profitability model containing all independent variables is defined as

(31) roi = c + ad(-1) + audit(-1) + btm + cap(-1) + ccc + cr + cs + csr + ebitm + ltcr(-2) + qr + rd(-2) + roa + sc(-1) + size + ssg(-1) + stcr(-1)

The abbreviations of the variables are presented above in table twelve. The negative values in the parentheses are the corresponding number of time lags, which have been chosen.

To estimate the coefficients a panel data analysis with fixed effect models is conducted. Statistically, fixed effects models are always reasonable with panel data, because they always give consistent results. However they may not be the most efficient model that would be possible, because random effects can provide better p-values as they are a more efficient estimator. In such a case one should run a random effect model if it is statistically justifiable. As has been outlined above the generally accepted way of choosing between a fixed and a random effect model is running a Hausman test, which can be done automatically in EViews. The Hausman test tests the null hypothesis if the coefficients of the random effects model are the same as the ones of fixed effects model. If they are and therefore have an insignificant p-value, then it is safe and better to use random effects models. The Hausman test conducted for the profitability model in the ongoing study, however, shows a significant value (at the on percent level) and therefore suggests the use of fixed effects. Thus in this context only fixed effect models are used for the profitability models.

As mentioned above it is assumed that in fixed effect models the differences across cross sectional units and time units can be captured in differences in the constant term. Therefore dummy variables are introduced, which allow the intercept to vary over time and over cross sections (Pindyck and Rubinfeld, 1998). The current type of fixed effect model has constant slopes but intercepts that differ according to the cross-sectional unit — the company. Although there are no significant temporal effects, it is assumed that there are significant differences among companies in this model. While the intercept is cross-section specific and in this case differs from company to company, it does not differ over time. This model and the coefficients are then computed using ordinary least squares.

Dependent Variable: ROI
Method: Panel Least Squares
Sample (adjusted): 1988 2004
Cross-sections included: 66
Total panel (unbalanced) observations: 511

Variable	Coefficient	Std. Error	t-Statistic	Prob.
AD(-1)	-11.513	6.373	-1.807	0.072
AUDIT(-1)	0.626	0.184	3.407	0.001
BTM	-2.642	0.643	-4.110	0.000
CAP(-1)	7.828	4.058	1.929	0.054
CCC	0.007	0.004	1.843	0.066
CR	-4.757	0.736	-6.467	0.000
CS	-0.016	0.009	-1.749	0.081
CSR	0.204	0.110	1.862	0.063
EBITM	-0.246	0.034	-7.156	0.000
LTCR(-2)	0.092	0.235	0.392	0.696

QR	2.454	0.902	2.720	0.007
RD(-2)	35.546	6.552	5.425	0.000
ROA	1.875	0.032	58.615	0.000
SC(-1)	-0.025	0.007	-3.606	0.000
SIZE	6.63E-12	6.90E-12	0.960	0.338
SSG(-1)	3.670	1.145	3.205	0.001
STCR(-1)	-0.417	0.362	-1.151	0.250
C	5.018	1.184	4.238	0.000

Effects Specification			
Cross-section fixed (dummy variables)			
R-squared	0.976	Mean dependent var	14.741
Adjusted R-squared	0.972	S.D. dependent var	9.851
S.E. of regression	1.661	Akaike info criterion	4.000
Sum squared resid	1180.719	Schwarz criterion	4.688
Log likelihood	-939.061	F-statistic	213.566
Durbin-Watson stat	1.415	Prob(F-statistic)	0.000

Table 14: Estimation output of full profitability model; Source: Standard & Poor's, Compustat North America

The output of this model is not discussed in detail because it is only seen as the starting point of the model selection procedure and therefore the output shown above can not be seen as a result in a statistical way. It is only included for overview purposes.

First, there is one major drawback in this model which has to be addressed. It becomes obvious when looking at the number of cross sections included, observations respectively, which can be classified as relatively low for a panel analysis. The main reason for the low number of these cross sections (i.e. 511) and therefore of observations are the three variables advertising, long term credit rating, and short term credit rating. Especially the number of observations in case of the ratings is very small (e.g. STCR has only about 4,000 observations). To obtain a greater number of observations in the final model these three independent variables are dropped before starting with the model selection process. This will lead to a greater number of cross sections (and also observations) in the final model. The dropping of the three variables can further be argued by the fact that there are still variables in the models which are likely to measure a similar effect. In the case of the credit rating, this would be the common stock rating, which is still in the model. In the case of the variable advertising there is still the variable R&D expenditure in the model.

In addition, there are some indicators in the remaining variables, which may be correlated. Examples are the current and the quick ratio, because both are a pretty good

proxy for liquidity. Therefore in the following the correlation matrix of all variables (including all three performance measures as well) is examined.

	AUDIT	BTM	CAP	CCC	CR
AUDIT	1.000	-0.042	-0.046	-0.061	-0.111
BTM	-0.042	1.000	-0.043	0.145	0.111
CAP	-0.046	-0.043	1.000	-0.049	0.003
CCC	-0.061	0.145	-0.049	1.000	0.327
CR	-0.111	0.111	0.003	0.327	1.000
CS	0.097	0.020	-0.008	-0.084	-0.251
CSR	-0.005	0.285	-0.057	0.122	0.202
EBITM	-0.053	-0.399	0.219	0.044	0.040
QR	-0.094	0.023	0.063	0.156	0.935
RD	-0.048	-0.133	0.230	0.239	0.287
ROA	-0.105	-0.389	0.044	-0.093	0.085
SC	-0.053	-0.151	0.051	-0.091	0.090
SIZE	0.078	-0.110	0.114	-0.157	-0.206
SSG	-0.037	-0.334	-0.034	-0.147	-0.085

	CS	CSR	EBITM	QR	RD
AUDIT	0.097	-0.005	-0.053	-0.094	-0.048
BTM	0.020	0.285	-0.399	0.023	-0.133
CAP	-0.008	-0.057	0.219	0.063	0.230
CCC	-0.084	0.122	0.044	0.156	0.239
CR	-0.251	0.202	0.040	0.935	0.287
CS	1.000	0.074	-0.074	-0.231	-0.218
CSR	0.074	1.000	-0.332	0.171	0.158
EBITM	-0.074	-0.332	1.000	0.099	0.087
QR	-0.231	0.171	0.099	1.000	0.359
RD	-0.218	0.158	0.087	0.359	1.000
ROA	-0.377	-0.244	0.622	0.118	0.084
SC	0.009	0.115	0.165	0.124	0.109
SIZE	0.041	-0.224	0.125	-0.142	-0.006
SSG	0.098	0.009	0.402	-0.035	0.011

	ROA	SC	SIZE	SSG
AUDIT	-0.105	-0.053	0.078	-0.037
BTM	-0.389	-0.151	-0.110	-0.334
CAP	0.044	0.051	0.114	-0.034
CCC	-0.093	-0.091	-0.157	-0.147
CR	0.085	0.090	-0.206	-0.085
CS	-0.377	0.009	0.041	0.098
CSR	-0.244	0.115	-0.224	0.009
EBITM	0.622	0.165	0.125	0.402
QR	0.118	0.124	-0.142	-0.035
RD	0.084	0.109	-0.006	0.011
ROA	1.000	0.166	0.009	0.679
SC	0.166	1.000	-0.036	0.177
SIZE	0.009	-0.036	1.000	-0.015
SSG	0.679	0.177	-0.015	1.000

Table 15: Correlation matrix including all but three variables; Source: Standard & Poor's, Compustat North America

Looking at the correlation matrix shows that there exists a correlation between the current ratio and the quick ratio (r = 0.94), which seems reasonable because both are a proxy for liquidity. To make sure their correlation does not limit the explanatory power of the results the standard errors are looked at when dropping the variables, although they are not very high. When multicollinearity is causing a problem dropping the corresponding variable would lead to a lower standard error (Pindyck and Rubinfeld, 1998). When the quick ratio is excluded the standard error of the current ratio decreases, while staying significant (at the 1 per cent level). When the current ratio is dropped from the model the standard errors of the quick ratio also declines, while staying significant too. The interesting thing tough is that the direction of the effect is swinging from positive to negative. As both variables have a negative effect on the dependent variable when the other one is excluded, the use of both would lead to a misinterpretation of the coefficients. Moreover the covariance between the estimated parameters is looked at, but it is found that the absolute value of the quick and the current ratio (0.062) is not significant higher than the others. A relatively high covariance between the estimated parameters would be associated with a high degree of multicollinearity (Pindyck and Rubinfeld, 1998). However, in order to obtain reliable results, the variable quick ratio is finally dropped from the model and therefore not considered in the following anymore.

The dropping of the variable quick ratio is undermined by another statistical testing; i.e. the variance inflation factor. The variance inflation factor measures the impact of collinearity among the X's in a regression model. It expresses the degree to which collinearity among the predictors degrades the precision of an estimate. This is done in a two step procedure: First, models with all remaining explanatory variables are computed. This means that on the left side the dependent variable is changing and on the right side the remaining explanatory variables are kept. Therefore fourteen different models are computed (i.e. for each of the fourteen variables). Then, the R-squared value of each model is looked at. Second, the variance inflation factor for each dependent variable is computed by calculating $(1-R^2)^{-1}$. The single variance inflation factors are shown in the table below.

variance inflation factor

dependent variable	R^2 value	vif
audit	0,032	1,033
btm	0,267	1,364
cap	0,095	1,105
ccc	0,352	1,543
cr	0,905	10,488
cs	0,191	1,236
csr	0,255	1,343
ebitm	0,582	2,390
qr	0,894	9,472
rd	0,217	1,278
roa	0,580	2,379
sc	0,075	1,081
size	0,112	1,126
ssg	0,157	1,187

Table 16: Variance inflation factor; Source: Standard & Poor's, Compustat North America

Looking at the table above one can easily find two potential candidates for collinearity, i.e. the current ratio and the quick ratio. Their variance inflation factor values are both about ten and therefore suggest collinearity. These findings are equivalent to the assumptions made earlier and so the exclusion of the quick ratio is reasonable.

The full profitability model consists then of thirteen independent variables. Starting with all variables first the advertising expenditure, long term credit rating, and short term credit rating are dropped (due to the low number of observations) followed by the quick ratio (due to the collinearity). Therefore the new full model is specified as follows

(32) roi = c + audit(-1) + btm + cap(-1) + ccc + cr + cs + csr + ebitm + rd(-2) + roa + sc(-1) + size + ssg(-1)

Next starting with the new full model the model selection process is started. The model selection is based on the Akaike Information criterion. The AIC for the new full model is 4.895 and now thirteen new models are created, whereas always one variable is dropped (remember that the AIC value of 4.895 does not correspond with the output shown above, because this is the value of the new full model, where four variables have been dropped). Next, the model with the lowest AIC is chosen as the next best model in terms of AIC. The interpretation is that if the criterion gets better trough a dropping of a variable then this new model should be chosen, as the explanation power of this variable for the model is not sufficient enough. This can also be seen in context of Occam's razor in terms of model parsimony, so within the thirteen models

the one is chosen where the variable with the least power of explanation is omitted. This process is repeated until the AIC does not get any lower. Then the model with the lowest AIC (i.e. 4.636) is chosen as the "best" model.

Model Selection Process

	AIC value	step	dropped variable	explaining variables
full model	4.895	0	-	13
next model with lowest AIC	4.642	1	rd	12
next model with lowest AIC	4.641	2	size	11
next model with lowest AIC	**4.636**	3	cap	10
next model with higher AIC	4.637	4	sc	-

Table 17: Model selection process final profitability model; Source: Standard & Poor's, Compustat North America

The process finally yields the following adjusted final profitability model with ten independent variables

(33) roi = c + audit(-1) + btm + ccc + cr + cs + csr + ebitm + roa + sc(-1) + ssg(-1)

Dependent Variable: ROI
Method: Panel Least Squares
Sample (adjusted): 1987 2004
Cross-sections included: 1197
Total panel (unbalanced) observations: 11522

Variable	Coefficient	Std. Error	t-Statistic	Prob.
AUDIT(-1)	0.224	0.056	3.985	0.000
BTM	-0.145	0.064	-2.276	0.023
CCC	-0.002	0.001	-1.753	0.080
CR	-0.369	0.026	-14.151	0.000
CS	-0.005	0.002	-2.280	0.023
CSR	0.162	0.029	5.507	0.000
EBITM	-0.083	0.005	-17.557	0.000
ROA	1.552	0.006	265.149	0.000
SC(-1)	-0.004	0.001	-3.241	0.001
SSG(-1)	4.347	0.321	13.549	0.000
C	0.300	0.201	1.489	0.136

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.955	Mean dependent var	8.393
Adjusted R-squared	0.950	S.D. dependent var	10.438
S.E. of regression	2.340	Akaike info criterion	4.636
Sum squared resid	56470.85	Schwarz criterion	5.407

Log likelihood	-25505.93	F-statistic	181.546
Durbin-Watson stat	0.953	Prob(F-statistic)	0.000

Table 18: Estimation output of final profitability model; Source: Standard & Poor's, Compustat North America

When looking at this model one can see the sharp increase in observations (i.e. 11,522). One can also find that all estimates are significant at least at the 10 per cent level. Finally, there are seven variables which are significant at the one percent level, two variables significant at the five percent level, and one variable significant at the ten percent level. In the following these indicators and their effects will be analyzed.

Although the effect of the auditor's opinion is highly significant (at the one percent level), the direction is another than it has been assumed. The results indicate that a negative opinion (i.e. qualified) of the auditor about the financial statements of a company will lead to a better profitability in the next year (due to a time lag of one year). There are two major possible explanations for that. First, the hypothesis about the effect mentioned above is true but in the exact opposite way. As companies are using accounting tricks, which mostly leads to a qualified opinion, also the earnings on the income statement are higher and therefore the profitability looks greater than it actually is. Second, although there exists a significant effect in a statistical sense, this is probably not true for an economic point of view. This means, there is no economic argument that would support a relationship between an auditor's opinion and the profitability of a company. As has been mentioned before, there have not been conducted any comparable studies involving this variable and therefore no parallels can be drawn. However the result in this context is that a negative relationship between the auditor's opinion and the profitability of a company measured by the Return on Investment exists.

The negative effect (at the five percent level) of the book-to-market ratio confirms the findings of major previous studies but contradicts the hypothesis in this context. It was assumed that value stocks have by definition a relatively high book-to-market ratio and will therefore have a greater profitability than growth stocks. The opposite is found to be true, namely a low book-to-market ratio leads to higher Return on Investment. The hypothesis of a clear cut between value stocks and growth stocks is probably not permissible in this context. However these findings are interesting in that way as most previous studies measured performance as stock returns, and so this result indicates that a negative effect is also true for a profitability measure like the Return on Investment. It seems as if the general rule of the most widely used variable that a negative book-to-market ratio explains performance can be expanded to the Return on Investment.

The ratio Cash Conversion Cycle has a significant negative effect (at the ten percent level) on the profitability performance. This means a shorter cash conversion cycle, which is a proxy for working capital efficiency, leads to a better profitability measured by the Return on Investment. The result is consistent with previous results as well as with the hypothesis of this indicator. The better the working capital is organized, the better the profitability. This is due to the simple fact that a company does not only have to produce revenues but also have to make sure that these revenues are generated efficiently in terms of inventory and cash. Successful companies will have a working inventory management as well as an efficient accounts receivable management, where only a small fraction of liquidity is tied up in the working capital.

The current ratio has a highly significant negative effect (at one percent level) on the profitability performance, which is the opposite of what has been hypothesized. Although there have not been conducted studies with this specific ratio so far, liquidity itself measured by cash or current assets has already been a source of investigation. The two main approaches are that either a high degree of liquidity is good because it gives the company the possibility for good investments and to meet payment requirements or too much liquidity is bad, because this encourage managers to invest to easily. The current study supports the second point of view. When looking at the companies in the sample a plausible reason for that seems to arise. All companies in the sample have survived the whole time period and so it is a matter of fact that they were always able to generate enough cash flow. And when they needed additional cash for current operations or investments it is assumed that they had enough possibilities to obtain money trough the stock market by issuing new shares. This implies that they always had enough money; and maybe sometimes too much, what could have tempted the managers to spend the money without too much evaluation. It seems reasonable to think that when this ratio is examined in a study with small and medium sized companies that the results will be different. The reason for that assumption is that most of these companies are facing liquidity issues very often, which can harm them dramatically.

Between the capital structure and the profitability performance exists a negative relation at the five percent level in the current context. This result is in line with the hypotheses and supports the findings of major previous studies. However, some have not found reliable evidence or actually found different results. The reasons for a negative effect of too much debt are that companies listed on major stock exchanges should become all money needed to make reasonable investments through the equity market and therefore do not need much debt. In addition equity can be seen as a cheaper source of capital as no fix payments have to be made. Finally, major influ-

ence from outside can be prevented as the goals of banks can differ from those of the shareholders.

The effect of the common stock rating on the profitability performance is highly significant positive (in a statistical sense) at the one percent level. The opposite result was hypothesized because it was assumed that a better rating would lead to a better profitability. The hypothesis of a positive effect on the profitability measure was based on economic theory rather than on previous results (no major comparable studies have been conducted related to this question). These results indicate that a higher rating, which is worse than a lower rating, will lead to better performance. An explanation could probably be found when looking at the definition of the rating. It says that it is an evaluation of a stock's past and future performance and its risk level. A stock rating tells the investor how a stock's market value relates to what analysts believe is a fair value for the stock, based on an objective evaluation of the company. The greater the amount by which the fair value exceeds the market value, the more highly recommended a buy of the stock is. Conversely, if the market value of the stock exceeds the fair value of the stock, then analysts recommend that the stock shall be sold. Assume that a value stock will be relatively close (or even exceed) to what is called the fair value whereas a growth stock will be substantially below its fair value and therefore still have some growth potential. Then a value stock with a generally higher profitability will receive a worse rating in terms of market value to fair value than a growth stock. This could explain the results provided in the ongoing study. Another simple explanation would be that a stock rating is measuring something different than the profitability of a company and therefore has no positive effect on the performance.

The variable EBIT margin provides another source of surprise. The hypothesis was that a higher EBIT margin will lead to a greater profitability, but the opposite was found true in the current study (at the one percent level). The only plausible explanation for the highly significant negative effect of the EBIT margin on the Return on investment is to assume that companies with a high EBIT margin generally have a lower profitability. The reason for such a relationship could be found in the analysis of different industries. Consider a supermarket chain (e.g. Walmart), which will have a low return on sales (as most wholesalers have) but may in turn have a great return on the invested capital.

The variable Return on Assets is also significantly positive related (at the one percent level) to the profitability performance and confirms therefore the hypothesis and previous results. This seems obvious as both ratios are calculated very similar. ROA is a ratio that measures how effectively or efficiently a firm uses its assets and is there-

fore a useful indicator of how profitable a company is producing relative to its total assets. It also shows how well the company is able to use its assets to generate earnings.

The effect of the ratio sales change in percent has a highly significant negative effect (at the one percent level) on the profitability with a one year time lag. It was assumed that growth measured by sales would have a positive impact on the profitability. Sales growth as the sole performance driver is also what a lot off consulting companies are preaching. However it is not true in the current context. The reason for that could be found in the underlying assumption of this hypothesis. Namely, it is assumed that earnings as well as the free cash flow are moving simultaneously with revenues. The ongoing study obviously reveals that most companies which achieve a sales growth are not able to transform this sales growth into a profitability growth. In fact the opposite is true and the profitability goes down when the sales went up in the previous year.

Finally, the Sustainable Growth Rate has a highly significant positive effect (at the one percent level) on the profitability performance of a company. This is again in line with the hypothesis and previous results. For future growth, a company needs money to fulfill its investment plans and thereby sustainable growth rate is the highest growth rate a firm can maintain without increasing its financial leverage (because no liabilities have to be taken). It is the money which stays in the company and can be invested. This leads to the conclusion that a right balance between the cash flow which is distributed to the shareholders and the cash flow which stays in the company for reinvestment is important. Companies which plough back more money and are investing this money efficiently and wisely are more successfully in terms of profitability performance.

An important statistical measure of any model is the adjusted R-squared, which measures the success of the regression in predicting the values of the dependent variable within the sample. The statistic will be close to (or even be) one if the regression fits perfectly, and zero if it fits no better than the simple mean of the dependent variable. The adjusted R-squared in this model of .95 is relatively high and can therefore be seen as a good sign for an appropriate model fit.

Generally it can be said that the profitability final model is good in a statistical as well as in an economic sense. This is not surprising as good models will always provide good estimates. Several interesting conclusions can be made and most variables seem to represent the relations between financial indicators and company perform-

ance measured by the Return on Investment in a fairly good way. However there are also some controversial results which are not in line with the hypotheses.

4.4.3 Cash Flow Model

The cash flow full model containing all independent variables is defined as

(34) dvpv = c + ad(-1) + audit(-1) + btm + cap(-1) + ccc + cr + cs + csr + ebitm + ltcr(-2) + qr + rd(-2) + roa + sc(-1) + size + ssg(-1) + stcr(-1)

The abbreviations of the variables are presented above in table twelve. The negative values in the parentheses are again the corresponding number of time lags, which have been chosen.

Before estimating the models it has to be determined again if fixed effect or random effect models are used in the panel data analysis (compare to the profitability model). As has been outlined above the generally accepted way of choosing between a fixed and a random effect model is running a Hausman test, which is also done for the cash flow model. The results are similar to the ones obtained when testing the profitability model.

Due to these results, again a panel data analysis with fixed effect models is conducted to estimate the coefficients. As mentioned above it is assumed that the differences across cross sectional units and time units can be captured in differences in the constant term. Therefore dummy variables are introduced, which allow the intercept to vary over time and over cross sections (Pindyck and Rubinfeld, 1998). The current type of fixed effect model has constant slopes but intercepts that differ according to the cross-sectional unit — the company. Although there are no significant temporal effects, it is assumed that there are significant differences among companies in this model. While the intercept is cross-section specific and in this case differs from company to company, it does not differ over time. This model and the coefficients are then computed using ordinary least squares. The output is shown in the following.

Dependent Variable: DVPV
Method: Panel Least Squares
Sample (adjusted): 1988 2004
Cross-sections included: 67
Total panel (unbalanced) observations: 512

Variable	Coefficient	Std. Error	t-Statistic	Prob.

AD(-1)	0.054	0.065	0.827912	0.408
AUDIT(-1)	0.005	0.002	2.631805	0.009
BTM	0.033	0.007	4.985348	0.000
CAP(-1)	0.007	0.041	0.171021	0.864
CCC	3.14E-05	4.08E-05	0.770096	0.442
CR	-0.013	0.008	-1.737758	0.083
CS	0.000	9.26E-05	4.446078	0.000
CSR	8.55E-05	0.001	0.076703	0.939
EBITM	0.000	0.000	0.529586	0.597
LTCR(-2)	-0.001	0.002	-0.306185	0.760
QR	0.017	0.009	1.801255	0.072
RD(-2)	-0.165	0.067	-2.484434	0.013
ROA	-0.000	0.000	-1.207687	0.228
SC(-1)	-7.14E-05	6.92E-05	-1.030674	0.303
SIZE	-1.48E-13	7.01E-14	-2.113611	0.035
SSG(-1)	-0.001	0.012	-0.055013	0.956
STCR(-1)	-0.007	0.004	-1.924738	0.055
C	0.014	0.012	1.173973	0.241

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.430	Mean dependent var	0.023
Adjusted R-squared	0.320	S.D. dependent var	0.021
S.E. of regression	0.017	Akaike info criterion	-5.177
Sum squared resid	0.122	Schwarz criterion	-4.481
Log likelihood	1409.222	F-statistic	3.894
Durbin-Watson stat	1.449	Prob(F-statistic)	0.000

Table 19: Estimation output of full cash flow model; Source: Standard & Poor's, Compustat North America

The output of this model is again not discussed in detail because it is only seen as the starting point of the model selection procedure and therefore the output shown above can not be seen as a result in a statistical way. It is only included for overview purposes.

As has been outlined in the previous chapter there does exist a high correlation between the quick ratio and the current ratio, because both are a proxy for liquidity. The correlation matrix containing all variables can be found above. That is why the quick ratio is dropped as an independent variable again and therefore leaves sixteen independent variables. As mentioned in the previous chapter the main reason for the low number of cross sections and therefore of observations are the three variables advertising, long term credit rating, and short term credit rating. That is why these variables are dropped again before starting the model selection process. This should again lead to a greater number of cross sections (and also observations) in the final model.

The new full model consists therefore of 13 independent variables. Starting from the full model first the quick ratio is dropped, followed by the advertising expenditure and long term credit rating, which finally leads to the new full model.

(35) dvpv = c + audit(-1) + btm + cap(-1) + ccc + cr + cs + csr + ebitm + rd(-2) + roa + sc(-1) + size + ssg(-1)

The same model selection procedure as mentioned above in terms of AIC is done. The following table illustrates the stepwise process with the corresponding AIC values. Remember that the AIC value of 5.0692 does not correspond with the output shown above, because this is the value of the new full model, where four variables have been dropped.

Model Selection Process

	AIC value	step	dropped variable	explaining variables
full model	-5.0692	0	-	13
next model with lowest AIC	-5.2396	1	rd	12
next model with lowest AIC	-5.3226	2	csr	11
next model with lowest AIC	-5.3290	3	cr	10
next model with lowest AIC	-5.3325	4	btm	9
next model with lowest AIC	-5.3327	5	ebitm	8
next model with lowest AIC	**-5.3329**	6	roa	7
next model with higher AIC	-5.3327	7	audit	-

Table 20: Model selection process final cash flow model; Source: Standard & Poor's, Compustat North America

The process finally leaves the following final cash flow model with 7 independent variables

(36) dvpv = c + audit(-1) + cap(-1) + ccc + cs + sc(-1) + size + ssg(-1)

Dependent Variable: DVPV
Method: Panel Least Squares
Sample (adjusted): 1987 2004
Cross-sections included: 1435
Total panel (unbalanced) observations: 15128

Variable	Coefficient	Std. Error	t-Statistic	Prob.
AUDIT(-1)	-0.001	0.000	-2.177	0.030
CAP(-1)	0.002	0.002	0.975	0.330
CCC	2.22E-05	3.79E-06	5.859	0.000
CS	6.42E-05	1.04E-05	6.179	0.000
SC(-1)	-1.55E-05	6.31E-06	-2.457	0.014
SIZE	-6.79E-14	1.42E-14	-4.789	0.000

SSG(-1)	-0.010	0.002	-6.024	0.000
C	0.0127	0.001	17.883	0.000
Effects Specification				
Cross-section fixed (dummy variables)				
R-squared	0.532	Mean dependent var		0.014
Adjusted R-squared	0.482	S.D. dependent var		0.022
S.E. of regression	0.016	Akaike info criterion		-5.333
Sum squared resid	3.536	Schwarz criterion		-4.606
Log likelihood	41780.07	F-statistic		10.777
Durbin-Watson stat	0.930	Prob(F-statistic)		0.000

Table 21: Estimation output of final cash flow model; Source: Standard & Poor's, Compustat North America

When comparing this adjusted final model with the final model from above one can see again a sharp increase in observations (15,128) and therefore a greater reliability of the results. Finally, there are four variables which are significant at the one percent level, two variables significant at the five percent level, and one variable (cap), which is not significant. Usually an insignificant variable is not obtained when conducting a deletion process. However, as it concerns only one variable and the probability is not extremely low this model is kept as the final model. In the following these indicators and their effects will be analyzed.

Again the effect of the auditor's opinion is significant (at five percent level), but here the effect is the same as it has been assumed. The results indicate that a positive opinion (i.e. unqualified) of the auditor about the financial statements of a company will lead to a better cash flow performance in the upcoming year. If the auditor has no concerns about the financial statements this is a good sign for future cash flows, because in prospering times the executives of a company have no need for the use of accounting tricks. They will only be applied when the company is performing poorly and therefore even if the numbers on the balance sheet look (too) good, not sufficient cash flow for the shareholders is generated. The results highlight once more the main advantage of a cash flow related measure. In contrast to performance measures which are derived from the balance sheet or the profit and loss statement, the cash flow measure is robust against different accounting methods. As has been mentioned before, there have not been conducted any comparable studies involving this variable and therefore no parallels can be drawn. However the result of the ongoing study is that a positive relationship between the auditor's opinion and the cash flow performance of a company measured by the cash dividend per share exists.

The ratio cash conversion cycle has a highly significant positive effect (at the one percent level) on the cash flow performance. This means a longer cash conversion

cycle which is a proxy for working capital efficiency leads to higher cash dividends. In this context the opposite has been hypothesized, because it seems reasonable that a better working capital management leads to a higher cash flow. One possible explanation could be that certain industries have a longer cash conversion cycle simply due to their specific circumstances and criteria and that these companies have generally higher cash dividends.

Concerning the effect of the capital structure on the cash flow performance one can find a highly significant positive relation (at the one percent level). This result is contrary to what has been hypothesized and is not in line with the findings of major previous studies. It was assumed that a major influence from outside can be seen as a negative impact on the performance in this context. The positive effect could be explained by the fact that when external funds are borrowed (e.g. from banks) at a fixed rate, they can be invested in the company and gain a higher interest than the interest paid to the bank (compare Modigliani and Miller 1963). The difference is a net profit for the shareholders and boosts therefore the Return on Equity, which in turn will increase the cash flow. The reason for this possibility and the chief benefit of debt is the tax deductibility of interest expenses and therefore a cheaper source of funds than equity. In addition, if a company has less equity and more debt the generated cash flow is distributed to a smaller number of shareholders, because the debt lender has already received (fixed) interests.

The effect of the ratio sales change in percent has a significant negative effect (at the five percent level) on the cash flow with a one year time lag. It was assumed that growth measured by sales would have a positive impact on this performance measure. The reason for that could be found in the underlying assumption of this hypothesis. Namely, it is assumed that earnings as well as the free cash flow are moving simultaneously with revenues. However, the ongoing study reveals that most companies which achieve sales growth are not able to transform this sales growth into a future cash flow growth. In fact the opposite is true and the cash flow goes down when the sales went up in the previous year. This could be due to extensive expenses related with this sales increase and lower efficiency.

Size also has a highly significant negative effect on the cash flow performance (at the one percent level). This indicates that smaller companies (measured by total assets) are able to generate relatively more cash flow for shareholders than bigger companies. The argument is that size is a disadvantage because of such factors as complexity, bureaucracy and inefficiencies. However in this context size was expected to have a positive effect on the cash flow performance due to economies of scale and scope. Previous studies have found contrary results concerning the effect of size,

and so the ongoing study adds another argument for the negative relation of size and performance (measured here by cash flow performance).

The sustainable growth rate has a highly significant negative effect (at the one per-cent level) on the cash flow performance of a company. This is again the opposite of what has been hypothesized. The results indicate that a lower sustainable growth will increase the cash dividends. This result seems obvious when only one period is looked at, because there is a simple trade off relation between the sustainable growth rate and the cash dividends. Either the cash flow is distributed to the share-holders (as cash dividends) or is reinvested in the company (reflected by the growth rate). It was assumed that this effect will change when introducing a time lag of one period. As it seems a one year time lag is too short, because there is still a negative effect. This effect should change when introducing a greater time lag.

Finally, the adjusted R-squared is looked at, which measures the success of the re-gression in predicting the values of the dependent variable within the sample. The statistic will be close to (ore even be) one if the regression fits perfectly, and zero if it fits no better than the simple mean of the dependent variable. The adjusted R-squared reported in this model of .48 is compared to the profitability model relatively low.

4.4.4 Market Model

The market full model containing all independent variables is defined as

(37) mvc = c + ad(-1) + audit(-1) + btm + cap(-1) + ccc + cr + cs + csr + ebitm + ltcr(-2) + qr + rd(-2) + roa + sc(-1) + size + ssg(-1) + stcr(-1)

The abbreviations of the variables are presented above in table twelve. The negative values in the parentheses are again the corresponding number of time lags, which have been chosen.

Before estimating the models it has to be determined again if fixed effect or random effect models are used in the panel data analysis (compare with the profitability and cash flow model). As has been outlined above the generally accepted way of choos-ing between a fixed and a random effect model is running a Hausman test, which is also done for the market model. The Hausman test conducted for the market model in the ongoing study shows a significant value (at the ten percent level) and therefore suggests the use of fixed effects. One could argue here that as the p-value is about eight per cent a random effect model would be more appropriate. However a random

effect model is not used in the ongoing study because the two previous models are also calculated with fixed effect models. Therefore a better comparison should be possible. Moreover it cannot be said that the p-value is really insignificant, which would justify the random effects models (because of eight per cent). In addition, when looking at the p-value of the full model one will find again highly significant p-values, which justifies the decision to use fixed effect models.

Thus again, a panel data analysis with fixed effect models is conducted to estimate the coefficients. As mentioned above it is assumed that the differences across cross sectional units and time units can be captured in differences in the constant term. Therefore dummy variables are introduced, which allow the intercept to vary over time and over cross sections (Pindyck and Rubinfeld, 1998). The current type of fixed effect model has constant slopes but intercepts that differ according to the cross-sectional unit — the company. Although there are no significant temporal effects, it is assumed that there are significant differences among companies in this model. While the intercept is cross-section specific and in this case differs from company to company, it does not differ over time. This model and the coefficients are then computed using ordinary least squares. The output is shown in the following.

Dependent Variable: MVC
Method: Panel Least Squares
Sample (adjusted): 1988 2004
Cross-sections included: 67
Total panel (unbalanced) observations: 512

Variable	Coefficient	Std. Error	t-Statistic	Prob.
AD(-1)	-36.407	110.529	-0.329	0.742
AUDIT(-1)	-2.066	3.189	-0.648	0.518
BTM	-74.037	11.153	-6.639	0.000
CAP(-1)	9.017	70.393	0.128	0.898
CCC	-0.069	0.070	-0.990	0.323
CR	20.747	12.760	1.626	0.105
CS	-0.528	0.158	-3.342	0.001
CSR	1.842	1.902	0.968	0.333
EBITM	0.590	0.596	0.989	0.323
LTCR(-2)	-4.586	4.082	-1.124	0.262
QR	-18.910	15.647	-1.209	0.228
RD(-2)	-197.925	113.664	-1.741	0.082
ROA	-0.895	0.555	-1.612	0.108
SC(-1)	0.149	0.118	1.261	0.208
SIZE	-9.98E-11	1.20E-10	-0.833	0.405
SSG(-1)	-27.826	19.863	-1.401	0.162
STCR(-1)	19.825	6.283	3.155	0.002
C	42.086	20.535	2.050	0.041

Effects Specification

Cross-section fixed (dummy variables)			
R-squared	0.262	Mean dependent var	13.932
Adjusted R-squared	0.119	S.D. dependent var	30.695
S.E. of regression	28.812	Akaike info criterion	9.708
Sum squared resid	355302.8	Schwarz criterion	10.404
Log likelihood	-2401.351	F-statistic	1.831
Durbin-Watson stat	2.394	Prob(F-statistic)	0.000

Table 22: Estimation output of full market model; Source: Standard & Poor's, Compustat North America

The output of this model is again not discussed in detail because it is only seen as the starting point of the model selection procedure and therefore the output shown above can not be seen as a result in a statistical way. It is only included for overview purposes.

As has been outlined in the previous chapter there does exist a high correlation between the quick ratio and the current ratio, because both are a proxy for liquidity. That is why the quick ratio is dropped as an independent variable again. As mentioned in the previous chapters the main reason for the low number of cross sections and therefore of observations are the three variables advertising, long term credit rating, and short term credit rating. In order to increase the number of observations the full model is respecified with leaving out all three variables. The full model consists therefore of thirteen independent variables. Starting from the full model first the quick ratio is dropped, followed by the advertising expenditure, the short term credit rating, and long term credit rating, which finally leads to the new full model.

(38) mvc = c + audit(-1) + btm + cap(-1) + ccc + cr + cs + csr + ebitm + rd(-2) + roa + sc(-1) + size + ssg(-1)

The same model selection procedure as mentioned above in terms of AIC is done. The following table illustrates the stepwise process with the corresponding AIC values. Remember again that the AIC value of 11.037 does not correspond with the output shown above, because this is the value of the new full model.

Model Selection Process

	AIC value	step	dropped variable	explaining variables
full model	11.037	0	-	13
next model with lowest AIC	10.893	1	rd	12
next model with lowest AIC	**10.876**	2	cr	11
next model with higher AIC	10.877	3	size	-

Table 23: Model selection process final market model; Source: Standard & Poor's, Compustat North America

Two variables are dropped and the process then leaves the following final market model with 11 independent variables

(39) mvc = c + audit(-1) + btm + cap(-1) + ccc + cs + csr + ebitm + roa + sc(-1) + size + ssg(-1)

Dependent Variable: MVC
Method: Panel Least Squares
Sample (adjusted): 1987 2004
Cross-sections included: 1236
Total panel (unbalanced) observations: 11844

Variable	Coefficient	Std. Error	t-Statistic	Prob.
AUDIT(-1)	1.758	1.247	1.409	0.159
BTM	-58.374	1.456	-40.101	0.000
CAP(-1)	-47.391	10.106	-4.690	0.000
CCC	-0.083	0.016	-5.280	0.000
CS	-0.112	0.045	-2.502	0.012
CSR	8.202	0.657	12.494	0.000
EBITM	0.175	0.118	1.481	0.139
ROA	1.230	0.121	10.172	0.000
SC(-1)	-0.168	0.026	-6.405	0.000
SIZE	-7.75E-11	4.96E-11	-1.564	0.118
SSG(-1)	-96.888	7.145	-13.560	0.000
C	38.071	4.353	8.746	0.000

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.318	Mean dependent var	20.050
Adjusted R-squared	0.238	S.D. dependent var	60.690
S.E. of regression	52.971	Akaike info criterion	10.876
Sum squared resid	29734218	Schwarz criterion	11.654
Log likelihood	-63164.70	F-statistic	3.972
Durbin-Watson stat	2.199	Prob(F-statistic)	0.000

Table 24: Estimation output of final market model; Source: Standard & Poor's, Compustat North America

When looking at the number of observations one can see again a sharp increase in observations (11,844) and therefore a greater reliability of the results. Finally, there are seven variables which are significant at the one percent level and one variable significant at the five percent level. The other three remaining variables are only significant at the fifteen percent level. Although a significance of fifteen per cent is usually not enough and sufficient for a statistical analysis (ten percent significance is most of the time the required minimum) in this context these variables are regarded as significant. This is argued by the fact that the selection process conducted here

only leaves variables in the final model which are relevant for explaining the relationship. Therefore, in the following all indicators and their effects will be analyzed.

The effect of the auditor's opinion is significant (at the fifteen percent level), but the direction is another one than it has been assumed. The results indicate that a negative opinion (i.e. qualified) of the auditor about the financial statements of a company will lead to a better market performance in the upcoming year. There are two major possible explanations for that. First, as companies are using accounting tricks, which mostly leads to a qualified opinion, also the revenues, earnings and other financial indicators will look greater to the shareholders than they actually are. That is why shareholders would buy this stock and the stock price will rise. Second, the introduced time lag between the auditor's opinion and the stock price increase is not appropriate and so the relation is only a statistical one, rather than an economical one. As has been mentioned above, there have not been conducted any comparable studies involving this variable and therefore no parallels can be drawn. However the result in the ongoing study is that there exists a negative relationship between the auditor's opinion and the market performance of a company in the upcoming year.

The book-to-market ratio has a highly significant negative effect (at the one percent level) on the market performance, which confirms the hypothesis made before conducting the analysis. This result is important because this ratio is the most widely used variable in explaining stock returns in this research field. The assumptions are that value stocks have by definition a relatively high book-to-market ratio (so called blue chips) and will therefore have lower returns than growth stocks (with a low book-to-market ratio). Here the future potential of the growth stocks is being priced in. Therefore the book-to-market ratio should have a negative impact on the market performance. Finally it can be said, that the ongoing study confirms the results of major studies and especially this market model is comparable because the stock price is used as the performance measure.

Capital expenditure to sales has a strong significant negative effect (at the one percent level) on the market performance. In this context it was assumed that a company which is investing in its physical assets and therefore building on its future will have a greater performance. This effect was believed to come into action one year after the corresponding expenses have been made. However the exact opposite is true which could be due to the relative short time lag.

The ratio cash conversion cycle has again a highly significant negative effect (at the one percent level) on the market performance. This means a shorter cash conversion cycle which is a proxy for working capital efficiency leads to a better market perform-

ance. The result is congruent with previous results as well as with the hypothesis of this indicator. The better the working capital is organized, the better the market performance. Investors obviously appreciate companies with an efficient working capital as this is an important indicator for successful companies (compare the effect to the results of the profitability performance).

The capital structure has a significant negative effect (at the five percent level) on the market performance. This result is in line with the hypotheses and supports the findings of major previous studies. The reasons for a negative effect of too much debt are that companies listed on major stock exchanges should become all money needed to make reasonable investments and therefore do not need too much debt. In addition equity can be seen as a cheaper source of capital as no fix payments have to be made. Finally, major influence from outside can be prevented as the goals of banks can differ from those of the shareholders. If a company is financed with less debt and more equity, the shareholders can be sure that mainly their interests will be fulfilled. As was true for the book-to-market ratio, also this finding is extremely important because it confirms major previous studies while having a similar performance measure (i.e. stock price).

The common stock rating reveals a highly significant (at the one percent level) effect on the market performance. As this ranking is an evaluation of a stock's past and future performance and its risk level it was assumed that this indicator should have a major positive influence (in an economic view) on the market performance. However the results show that the opposite is true. This item is an appraisal of past performance of a stock's earnings and dividends and the stock's relative standing as of a company's current fiscal yearend. Growth and stability of earnings and dividends are thereby key elements in establishing this rating. Quite often it is argued that stock ratings and recommendations delivered by investment banks, rating companies, and others do not reflect the true situation of a company. Moreover some previous studies revealed that most ratings a fairly poor in predicting future stock performance. The arguments could be strengthened by these results. The stock is reacting exactly in the opposite way than the rating from Standard & Poor’s would suggest (i.e. a worse rating leads to a higher stock price). The result is even more interesting, as Standard & Poor’s is one of the worldwide leading rating agencies. A possible explanation for this negative effect might be the matter of timing. It cannot be said when exactly the stock ratings were published and therefore there might be a (relatively large) time gap between the publishing of the rating at the date when the stock price was measured. This could indicate that the negative effect of the stock rating is only a statistical output, but not an economical.

The variable EBIT margin is significantly positive related to the stock price (at the fifteen percent level). The hypothesis is that a higher EBIT margin will lead to a better market performance measured by the stock price and this effect is found to be true. These results indicate that if a company is able to improve its EBIT margin the stock market will react positively to that and investors will buy the specific stock.

The variable Return on Assets is again significantly positive related (at the one percent level) to the market performance and therefore confirms the hypothesis and previous results. ROA is a ratio that measures how effectively a firm uses its assets and is therefore a useful indicator of how profitable a company is relative to its total assets. The results indicate that companies that are more profitable will have a higher market performance measured by the stock price change.

The effect of the variable sales change in percent has a highly significant negative effect (at the one percent level) on the market performance with a one year time lag. It was assumed that growth measured by sales would have a positive impact on the market performance, as investors would appreciate growing companies. Actually it does not seem reasonable that companies with a shrinking sales number will have a better market performance. As no substantial previous findings exist concerning this variable the only explanation would be that this relation is a statistical one but no economic one. The reason for this could be that in this case the time lag of one year is too long because especially sales numbers are reported very quickly and also during the year. Thus these positive messages are influencing (i.e. increasing) the stock price immediately and not one year later. Therefore the effect may change when the analysis is conducted without a time lag.

Size also has a negative effect on the market performance (at the fifteen percent level). This indicates that smaller companies (measured by total assets) have better stock performances than bigger companies. This is the effect which was hypothesized. The argument is that smaller companies will have more growth potential (in terms of assets as well as in terms of stock price) whereas larger companies will be more focused on dividends. Previous studies found contrary results concerning the effect of size on stock returns, and so the ongoing study adds another argument for the negative relation of size and performance measured by the stock price.

Finally, the sustainable growth rate has a significant negative effect (at the one percent level) on the market performance of a company. This is the opposite of what has been hypothesized and what previous studies suggest. For future growth, a company needs money to fulfill its investment plans and thereby sustainable growth rate is the highest growth rate a firm can maintain without increasing its financial leverage (be-

cause no liabilities have to be taken). It is the money which stays in the company and can be invested. The results indicate that a lower sustainable growth will increase the stock price. It is assumed that the same arguments concerning the time lags are true, which have been mentioned above in the context of the variable sales change.

Concerning the model fit it has to be said that the overall fit of the model is compared to the previous models not very high. This can be seen when looking at the adjusted R-squared value, which is only .24. This value seems low, but for models where the stock returns are explained it is a satisfying value. A possible explanation is that a relative large number of explanatory variables are included in the full model. Although the AIC process minimizes the number of variables, there are probably still too many in the final model. Several additional models are formed and computed in order to look at their model fit when fewer variables are added. It can be said that the adjusted R-squared value does not increase substantially when models with less variables are estimated. Another issue and possible explanation is that besides economic reasons of course irrational reasons will influence the stock price too (e.g. speculating). It seems impossible to catch these irrational reasons and put them into any kind of model. Summarized it has to be said, that an R-squared value of .24 is fine when it comes to explaining stock returns.

One could argue that the time lags introduced in the market model make no sense, because investors do anticipate these future developments. One would assume that these developments are already priced in today and so there would be no time lag needed in the model. There are arguments for and against it and it will definitely not be easy to determine what mechanisms influence the stock price in reality (a short outline has been given above). A detailed discussion of this topic is by far beyond the capacity of this dissertation.

However, to draw some conclusions about the time lags in the ongoing study additional statistical analysis with the same full model and the same explaining variables (i.e. without quick ratio, short term credit rating, long term credit rating, and advertising expenditure) except the time lags is conducted. The goal is to examine what the effects on the variables with time lags are. In particular the two variables sales change and sustainable growth rate are looked at, because their results do not seem to fit the final model shown above. As was done before an AIC process is started to select the best model in terms of AIC. The analysis of the “best” model reveals interesting information, because both effects stay significantly (at the one per cent level) but the direction has changed. This confirms the assumptions made above that concerning these two variables a time lag makes no sense when analyzing their effect on the stock performance. Hence sales growth is pushing the stock price up as well

as a high reinvestment of the earnings (i.e. measured by the sustainable growth rate). Moreover also the effects and interpretations of the other variables, which have been significant before do not change much. Still the adjusted R-squared value is very low (.14). Detailed information concerning this adjusted final market model without lags can be found in the Appendix.

In order to draw some conclusions concerning the explanation of stock returns one additional model is introduced. This model only consists of the book-to-market ratio and the variable size (i.e. two explanatory variables). The results provide valuable information, because both variables have a highly significant negative effect (at the one percent level) on the stock performance. This is in line with most previous studies, which found that the variables book-to-market ratio and size are able to explain stock returns. However, as has been shown above there are also other factors which determine the stock price. So the book-to-market ratio and size do not completely explain the market performance of a company. The estimation output of this reduced market model can again be found in the Appendix.

4.4.5 Binary Logit Model

The main task when it comes to binary logit models is to predict whether an event is true or not and therefore find a relationship between a set of attributes (e.g. indicators) describing an individual (e.g. company) and the probability that the individual will act in a certain way (e.g. performance measure). Therefore a binary logit model is finally calculated in this context in order to predict whether a firm is above or below the average value for the firms in the market. The dependent variable in this logit model is a dummy variable, which is one if the performance measure is greater than the average of all 1,672 cross sections (i.e. companies) and zero otherwise. The interpretation of the model is, that it predicts correctly if the predicted probability is greater than 0.5 and the corresponding dependent variable is one and vice versa. The interpretation of the results is pretty straightforward, namely that a high degree of correct prediction is a strong evidence of the forecasting power of the indicators.

It is worth noting that in the statistics literature, the fraction of y = 1 observations that are correctly predicted is termed the sensitivity, while the fraction of y = 0 observations that are correctly predicted is known as specificity. Here, these two values, expressed in percentage terms, are labeled “% correct” (EViews, 2004).

In order to compute the binary logit models the corresponding final models of each dimension are used, which are as followed

(40) profitability model: roi = c + audit(-1) + btm + ccc + cr + cs + csr + ebitm + roa + sc(-1) + ssg(-1)

(41) cash flow model: dvpv = c + audit(-1) + cap(-1) + ccc + cs + sc(-1) + size + ssg(-1)

(42) market model: mvc = c + audit(-1) + btm + cap(-1) + ccc + cs + csr + ebitm + roa + sc(-1) + size + ssg(-1)

In the following table the results of the binary logit model for the three performance measures are summarized. The table includes the numbers of the observations for all cases when the dependent variable was zero and one respectively for all three models. In addition the percentage number of the correct predictions in the sample is shown. The detailed results of all three models can be found in the Appendix.

Binary Logit Results

	ROI	DVPV	MVC
Dependent = 0	2,554	13,140	7,859
% Correct	95.54%	89.95%	90.46%
Dependent = 1	8,968	1,988	3,985
% Correct	98.84%	18.08%	31.09%
total number	11,522	15,128	11,844
total percent correct	**98.11%**	**62.30%**	**70.48%**

Table 25: Binary logit results of all three final models; Source: Standard & Poor's, Compustat North America

Generally it can be said that the overall forecasting power of the indicators which are left in each of the final models is good. They predict correctly in about 98 per cent of the cases in the profitability model, which is close to 100 per cent and therefore a real good sign. Thus it indicates that the variables included in the final profitability model are important indicators in explaining the success of companies. Moreover, the overall prediction of the profitability measure enhances the wide spread use in practice of the Return on Investment, which is sometimes seen as the main ratio among all.

The overall forecasting power is also good in terms of the cash flow model as well as the market model, which predict correctly in about 62 per cent of the cases and about 70 per cent respectively. However one has to state that in these two models despite the good overall prediction the sensitivity of the models is really poor (with the dependent variable "1"), while the specificity is as high as in the profitability model (with the dependent variable "0"). A poor sensitivity can occur when the model performance is influenced major by such factors as changes in estimated coefficients, and changes in the time paths of exogenous variables (Pindyck and Rubinfeld, 1998). In

contrast a poor specificity of the model would be due to omitted variables, the presence of an irrelevant variable, or the presence of nonlinear relation in the explanatory variables (Pindyck and Rubinfeld, 1998).

Finally, it can be said that the profitability model seems to have a very good forecasting power and that the model is therefore specified well. All indicators in the final profitability model seem to represent the success of companies fairly well. When it comes to the cash flow model and the market model such a statement is more restricted and the predicting power of the models is not as good. This could be due to the fact that most explanatory variables in the models are ratios and company specific data. The Return on Investment is exactly the measure which captures most of these data. On the other side especially when it comes to the market performance of a company a lot off irrational and outside factors are influencing the change of the stock price, which can hardly be captured in a statistical model. A similar point can be made regarding the cash flow performance. Of course it is important how much cash flow is generated, which in turn is determined by ratios and company specific data (same as the ROI). However, the question of how much of this cash flow is then distributed to the shareholders or invested can probably not be answered sufficiently in a statistical model (because it is the decision of the companies' executives).

4.5 Comparison of the Three Approaches

This chapter provides a summary of the results of the three different final models (i.e. profitability model, cash flow model, and market model). In addition the results are compared and their relations are analyzed.

In the beginning all three models contain the same seventeen independent (i.e. explanatory) variables. As there does exist a high correlation between the quick ratio and the current ratio, because both are a proxy for liquidity, the quick ratio is dropped as an independent variable in all three models. The exclusion of the quick ratio is confirmed by the use of the variance inflation factor, which is a statistical technique to detect collinearity. In addition, in order to increase the number of observations all three full models are respecified with leaving out the three variables with a low number of observations (i.e. advertising, long term credit rating, and short term credit rating). The three adjusted full models consist therefore of thirteen independent variables. Starting from each full model first the quick ratio is dropped, followed by the advertising expenditure, the short term credit rating, and long term credit rating, which finally leads to new full models.

All three models then use fixed effect models to estimate the coefficients. This is done because the specification test (i.e. Hausman test) shows significance and therefore random effect models cannot be applied. The type of fixed effect model used in the ongoing study has constant slopes but intercepts that differ according to the cross-sectional unit. Although there are no significant temporal effects, it is assumed that there are significant differences among companies in this model. The three models and the coefficients are then computed using ordinary least squares. The statistical analysis is done with EViews.

Starting with each of the three full models the model selection process is started. The model selection is based on the Akaike Information criterion, whereas always one variable is dropped in a stepwise procedure. Next, the model with the lowest AIC is chosen as the next best model in terms of AIC. The interpretation is that if the criterion gets better trough a dropping of a variable than this new model should be chosen, as the explanation power of the dropped variable for the model is not sufficient enough. This process is repeated until the AIC does not get any lower and the model with the lowest AIC is then chosen as the "best" model. The motivation for this procedure is if the BIC is used the true model will be chosen with probability 1.

This process finally leaves the following three adjusted final models

(43) roi = c + audit(-1) + btm + ccc + cr + cs + csr + ebitm + roa + sc(-1) + ssg(-1)

(44) dvpv = c + audit(-1) + cap(-1) + ccc + cs + sc(-1) + size + ssg(-1)

(45) mvc = c + audit(-1) + btm + cap(-1) + ccc + cs + csr + ebitm + roa + sc(-1) + size + ssg(-1)

whereas the profitability model (roi) has ten significant explanatory variables and a total number of 11,522 observations, the cash flow model (dvpv) contains of seven explanatory variables and 15,128 observations, and the market model (mvc) has eleven significant explanatory variables and 11,844 observations. There are five variables which are significant across all three models, five variables significant across two models, two variables significant only in one model, as well as one variable which is not significant (capital expenditure in the cash flow model; for details see above).

The variable auditor's opinion (with one year time lag) is significant across all three models, but with different effects. The influence on the profitability model as well as on the market model is a negative one (in an economic sense), while the influence on

the cash flow model is a positive one (again in an economic sense). This indicates that an unqualified opinion about the financial statements of a company leads to a higher cash flow performance in the upcoming year, whereas the opposite is true for the other two performance measures. The results undermine the fact, that the cash flow performance is the only performance, which cannot (or hardly) be influenced by accounting issues. Thus an unqualified opinion has a direct link to the cash dividends through the financial statements. Although the results look contrary they are interesting as the auditor's opinion is left with a significant effect in all three final models.

To the writer's knowledge there have not been conducted any significant comparable studies dealing with this potential indicator and therefore no parallels can be drawn. The inclusion of the auditor's opinion is an extension to previous studies and therefore leads to new results (negative effect on the profitability and the market performance, and positive effect on the cash flow performance), which have not been investigated before. As the variable auditor's opinion is significant across all three models, further studies in this field should consider adding this independent variable.

The explanatory variable cash conversion cycle is also significant across all three models, but again with different results. A shorter cash conversion cycle leads to a higher profitability and a better market performance, while a longer cash conversion cycle leads to a better cash flow performance. The positive effect on the profitability performance was expected and underlines once more the importance of an efficient working capital for the profitability of a firm. The stock market also reacts positive to an efficient working capital. In this context (compared to the other two performance measures) the negative economical effect on the cash flow performance seems not reasonable and could only be due to characteristics in certain industries.

The results of the positive effect of a shorter cash conversion cycle are consistent with the results of previous studies. Johnson and Soenen (2003) show that the cash conversion cycle is significantly positive related across all three performance measures (market performance and profitability measures). Shin and Soenen (1998) report similar results whereas shorter cash conversion cycles are significantly positive associated with better performance. The specific effect of the cash conversion cycle on the cash flow performance measured by cash dividends has not yet been investigated.

The variable capital structure is also significant in all three models, but again with different results. There exists a negative effect of debt on the market performance and the profitability performance and a positive effect on the cash flow performance. Therefore higher leverage will increase cash dividends, whereas lower leverage will

improve the return on investment as well as the stock performance. It is interesting that there obviously exists a trade off when it comes to leverage. Either a company has more equity and less debt leading to a high degree of profitability or less equity and more debt leading to a higher cash flow. The positive effect on the cash flow performance could be due to the fact that when a company has more money through debt available for investing, less equity is needed. Therefore the remaining part of equity, which is then not needed for investing, can be distributed to the shareholders. In addition shareholders will appreciate companies with more equity and less influence from banks.

The results concerning the effect of the capital structure are in contrast to the findings of Johnson and Soenen (2003), where no evidence is found that there does exist a relationship at all (neither positive nor negative) between the capital structure and company performance. The negative effect of debt on the market performance, which is found in the ongoing study, is in line with the results of Fama and French (1998), but contradicts the results made by Bhandari (1998). Bhandari provides empirical evidence that the stock returns are positively related to the ratio of debt to equity.

The variable sales change (with one year time lag) is significant across all three models and this is the only variable where the directions are the same in all three models. However, the influence on all three performance measures is a negative one. If the revenues have increased in the previous year the profitability as well as the cash flow and market performance is diminishing. These results are exactly the opposite of what was hypothesized. Thus short term sales growth does not lead to superior performance, quite the reverse is true. This is especially interesting because in the past many consulting companies have highlighted the overall importance of growth as the sole sustainable advantage. It is possible that companies are not able to transfer the generated sales growth into profitability and cash flow in the short run.

A lot of qualitative research and research from consulting companies has been done concerning sales change stressing how important long term growth is (e.g. Mass, 2005; Nohria et al, 2003; Roland Berger Consultants, 2004). In the ongoing study the opposite is found to be true; a positive sales change (i.e. increase) leads to a worse performance (in all three dimensions) in the upcoming year.

The variable sustainable growth rate (with one year time lag) is finally the fifth variable which is significant across all three models; again with different effects. The variable has a significant positive effect on the profitability performance, and a negative effect on the cash flow and market performance. If more money is ploughed back and reinvested the company's profitability is rising, whereas the cash dividends and

the stock price are shrinking. The effect on the profitability seems reasonable, and concerning the negative effect on the other two performance measures the time lag is probably too short. In terms of cash flow performance it is obvious that either available cash is invested or distributed and so in the short run there has to exist a negative relation.

Johnson and Soenen (2003) find that companies with higher sustainable growth rates have superior financial performances (market performance and profitability measures). The positive effect on the profitability performance found in the ongoing study is in line with these results, whereas the results of the other two performance measures (cash flow and market performance) are different.

The variable book-to-market ratio has a significant effect on the profitability performance and the market performance. In both models the influence is a negative one, indicating that a lower book-to-market ratio leads to a higher return on investment and a better stock performance. The assumptions concerning the effect of this ratio are that value stocks have by definition a relatively high book-to-market ratio (so called blue chips) and will therefore have lower returns than growth stocks (with a low book-to-market ratio). Here the future potential of the growth stocks is being priced in. Therefore the book-to-market ratio should have a negative impact on the market performance.

This ratio is the most widely used variable when it comes to empirical research in this field. The results of the market performance confirm the results of major previous studies and seem reasonable, because a low book-to-market means that the stock is relatively undervalued and therefore has growth potential. Kothari and Shanken (1997) and Pontiff and Schall (1998) show that the book-to-market ratio has the ability to negatively predict market returns. However, other researcher groups present contrary results concerning this ratio. For example Fama and French (1998) show that value stocks have higher returns than growth stocks. Chan, Hamao and Lakonishok (1991) find similar results when examining Japanese companies. Most recently Johnson and Soenen (2003) find that the book-to-market ratio has a significant positive relation with Jensen's alpha. However, this ratio has a significantly negative effect on the Sharpe's ratio.

The variable EBIT margin is also significant in the profitability and market model, but with different results. There exists a negative effect of high EBIT margins on the profitability performance and a positive effect on the market performance. Therefore higher EBIT margins lead to a higher stock price, whereas lower EBIT margins lead to a higher return on investment. The positive effect on the stock price seems rea-

sonable as investor will appreciate a higher profitability. However the negative effect on the profitability performance seems unreasonable. This is especially true because the EBIT margin (exactly the EBT margin) is besides the turnover of assets the second essential part determining the ROI (which is the profitability performance measure). Thus the return of the assets is the relevant factor in explaining the performance measure and has to compensate the negative effect of the EBIT margin. In addition, it was also assumed that the EBIT margin will have an effect on the cash flow performance, but the variable is not left in the final model there.

To the writer's knowledge there have not been conducted any significant comparable studies dealing with this potential indicator and therefore no parallels can be drawn. This ratio is moreover used extensively by practioners. The inclusion of the EBIT margin is an extension to previous studies and therefore leads to new results (negative effect on the profitability and positive effect on the market performance), which have not been investigated before.

The variable return on assets has a significant effect on the profitability performance and the market performance. The effect is a positive one and so a higher return on assets leads to a higher profitability measured by the return on investment and a higher stock price. The positive influence on the profitability measure is obvious as the indicator ROA is also a proxy for profitability. In addition the analysis reveals that investors are looking for high profitability when picking their stocks. However, it was also expected that the cash flow performance is influenced by the variable ROA, because profitability is needed to generate cash flow, which is not the case in the ongoing study.

Johnson and Soenen (2003) find that there does exist a positive relationship between return on assets and company performance. The results of the ongoing study confirm these previous results.

The variable common stock rating is also significant in the profitability and market model, again with the same effect. However the influence is a positive one (in a statistical sense), which is the opposite of what has been hypothesized. These results indicate that a higher rating, which is worse than a lower rating, will lead to better performance. Thus the common stock rating is not a good indicator for the actual stock performance. Actually, the stock is moving in the opposite direction than the rating suggests. This is quite interesting, as a stock rating is expected to measure the current standing and the future potential of a listed company fairly well. In addition, one would think that a stock rating of a rating agency such as Standard and Poor's is influencing the overall investors decisions and therefore determining the stock price to

a certain degree. The negative effect on the profitability performances indicates that the stock rating is certainly not measuring the profitability of a listed company.

To the writer's knowledge there have not been conducted any significant comparable studies dealing with this potential indicator and therefore no parallels can be drawn. The hypothesis of a positive effect on the performance measures was based on economic theory rather than on previous results.

The variable size is significant in the cash flow model as well as in the market model, again with the same effect. There exists a negative effect of size measured by total assets on the cash flow performance and on the market performance. This indicates that smaller companies are able to generate relatively more cash flow for shareholders than bigger companies and are able to have higher stock increases. However the size has no influence on the profitability performance.

Company size is the second most publicized variable to explain company performance. For example Fama and French (1992) show that stock returns are negatively related to size. A similar result is provided by Banz (1981) and Basu (1983), who find that small stocks have higher returns than big stocks. Barber and Lyon (1997) reveal that the relation between size and security returns is also similar for financial and non-financial firms. Rouwenhorst (1999) shows that even in emerging markets stocks small stocks outperform large stocks. The results in the ongoing study confirm these previous results, as size has a negative effect on the cash flow performance as well as on the market performance. Only Johnson and Soenen (2003) found that on average large companies have superior financial performances.

The variable capital expenditure is only significant in the market model. The effect is a negative one and so a higher capital expenditure leads to a lower stock price. This could be due to the short time lag. In addition capital expenditure is not explaining the profitability and the cash flow performance as it was assumed. As to the reader's knowledge there have not been conducted any significant comparable studies dealing with this potential indicator no parallels can be drawn. Moreover the results generated in this context (negative relation between capital expenditure and stock price) can be used and investigated in further studies.

The variable current ratio is only significant in the profitability model. The variable has a significant negative effect, which is the opposite of what has been hypothesized. The results indicate that more liquidity is bad, because this may encourage managers to invest to easily. There is no influence on the cash flow and the market performance.

There have not been conducted any significant comparable studies dealing with this potential indicator, although the effects of liquidity in terms of cash have already been investigated. On the one hand Brealey and Myers (1996) argue that a high amount of liquidity is good because it gives the company the possibility to make quick decisions for proper investments. On the other hand Jensen (1986) is pointing out that too much liquidity might not be good, because this may encourage managers to invest to easily in mature businesses or bad acquisitions. The results of the ongoing study therefore confirm the thesis of Jensen.

Finally, the variable research and development expenditure is the only variable, which is dropped in all three models. Research and development is seen as a proxy for innovation, which was believed to have a significant effect on the performance of companies. But the results indicate that R&D expenditure is not a relevant factor in explaining performance measured by the three dimensions in the ongoing study.

Chan et al. (2001) find no reliable evidence that support a direct link between R&D spending and stock returns. The same is true for the ongoing study. However, Johnson and Soenen (2003) find in their study that there exists at least a weak link to company performance (measured by EVA) but this effect is a negative one. Damanpour and Evan (1984) report a positive relationship between innovation and performance. Similarly, Subramanian and Nilakanta (1996) also find that innovativeness had a positive effect on performance when measured by return on assets. Aboody and Lev (2000) find that performance (measured by insider gains) is higher in companies with a relatively high R&D intensity.

When analyzing the summarized results it comes clear that only one variable (i.e. sales change) has the same significant effect on all three performance measures, while all other effects are different across the three models. In addition the variables book-to-market ratio, return on assets, size and common stock rating have the same effect in the final models, where they are left.

Summarized, the results indicate companies with a low book-to-market ratio, an efficient working capital management, a small portion of liquidity, more equity and less debt, shrinking revenues, and high retained earnings for reinvesting purposes will have a better profitability performance measured by the return on investment. Further on, companies with an unqualified auditor's opinion, less equity and more debt, few assets, and no retained earnings will have a better cash flow performance measured by cash dividends. Finally, companies with a low book-to-market ratio, efficient working capital, more equity and less debt, negative stock rating, high EBIT margin, few

assets and high profitability will have a better market performance measured by the stock price.

These results indicate that there exists a relationship between company performance and financial indicators as it was assumed in the hypothesis. Although some effects seem contrary and unreasonable at least some of the indicators are explaining a company's performance quite well.

A few final conclusions and considerations concerning the results described above will be presented in the following. It can be said, that different performance measures exhibit a trade off relation between the different underlying goals. This means that a company cannot serve all three dimensions (i.e. having superior profitability, generating sustainable cash flow for shareholders, and outperforming the stock market) at the same time. It will not be possible because the effects of certain decisions are different on different performance measures. Instead a company has to focus on one operational goal, which is derived from the company's strategy. A company will have to align the structure and all processes related to the business with one operational goal. Then the company will be able to achieve above average performance (measured by the corresponding performance measure).

Further studies could test the three models presented in the ongoing study with data from different regions or countries. In addition it has to be said that only listed and audited companies have been examined in the study, and therefore a study across small and medium sized companies with the same variables would be interesting. It can be assumed that the results for particular variables may differ. Another interesting issue for upcoming research will be to examine all variables, which have been analyzed in the ongoing study for the first time and have been found to be significant (e.g. auditor's opinion). Another major point for future empirical study may be the negative effect of the stock rating. It would be interesting to examine whether stock ratings are generally not able to explain stock and profitability performance. Therefore also ratings from other major rating agencies (e.g. Moody's) as well as investment banks could be used.

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Appendix

A.1. Panel Regression

Dependent Variable: MVC
Method: Panel Least Squares
Sample: 1986 2004
Cross-sections included: 1258
Total panel (unbalanced) observations: 12652

Variable	Coefficient	Std. Error	t-Statistic	Prob.
BTM	-40.09121	1.364268	-29.38660	0.0000
CCC	-0.012360	0.007210	-1.714264	0.0865
CS	-0.189922	0.028232	-6.727127	0.0000
CSR	9.590758	0.360074	26.63550	0.0000
EBITM	-0.212553	0.068712	-3.093375	0.0020
SC	0.436409	0.026127	16.70351	0.0000
SIZE	-3.86E-11	2.40E-11	-1.604831	0.1086
SSG	30.23391	6.353919	4.758310	0.0000
C	7.569578	2.270938	3.333238	0.0009

Effects Specification
Cross-section fixed (dummy variables)

R-squared	0.143138	Mean dependent var	26.01099
Adjusted R-squared	0.142596	S.D. dependent var	65.20217
S.E. of regression	60.37468	Akaike info criterion	11.03973
Sum squared resid	46085019	Schwarz criterion	11.04502
Log likelihood	-69828.32	F-statistic	264.0005
Durbin-Watson stat	1.804313	Prob(F-statistic)	0.000000

Table 26: Estimation output of final market model without lags; Source: Standard & Poor's, Compustat North America

Dependent Variable: MVC
Method: Panel Least Squares
Sample: 1986 2004
Cross-sections included: 1608
Total panel (unbalanced) observations: 26854

Variable	Coefficient	Std. Error	t-Statistic	Prob.
BTM	-46.06171	0.921688	-49.97536	0.0000
SIZE	-6.71E-11	2.89E-11	-2.320940	0.0203
C	58.19777	0.818887	71.06932	0.0000

Effects Specification			
Cross-section fixed (dummy variables)			
R-squared	0.147796	Mean dependent var	25.61004
Adjusted R-squared	0.093478	S.D. dependent var	83.73319
S.E. of regression	79.72357	Akaike info criterion	11.65309
Sum squared resid	1.60E+08	Schwarz criterion	12.14460
Log likelihood	-154856.0	F-statistic	2.720955
Durbin-Watson stat	2.017110	Prob(F-statistic)	0.000000

Table 27: Estimation output of reduced market final model; Source: Standard & Poor's, Compustat North America

A.2. Binary Logit Model

Dependent Variable: ROI_BINARY_MEAN
Method: ML - Binary Logit (Quadratic hill climbing)
Sample (adjusted): 1987 2004
Included observations: 11522 after adjustments
Convergence achieved after 8 iterations
Covariance matrix computed using second derivatives

Variable	Coefficient	Std. Error	z-Statistic	Prob.
AUDIT(-1)	0.342885	0.186218	1.841304	0.0656
BTM	-0.815948	0.180732	-4.514677	0.0000
CCC	0.000551	0.001264	0.435975	0.6629
CR	-0.736525	0.059070	-12.46878	0.0000
CS	-0.010150	0.004672	-2.172657	0.0298
CSR	-0.063379	0.070531	-0.898597	0.3689
EBITM	-0.079387	0.013179	-6.023959	0.0000
ROA	5.331093	0.241671	22.05930	0.0000
SC(-1)	-0.005877	0.003302	-1.779977	0.0751
SSG(-1)	1.226675	0.985793	1.244354	0.2134
C	-9.885610	0.706817	-13.98610	0.0000

Mean dependent var	0.778337	S.D. dependent var	0.415383
S.E. of regression	0.116327	Akaike info criterion	0.090781
Sum squared resid	155.7678	Schwarz criterion	0.097800
Log likelihood	-511.9872	Hannan-Quinn criter.	0.093140
Restr. log likelihood	-6095.191	Avg. log likelihood	-0.044436
LR statistic (10 df)	11166.41	McFadden R-squared	0.916001
Probability(LR stat)	0.000000		

Obs with Dep=0	2554	Total obs	11522
Obs with Dep=1	8968		

Table 28: Estimation output final profitability logit model; Source: Standard & Poor's, Compustat North America

Dependent Variable: DVPV_BINARY_MEAN
Method: ML - Binary Logit (Quadratic hill climbing)
Sample (adjusted): 1987 2004
Included observations: 15128 after adjustments
Convergence achieved after 4 iterations
Covariance matrix computed using second derivatives

Variable	Coefficient	Std. Error	z-Statistic	Prob.
AUDIT(-1)	0.120890	0.039849	3.033711	0.0024
CAP(-1)	-0.926447	0.179887	-5.150150	0.0000
CCC	-0.001034	0.000231	-4.479015	0.0000
CS	0.006730	0.000855	7.871059	0.0000
SC(-1)	-0.012793	0.000859	-14.89161	0.0000
SIZE	1.44E-11	1.43E-12	10.11543	0.0000
SSG(-1)	-3.034968	0.208038	-14.58853	0.0000
C	-0.196876	0.069624	-2.827714	0.0047

Mean dependent var	0.384651	S.D. dependent var	0.486529
S.E. of regression	0.469153	Akaike info criterion	1.262159
Sum squared resid	3327.979	Schwarz criterion	1.266191
Log likelihood	-9538.974	Hannan-Quinn criter.	1.263497
Restr. log likelihood	-10079.71	Avg. log likelihood	-0.630551
LR statistic (7 df)	1081.479	McFadden R-squared	0.053646
Probability(LR stat)	0.000000		

Obs with Dep=0	9309	Total obs	15128
Obs with Dep=1	5819		

Table 29: Estimation output final cash flow logit model; Source: Standard & Poor's, Compustat North America

Dependent Variable: MVC_BINARY_MEAN
Method: ML - Binary Logit (Quadratic hill climbing)
Sample (adjusted): 1987 2004
Included observations: 11844 after adjustments
Convergence achieved after 18 iterations
Covariance matrix computed using second derivatives

Variable	Coefficient	Std. Error	z-Statistic	Prob.
AUDIT(-1)	0.108100	0.047404	2.280376	0.0226
BTM	-2.207394	0.080521	-27.41396	0.0000
CAP(-1)	-0.839383	0.238887	-3.513727	0.0004
CCC	-0.001059	0.000293	-3.614266	0.0003
CS	-0.000751	0.001180	-0.636755	0.5243
CSR	0.330884	0.014981	22.08649	0.0000
EBITM	-0.006158	0.003178	-1.937345	0.0527
ROA	0.038018	0.004524	8.403063	0.0000
SC(-1)	-7.62E-05	0.000968	-0.078663	0.9373
SIZE	-2.40E-12	1.32E-12	-1.822556	0.0684
SSG(-1)	-2.451243	0.259472	-9.447035	0.0000

C	-0.720605	0.116766	-6.171354	0.0000

Mean dependent var	0.336457	S.D. dependent var	0.472517
S.E. of regression	0.441200	Akaike info criterion	1.150272
Sum squared resid	2303.185	Schwarz criterion	1.157748
Log likelihood	-6799.909	Hannan-Quinn criter.	1.152781
Restr. log likelihood	-7564.261	Avg. log likelihood	-0.574123
LR statistic (11 df)	1528.704	McFadden R-squared	0.101048
Probability(LR stat)	0.000000		

Obs with Dep=0	7859	Total obs	11844
Obs with Dep=1	3985		

Table 30: Estimation output final market logit model; Source: Standard & Poor's, Compustat North America

Dependent Variable: ROI_BINARY_MEAN
Method: ML - Binary Logit (Quadratic hill climbing)
Sample (adjusted): 1987 2004
Included observations: 11522 after adjustments
Prediction Evaluation (success cutoff C = 0.5)

	Estimated Equation			Constant Probability		
	Dep=0	Dep=1	Total	Dep=0	Dep=1	Total
P(Dep=1)<=C	2440	104	2544	0	0	0
P(Dep=1)>C	114	8864	8978	2554	8968	11522
Total	2554	8968	11522	2554	8968	11522
Correct	2440	8864	11304	0	8968	8968
% Correct	95.54	98.84	98.11	0.00	100.00	77.83
% Incorrect	4.46	1.16	1.89	100.00	0.00	22.17
Total Gain*	95.54	-1.16	20.27			
Percent Gain**	95.54	NA	91.46			

	Estimated Equation			Constant Probability		
	Dep=0	Dep=1	Total	Dep=0	Dep=1	Total
E(# of Dep=0)	2397.94	156.06	2554.00	566.13	1987.87	2554.00
E(# of Dep=1)	156.06	8811.94	8968.00	1987.87	6980.13	8968.00
Total	2554.00	8968.00	11522.00	2554.00	8968.00	11522.00
Correct	2397.94	8811.94	11209.89	566.13	6980.13	7546.25
% Correct	93.89	98.26	97.29	22.17	77.83	65.49
% Incorrect	6.11	1.74	2.71	77.83	22.17	34.51
Total Gain*	71.72	20.43	31.80			
Percent Gain**	92.15	92.15	92.15			

*Change in "% Correct" from default (constant probability) specification

**Percent of incorrect (default) prediction corrected by equation	

Table 31: Classification table final profitability logit model; Source: Standard & Poor's, Compustat North America

Dependent Variable: DVPV_BINARY_MEAN
Method: ML - Binary Logit (Quadratic hill climbing)
Sample (adjusted): 1987 2004
Included observations: 15128 after adjustments
Prediction Evaluation (success cutoff C = 0.5)

	Estimated Equation			Constant Probability		
	Dep=0	Dep=1	Total	Dep=0	Dep=1	Total
P(Dep=1)<=C	8373	4767	13140	9309	5819	15128
P(Dep=1)>C	936	1052	1988	0	0	0
Total	9309	5819	15128	9309	5819	15128
Correct	8373	1052	9425	9309	0	9309
% Correct	89.95	18.08	62.30	100.00	0.00	61.53
% Incorrect	10.05	81.92	37.70	0.00	100.00	38.47
Total Gain*	-10.05	18.08	0.77			
Percent Gain**	NA	18.08	1.99			

	Estimated Equation			Constant Probability		
	Dep=0	Dep=1	Total	Dep=0	Dep=1	Total
E(# of Dep=0)	5920.06	3336.32	9256.38	5728.28	3580.72	9309.00
E(# of Dep=1)	3388.94	2482.68	5871.62	3580.72	2238.28	5819.00
Total	9309.00	5819.00	15128.00	9309.00	5819.00	15128.00
Correct	5920.06	2482.68	8402.74	5728.28	2238.28	7966.57
% Correct	63.60	42.67	55.54	61.53	38.47	52.66
% Incorrect	36.40	57.33	44.46	38.47	61.53	47.34
Total Gain*	2.06	4.20	2.88			
Percent Gain**	5.36	6.83	6.09			

*Change in "% Correct" from default (constant probability) specification	
**Percent of incorrect (default) prediction corrected by equation	

Table 32: Classification table final cash flow logit model; Source: Standard & Poor's, Compustat North America

Dependent Variable: MVC_BINARY_MEAN
Method: ML - Binary Logit (Quadratic hill climbing)
Sample (adjusted): 1987 2004
Included observations: 11844 after adjustments
Prediction Evaluation (success cutoff C = 0.5)

	Estimated Equation			Constant Probability		
	Dep=0	Dep=1	Total	Dep=0	Dep=1	Total
P(Dep=1)<=C	7109	2746	9855	7859	3985	11844
P(Dep=1)>C	750	1239	1989	0	0	0
Total	7859	3985	11844	7859	3985	11844
Correct	7109	1239	8348	7859	0	7859
% Correct	90.46	31.09	70.48	100.00	0.00	66.35
% Incorrect	9.54	68.91	29.52	0.00	100.00	33.65
Total Gain*	-9.54	31.09	4.13			
Percent Gain**	NA	31.09	12.27			

	Estimated Equation			Constant Probability		
	Dep=0	Dep=1	Total	Dep=0	Dep=1	Total
E(# of Dep=0)	5542.62	2316.38	7859.00	5214.78	2644.22	7859.00
E(# of Dep=1)	2316.38	1668.62	3985.00	2644.22	1340.78	3985.00
Total	7859.00	3985.00	11844.00	7859.00	3985.00	11844.00
Correct	5542.62	1668.62	7211.24	5214.78	1340.78	6555.56
% Correct	70.53	41.87	60.89	66.35	33.65	55.35
% Incorrect	29.47	58.13	39.11	33.65	66.35	44.65
Total Gain*	4.17	8.23	5.54			
Percent Gain**	12.40	12.40	12.40			

*Change in "% Correct" from default (constant probability) specification
**Percent of incorrect (default) prediction corrected by equation

Table 33: Classification table final market logit model; Source: Standard & Poor's, Compustat North America