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From Value to Growth Stocks

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A Financial Ratio Analysis

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Abstract

Title: From Value to Growth Stocks – A Financial Ratio Analysis

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Purpose: The value investing philosophy, which can be traced at least to the teaching of Graham and Dodd in the 1930's, entails identifying and investing in potentially under valued stocks with a potential for extraordinary returns. The focus of this thesis is to identify patterns and characteristics in financial accounting data preceding creation of shareholder value.

Methodology: The authors of this thesis utilize a multivariate discriminant analysis in order to identify indicators of value creation and subsequent extraordinary returns in value stocks. A discriminant function is derived which successfully identifies which value stocks will eventually become growth stocks.

Conclusion: The thesis proves that it is possible to predict future extraordinary returns using easily accessible financial accounting data. Furthermore, the authors conclude that firms are rationally priced at low market-to-book ratios due to a lack of profitable investment opportunities. Firms leaving the value segment to become growth stocks are shown to achieve this transition by improving a suboptimal capital structure.

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1 Introduction

Chapter 1 provides a brief introduction to the value investing philosophy and the conditions for its success. Furthermore, the purpose of the thesis and what it aims at achieving is discussed followed by an overview of the thesis structure.

1.1 Background

It is the goal for every active investor to build a portfolio of assets which will outperform the return of the market portfolio. In order to construct such portfolios, the members of the investor community attempt to predict which stocks will outperform the market. Whereas some investors seem to follow their gut feeling or more or less good advice supplied by others, most apply clear strategies and rigid analysis when making their investment decisions. Although there are several investing strategies in practice, Anderson (1999) identifies the value investing and growth investing philosophies as the most universally followed schools.

The value investing school is often linked to Graham and Dodd and portrayed in their 1934 book *Security Analysis* (Graham and Dodd, 1934). This strategy builds on the concept of identifying and investing in stocks which are trading at a lower price than motivated by its intrinsic value, commonly referred to as value stocks, and reap a profit when the market corrects itself. By subscribing to this school, the investor is confident of his or her own ability to see values which are not recognized by the market. Growth investing comprises an opposing philosophy. While the value investor invests in stocks which are disfavored by the market, hoping the market value of their equity will increase, the subscriber to the growth philosophy invests in stocks which are already popular in the market place, hoping their market value will increase further. Such stocks are referred to as growth stocks. (La Porta, Lakonishok, Shleifer and Vishny, 1997; Anderson, 1999)

Several academicians have devoted their research to the subject of the value investing strategy. There have been a large number of studies comparing the returns on investing in value stocks as compared to the stock market in general and growth stocks in particular (Harris and Marston, 1994; La Porta et al., 1997; Fama and French, 1998; Cohen, Polk and Vuolteenaho, 2003). Several studies have also tried to find an explanation to why there could be a higher return, finding evidence both in support of and against theories of a higher return due to risk discrepancies (Black, 1972; Fama and French, 1996; Polk, Thompson and Vuolteenaho, 2006), mispricing due to market inefficiencies and irrational behavior by the investor community (MacKinley, 1995; Penman, Richardson and Tuna, 2007).

In an article, Piotroski (2000) presents evidence that in order for the value strategy to be successful, the market has to be inefficient in recognizing signals indicating the future performance of firms and the investor has to be able to identify patterns in accounting data preceding value creation. The purpose of this thesis is to identify such patterns that distinguish between successful value stocks and value stocks that are poor investment alternatives.

1.2 Problem Discussion

In the preparatory work of this study, it is found that a few firms each year make the transition from being a value stock to being a growth stock over the course of one year. But what is the cause of this increase in market value of equity? In order to be able to distinguish between successful and unsuccessful value stocks, it is necessary to consider the different explanations to why stocks are traded at different market-to-book ratios.

Common financial textbooks, such as (Arnold, 2005; Koller, Goedhardt and Wessels, 2005) recommend to use the discount cashflow approach to value the equity of a company. Based on historical accounting data, this method entails forecasting future performance of the firm. According to this theory, the value of a company’s equity equals all future expected cash-flows to equity discounted by the firm-specific cost of capital. Building upon this, a significant increase in market-to-book value of a company might indicate that the market perceives substantial improvements within the company leading to higher future earnings.

In addition to differences in expected earnings, the market value of equity is determined by the level of risk associated with investing in the company. In accordance with the *Capital Asset Pricing Model* (CAPM) investors demand higher expected returns for riskier investments, thus the market price of risky investments should be lower compared to less risky assets (Sharpe, 1964; Lintner, 1965; Black, 1972). However, some researches argue that the CAPM does not capture all fundamental risk of an investment (Fama and French, 1992), stating that value stocks are in fact riskier than growth stocks.

Other studies do not find evidence for value stocks being substantially riskier than growth stocks. In fact, some value stocks might even be traded below their actual fair value (Lakonishok, Shleifer and Vishny, 1994).

The second chapter will provide an in-depth discussion about the value investing anomaly.

1.3 Thesis Purpose

The discussion about the value investing anomaly shows that previous research related to value investing has focused on the differences between value and growth stocks. These studies investigate how a value premium could be theoretically explained, if it in fact exists. In contrast, this thesis focuses solely on the value segment. The purpose is to identify differences between value stocks that will increase their market-to-book value significantly within one period and those value stocks that remain traded at a low market-to-bock ratio.

By applying a multivariate discriminant analysis on a set of financial ratios, a function which best discriminates value stocks about to become growth stocks (movers) from other value stocks (non-movers) is constructed. If successfully derived, the discriminant function can be used to predict which value stocks will turn into growth stocks and thereby draw conclusions as to what factors drive the increase in market prices among value stocks. Such a model will prove useful to value investors in picking successful value stocks.

1.4 Thesis Outline

The remaining parts of the thesis adhere to the following structure:

Chapter 2 provides a review of related literature, discussing the prevalence of a value premium on investing in value stocks. The opinions and proofs of what may cause such a premium, provided by published scholars, are presented and discussed. Furthermore, the chapter provides a discussion, motivating the use of change in market-to-book value as a proxy for value creation in the empirical research presented.

Chapter 3 gives an overview of the empirical method used in this study and explains the basis on which its use is found appropriate. In addition to this, the chapter describes choice and collection of input data.

Chapter 4 gives a thorough description on how the collected data was prepared for analysis. This includes a description of the treatment of disturbances, such as outliers, in the original data sample. The chapter continues with an in-depth narrative of how the discriminant function is derived and how its adequacy in discriminating between value creating and non-value creating firms is tested. Finally, a summary of the results of the empirical research is provided.

C*hapter 5* contains an analysis of the empirical findings are evaluated in relation to the discussion found in previous literature.

Chapter 6 provides the conclusions drawn from the empirical findings and gives suggestions for further research.

2 Theoretical Background

Chapter 2 reviews literature discussing the prevalence of a premium on value stocks and the potential causes of such an anomaly. In addition to this the use of the market-to-book ratio in identifying value creation is discussed.

2.1 The Impact of the Market-to-Book Ratio – Value vs. Growth Stocks

A value stock is commonly defined as a stock with a low ratio of market value to equity book value (market-to-book ratio) whereas a growth stock is a stock with a high market-to-book ratio (Fama and French, 1998). Several studies (Fama and French, 1992; Cohen et al., 2003; Jiang and Koller, 2007; Penman et al., 2007) have found evidence of the existence of a premium return on investing in value stocks over the return on investment in growth stocks. In the economic literature, this premium is generally referred to as the value effect or value anomaly and forms the fundament of the value investing philosophy.

Fama and French (1998) find strong evidence of such a value premium not being exclusive to the U.S. stock markets, but also existing internationally. In their article, they study the returns of value stocks in thirteen major stock markets between 1975 and 1995. The authors conclude that firms defined as value stocks due to high ratios of book-to-market, earnings-to-price, cash flow-to-price, and dividend-to-price, produce large value premiums in twelve of these markets. In addition to this, the findings presented in the article suggest that the phenomenon is also present in emerging markets. While the phenomenon of a premium on the return on value stocks is claimed not to be specific to the U.S. or established markets, neither does it appear to be specific to any one industry. Banko, Conover, and Jensen (2006) find that the value anomaly is present across industries. The authors also find evidence of a value effect between industries, resulting in a superior return from holding stocks of an industry classified as a value industry compared to stocks belonging to a growth industry.

Yet, other studies argue that the value premium identified by earlier studies, such as Fama and French (1992), is merely the result of sample specific factors. MacKinlay (1995) argues that what appears to be a statistically significant relationship easily can be found in ex ante data by grouping assets with common disturbance terms. Thereby, the evidence of the value effect actually existing may be a result of selection biases. Black (1993) directs heavy criticism toward Fama's and French's (1992) findings, and indeed toward those who have followed them, in proving the existence of a value effect. The author accuses Fama and French of data mining and of misinterpreting their own work and that of others.

To a large extent, Black's (1993) criticism relates to Fama's and French's attempt to explain the value anomaly as a rational prizing of risk. If indeed the value effect is not merely a result of data mining, Black favors the view that it may be the result of market inefficiencies causing the market to irrationally miss pricing stocks. This opens up a door to the potential of being able to identify the miss priced stocks before the market corrects itself, using data available in the period before the value creating value stock moves into the growth category.

The main objective of the analysis presented in this thesis is, however, not to prove or disprove the existence of premium returns from holding a value stock portfolio. Rather, the analysis focuses on identifying factors that can be used to predict future movements.

2.2 Market-to-Book as an Indicator of Value Creation

The true equity value beyond book equity value of a corporation is defined by the present value of all future abnormal earnings the company will generate. Abnormal earnings are earnings in surplus to the alternative cost of equity capital or the return on equity capital expected by investors. As it is impossible to determine the future earnings of a company with certainty, the market value of equity reflects the market's expectations of the future abnormal earnings the firm is capable to generate. If the market expects the firm to be able to generate a higher return on book equity, investors will value the equity of the firm at a higher market-to-book ratio. (Palepu, Healy, Bernard and Peek, 2007)

However, a high market-to-book ratio alone does not mean that the firm is creating value. Jiang and Koller (2007) find that many of the companies that continue to beat the market over a longer period do so by continuing to utilize the capabilities which originally made the company favored by the stock market. In that case the firm does not outperform investors' expected return on equity and thereby value is not created. The authors also argue that many firms continue to outperform the market thanks to macroeconomic factors, which are not under the immediate control of the firm's management. Such outperformance of the market is not the result of successful management of the firm and cannot be expected to endure in the long run without management taking active measures to create value.

Value is created first when the corporation unexpectedly outperforms cost of equity capital through the creation of new profit generating capabilities. When the new capabilities are recognized by the market the market will adjust the market value of the firm's equity to better match the new expected earnings (Malkiel, 2004; Palepu et al., 2007). As this adjustment will be reflected in the market-to-book ratio of the firm, a transition from the value to the growth category can be used as an indicator of value creation.

Although the research presented here only analyzes the creation of value in value stock companies, this thesis does by no means make any claim that value adding activities are exclusive to value stocks. Firms that have entered the growth segment may very well continue to create value to its shareholders and thereby remain favored by the market.

2.3 Market-to-Book as a Measure of Risk

In their article, Fama and French (1992) argue that the existence of the value effect is due to a rational pricing of risk, which is not accurately captured by the *Capital Asset Pricing Model* (CAPM) of Sharpe (1964), Lintner (1965), and Black (1972). In the

CAPM, β is a relative measure of risk and is positively related to the expected return on an asset. Through a series of tests, the authors conclude that β is not positively related to average returns on the U.S. stock market between 1963 and 1990, thereby rendering the CAPM insufficient in explaining the occurrence of a value premium. According to Fama and French, as well as Chen and Zhang (1998), the risk overseen by the CAPM may be a risk associated with a low distance to distress. In their article, Chen and Zhang study the behavior among value stocks in the U.S., and the five Pacific Rim economies of Japan, Hong Kong, Malaysia, Taiwan, and Thailand. They find evidence that the value effect observed in the U.S., Hong Kong, Japan and Malaysia is likely to stem from firms in financial distress with high financial leverage and subject to high uncertainty regarding future earnings. Unarguably, the financial risk associated with high financial leverage, in combination with the business risk of high uncertainty regarding future earnings, imposes high total risk on the firm and thereby shrinks its distance to default.

Black (1993) argues that financial leverage provides indirect borrowing to investors who are unwilling to take on debt directly. As this is attractive to some investors, the stock price will be bid up by the market. Hence the return anomaly from adding financial risk to the firm is not a compensation for increased risk but rather an effect of realizing value by lowering risk.

Penman, et al. (2007) investigate the effect of adding leverage by decomposing the market-to-book ratio into two parts; enterprise market-to-book, related to business operations, and leverage market-to-book, corresponding to the financing activities of the firm. They find that adding leverage to the enterprise market-to book ratio in fact has a negative impact on returns. In the light of their rather puzzling results, Penman et al. conclude that mispricing, rather than rationally priced risk, is a possible explanation to the value effect.

2.4 Market-to-Book as an Indicator of Mispricing

In a 1994 article, Lakonishok, Shleifer, and Vishny (1994) investigate the relation between fundamental risk and the return on both value stocks and growth stocks. The authors find no support for the theory of fundamental risk being able to explain a risk premium on value stocks. Rather, evidence is found of value stocks being underpriced in relation to their return and risk characteristics. If indeed value stocks are not riskier than growth stocks, as found by Lakonishok et al. (1994), rationality implies that no difference in returns between the two groups should prevail unless the one segment demonstrates superior growth capabilities. This does however not appear to be the case. Harris and Marston (1994) conclude that the value effect cannot be explained solely by β and growth. If Black's (1993) argument that CAPM does hold, and that β captures all risk related to the firm, the explanation of the value effect has to be found in mispricing tendencies.

It is tempting to hypothesize that the value effect would be more prevalent in industries made up of companies which are difficult to value and therefore more likely to be mispriced. Based on the idea that intangible assets are more difficult to value than tangible assets, Banko et al. (2006) test whether the value effect is significantly stronger among firms with a high ratio of intangible assets. Surprisingly, the study shows indications of the value effect being stronger among capital intensive industries such as the apparel and utilities industries.

The cause of mispricing of firms may lay in the different investment horizons of individual investors. While the value investing philosophy is a long term strategy, in which an investment may not pay off for several years, many investors have investment horizons of only a few months. If this is the case for a large enough fraction of the market participants, the demand for, and thereby the market price of, growth stocks will go up while the opposite effect can be expected in the value segment of the market. The idea of such mispricing is supported by MacKinlay (1995), who argues that the value premium in U.S. stock returns is too large to be explained by rational pricing. Haugen (1996) goes as for as stating the mispricing to be so large it is close to creating an arbitrage opportunity.

The theory of mean reversion also applies to earnings forecasts, giving further support to the value school. Furthermore, Keil, Smith and Smith (2004) show evidence of earnings forecasts regularly being over pessimistic for stocks which are predicted to experience low returns overly optimistic assets which are anticipated to perform well. If such exaggerating forecasts influence the market price to move too much, this is a contradiction to the efficient market hypothesis as it means that assets can be miss priced.

Concluding a chapter on irrational behavior in the stock market, Malkiel (2004) reminds the reader that in the end the worth of a stock can only equal the worth of the cash flows it is capable of generating for its investors. Malkiel does not deny the presence of irrational behavior among investors but, although the process may be slow, the market will realize the true value of the firm and correct itself accordingly.

3 Methodology and Data

Chapter 3 provides a discussion on the choice of empirical method as well a description of the collection of input data.

This thesis aims at identifying financial characteristics of stocks that change status from value to growth stocks within one period. In contrast to the common research on the value investing anomaly, the analysis solely focuses on assets that are considered as value stocks. For this purpose, the financial data of companies trading at a low market-to-book ratio on the American stock markets will be examined.

Instead of using absolute values, the stocks considered in this analysis are classified in two groups based on their individual market-to-book value compared to the rest of the market. The first group of stocks includes stocks that changed status from value to growth stocks within one period, whereas the stocks of the second group remain valued on a constantly low level. In the first step, both groups are examined for significant differences in mean value of their financial characteristics based on a univariate analysis. The focus of the analysis is however on a subsequent multivariate discriminant analysis, a method previously used in the financial literature to predict financial distress.

3.1 Descriptive Univariate Statistics

In the first part of the analysis, the aim is to analyze whether a group of stocks that move from value to growth stock show significantly different characteristics based on a univariate statistic. The method applied is an independent-sample t-test, which is used to compare the means of the groups for each financial ratio separately. The two-tailed version of the test is used with null hypothesis of equal group means. This implies that deviations in group-mean of one group will be identified in both, positive and negative direction.

For the independent-sample t-test the observations need to be independent and normally distributed. While it is reasonable to assume independence among the financial ratios for the given sample, even though there might be interdependences within observations belonging to the same industry, financial variables are usually not normally distributed (Rees, 1995). In order to reduce the deviation from a normal distribution, those observations showing extreme values have been excluded from the original sample. This approach yields to satisfactory results for most of the financial variables. However, for the variables, total assets and sales indicating company size, an additional logarithmic transformation needs to be applied.

The classification of the financial ratios into different groups implies a theoretically founded reduction of correlation among the different ratio groups (Altman, 1968). In the second part of the univariate analysis the strength of the linear relationship between the ratios will be examined by comparing the individual correlation coefficients. The information will be used to identify those ratios that contain unique information, in order to further reduce the range of potential explanatory variables for the discriminant analysis.

3.2 Multivariate Analysis

A multivariate discriminant analysis is used to examine interdependences among the individual explanatory variables and their ability to explain differences among movers and non-movers. After the identification of significant discriminant variables the aim will be to analyze if the findings can be used to support the theories introduced in chapter 2.

The discriminant analysis is a multivariate technique that is used to identify differences in the characteristics of two or more known and mutually exclusive groups. In particular the approach is used to answer the following questions (Backhaus, Erichson, Plinke and Weiber, 2003):

- Do the groups significantly differ concerning the examined variables?

- Which variables are appropriate to distinguish between the groups?

In this case, the aim is to identify combinations of financial ratios that can be used to distinguish between a group of stocks that moved from value to growth stocks within one period and a group of those that remained value stocks. The advantage of this multivariate approach is that it does not rely on a single factor to predict the described movements. Rather, different profiles of financial characteristics are analyzed simultaneously. For instance, a firm might be highly solvent and indicate a low level of distress risk, but on the other hand poor efficiency and profitability figures still prevent the movement to a growth stock. Obviously, a univariate approach would yield to contradicting interferences in this case.

The most important difference between a discriminant analysis and a usual linear regression is that the dependent variable in the discriminant model is a qualitative factor of nominal scale, e.g. female/male, bankrupt/non-bankrupt or mover/non-mover, while all explanatory variables have to be metric measures (Backhaus et al., 2003). Moreover, in a linear regression a causal flow is assumed, i.e. the exogenous variables in combination with the error term explicitly determine group membership, whereas for the discriminant approach the group membership is predefined. Thus, there is a causal flow from group membership to the explanatory variables (Altman, Avery, Eisenbeis and Sinkey, 1981). Therefore, the aim is to derive a function of financial variables that best discriminates between movers and non-movers.

The discriminant function in general has the following form: $Y = b_0 + b_1 X_1 + b_2 X_2 + ... + b_j X_j$, where

Y = discriminant variable

X_j = independent variables

b_j = discriminant coefficients

During the analysis, the discriminant coefficients b_j are estimated. These coefficients in combination with the actual financial ratios X_j can then be used to calculate an individual discriminant score for each observation. In this model the constant coefficient b_0 is used to create a critical cutoff score equal to zero, so that an observation with a negative individual score will be assigned to the movers-group and a positive score results in a classification as non-mover. Thus, the adequacy of the model improves with the increase of the spread between the average group discriminant values, i.e. the variance between the groups.

In order to test the predictive power of the model, the discriminant function is applied on different hold-out samples that have not been included in the preceding estimation. The goodness of the function is evaluated on the percentage of correctly predicted group memberships of the observations in the hold-out sample. Moreover two different types of errors are classified, which accounts for different costs associated to misclassification. In this context, a non-moving stock that is incorrectly classified as a moving-stock is intuitively inferior to a misclassification of a moving-stock and therefore attributed as a type I error. Biased interpretations in the later evaluation as well as misleading investment advices in particular would be the consequence. Figure I shows the applied error classification.

		Predicted membership	
		Movers	**Non-Movers**
Actual membership	**Movers**		**Type II error**
	Non-Movers	**Type I error**	

Figure 1: Error Classification

3.3 Sample Selection

The sample data is taken from the three major U.S. stock markets; AMEX, NASDAQ, and NYSE. Although value creating activities and subsequent positive movements in market-to-book ratios are expected to take place in value firms in stock markets throughout the world, the substantial access to historic data through Thompson DataStream and the scale of the market motivates the use of the major U.S. stock markets in this analysis. Sourcing an equally large set of data from, for instance, the European market would call for the use of data from a large number of national exchanges, subject to different taxation, legislation, and reporting praxis.

Even though the overall number of stocks examined from the AMEX, NASDAQ, and NYSE together amount to more than 2600, the number of stocks finally regarded as movers does not exceed 40 companies in a single period. In order to collect a large enough data set to perform the analysis with credible results, it becomes necessary to form the sample portfolio out of observations taken from an interval of 20 years, ranging from 1986 to 2005. Altman (1968) used the same approach of pooled data to collect a sufficiently large sample of firms going bankrupt. It would however been beneficial to the credibility of the analysis if the observations would all have been taken from the same year rather than from wide range of years. The reason for this is the fact that the average of most ratios tend to vary from one year to another. This can be the result of changes in taxation, legislation, overall market climate etc., causing both the stock market and the managers of the individual companies to alter their behavior. The problem is similar to that which was assumed to arise if using data from several smaller exchanges, domiciling in different countries. However, had that alternative been utilized, the problem would likely have been multiplied, as each of the national markets could be expected to have experienced such changes. It is also recognized that the annual number of transitions from value to growth is substantially larger in the latter years of the range. This will create a bias toward the macro economic environment in recent years and can potentially help the accuracy of the final model in predicting value creation in coming years.

The fact that the data set only includes firms which are still traded at the end of the 20 year period adds further bias. Through serendipity, the practice of deliberately giving higher explanatory power to observations made in more recent years has been adhered to. According to Albanis and Batchelor (1999) this practice is especially useful in the analysis of financial data, since patterns are likely to disappear as they are soon exploited by traders. Analogous to this, the final model can be expected to prove weak when tested against data from the early years of the sample period.

Preferably, stocks would be selected from a single industry. Again, the lack of sufficient data requires the consideration of different industries. However, in selecting the sample, stocks were sorted into industry groups. This allows for identification of statistically any significant differences in the ratios of firms belonging to different industries. Finding that the characteristics of one industry differs significantly from the rest of the sample may motivate excluding that industry from the sample. In the sample, the industry groups have different weights. The "industrials" group is the largest and the derived model may therefore be biased toward explaining industry specific characteristics of this group. Fama and French (1992) remark that while high leverage is normal among financial firms in good health, a high leverage ratio can be interpreted as an indication of distress among non-financial firms. Because leverage and risk of distress is ascribed high explanatory power over stock prices by several researchers (e.g. Black (1993), Fama and French (1992)), it is considered necessary to include ratios depicting these factors in the discriminant analysis. However, since these factors are likely to have different meaning to financial firms than for other firms, financial firms are excluded from the final sample.

For the purpose of evaluating the capability of the derived model to predict movements from the value segment to the growth segment more than one year before the event, it is necessary to have access to financial ratios from a couple of years leading up to the transition. To ensure this, stocks introduced to the exchange less than three years prior to the actual transition are excluded. However, by doing so, a bias toward the characteristics of well established value stocks is created in the discriminant function. This bias may be deteriorating the ability of the final model to predict increases in market value for newly introduced companies. Nevertheless, it is possible that their characteristics differ from those of established companies. Hence, excluding start-up firms improves the accuracy of the model in predicting market value increases among established companies.

In each year of the sample period, every firm is classified into one out of three groups based upon their market-to-book value on June 30 of that year. Firms with a market-to-book ratio below the 30th percentile are considered value stocks whereas those with a market-to-book ratio above the 70th percentile are regarded growth stocks. The majority of stocks are assigned to a middle group that is considered neither value nor growth stock. The same classification criteria is applied by several other researchers (Fama and French, 1993; Harris and Marston, 1994; Fama and French, 1998; Griffin and Lemmon, 2002) though others leave out the middle class all together (Capual, Rowley and Sharpe, 1993).

When using the transition between the value and growth groups as a proxy for value creation, the middle group acts as a moat, ensuring that only stocks which make a definite transition are considered value creating. Had the moat not existed, the number of transitions in the sample would likely have been substantially larger. However, the sample could include several stocks which have in fact shown a decrease in their market to book value and several of the stocks would be likely to frequently move between the two groups. In that case, it is doubtful that an appropriate function can be derived that significantly discriminates between the groups. Applying a larger middle group reduces noise and increases the likelihood of the movers actually having made a definite transition. While the precision of the analysis is likely to have benefited an even more narrow definition of value and growth, the loss of number of movers in the sample would potentially have the opposite effect.

Having limited the sample in accordance with the description above, the unadjusted sample contains 152 value stocks known to make the transition from value to growth stocks within a year. In the final sample, these 152 “movers” make up Group 1 while Group 2 is made up of “non-movers” consisting of 137 stocks. The non-movers solely consist of stocks that have been constantly traded at a market-to-book ratio below the 30^{th} percentile for several periods. Group 2 is chosen to match Group 1 with respect to industry distribution and the year the observation was made. The selection of Group 2 members was made in this way rather than by completely random selection in order to reduce the risk of year or industry specific factors disturbing the result.

After the adjustment of the original data for missing values and outliers, the final sample consists of 28 stocks in each group. The practice of using two equally sized groups follows the example set by Altman (1968) in deriving a discriminant function for predicting bankruptcy. A reason for this approach is the assumption of equal group covariance-matrices in the discriminant analysis. Equally sized groups scientifically reduce the deviation from this assumption (Altman et al., 1981). However, a disadvantage of this practice is that a-priori probabilities of group membership cannot be modeled using unequal group sizes, which implies a 50% chance of randomly picking a value stock out of the analyzed sample. The original data (large sample) will be used for secondary testing purposes during the analysis.

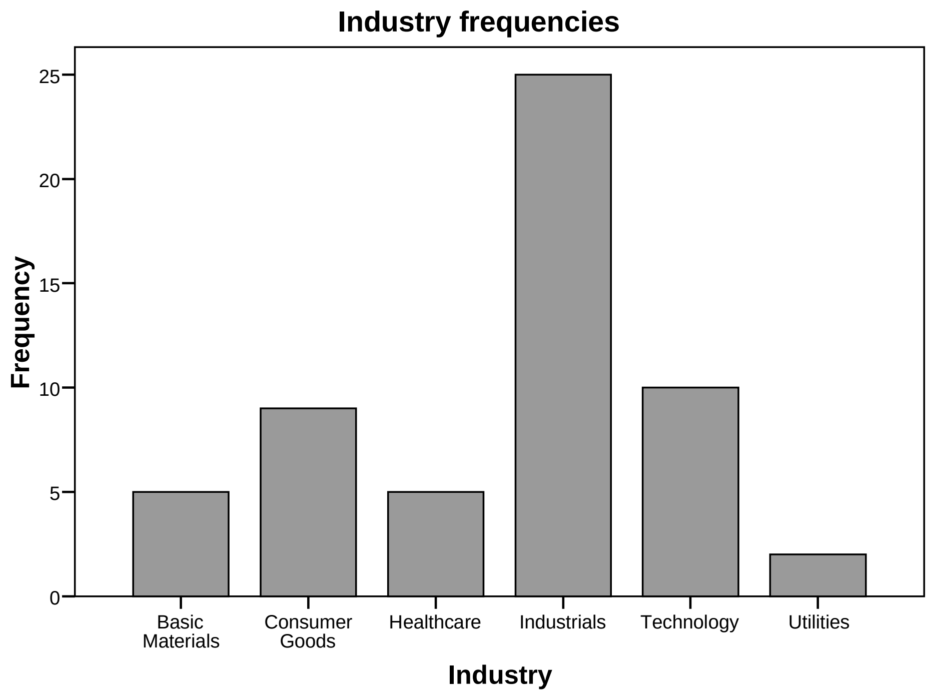

Figure 2: Sample Overview - Initial Sample

3.4 Variable Selection

In order to identify significant differences in the characteristics of value creating and non-value creating firms, the discriminant power of a set of financial ratios need to be analyzed. In all, 27 financial variables were identified as value drivers by valuation text books or were given explanatory power over stock returns by one or several of the articles referred to in earlier chapters of this thesis. These were related to one of seven key factors for evaluating the financial health, value adding abilities, and market value of a firm; leverage, liquidity, efficiency, investment rate, profitability, risk, and size. Most of these factors correspond in one way or another to the overall risk profile of a firm, its opportunities to profitable investments or to its access to additional capital. Although most of the seven factors are represented by more than one ratio, the final discriminant function was not restricted to include a representative ratio of each factor, neither was it restricted to only containing one ratio from each group. However, the reason for classifying financial variables has been to reduce the probability of considering variables in the final model that explain the same characteristics, even though the correlation coefficient indicates no linear relationship.

Table 1 provides an overview of the variables considered in the analysis and how they are defined.

	Financial Variable	**Calculation**
Leverage	Net Debt / Equity	Net Debt / Common Equity
	Debt / Total Assets	Total Debt / Total Assets
Liquidity	Current Ratio	Current Assets / Current Liabilities
	Interest Coverage	EBIT / Interest Expenses
	Interest Expense / Debt	Interest Expense / Total Debt
Efficiency	Sales / Working Capital	Sales / (Current Assets - Current Liabilities)
	Asset Turnover	Sales / Total Assets
	Receivables Turnover	Sales / Receivables
	Inventory Turnover	Sales / Inventory
	Fixed Assets Turnover	Sales / Fixed Assets
Investment Rate	Ret. Earnings / Total Assets	Retained Earnings / Total Assets
	Dividend Payout Ratio	Dividends / Net Income
	R&D / Sales	Research & Development / Sales
	Capital Expend. / Sales	Capital Expenditures / Sales
	Capital Expend. / Total Assets	Capital Expenditures / Sales
Profitability	RoIC	Net Income / Invested Capital (t-1)
	RoIC (5-year)	Net Income / Invested Capital (5-year average)
	Return on Assets	Net Income / Total Assets (t-1)
	Profit Margin	Net Income / Sales
	Free Cash Flow / Total Assets	Free Cash Flow / Total Assets
	RoE	Net Income / Common Equity
	RoE (5-year)	Net Income / Common Equity (5-year average)
	Sustainable Growth Rate	RoE x (1 - Dividend Payout Ratio)
Risk	Beta	provided by Datastream
Size	ln (Sales / Total Assets)	ln (Sales / Total Assets)
	ln (Total Assets)	ln (Total Assets)
	ln (Sales)	ln (Sales)

Table 1: Variable Overview

3.4.1 Leverage

The amount of debt on a firm's balance sheet has the potential of affecting its ability to engage in value adding investments. As debt capital is usually cheaper than equity, increasing leverage reduces the weighted cost of capital (WACC) (Arnold, 2005). This has cost reducing effects but also allows the firm to pursue projects with lower expected return. However leverage also reduces flexibility. Already high leverage can make creditors reluctant to provide more debt capital, making it difficult to borrow money to invest in a profitable project. Moreover, in accordance with the *Traditional Trade-off Theory,* increasing risk of financial distress might raise the cost of debt financing to a level where it offsets any positive effect, e.g. the tax shield advantage (Ogden, Jen and O' Connor, 2003). When opportunities to make value adding investments arise, management can also choose to retain earnings rather than to pay dividends to shareholders in order to finance investments (Myers and Mayluf, 1984). Interest payments are a cost which has to be serviced by the generated cash flows before any dividend payments or investments can be made. High leverage and the consequent interest payments thereby create a constraint on investment flexibility (Graham and Harvey, 2001). However, from a principal agent theory point of view, as argued by Hanka (1998), such constraints may be valuable to the stock holder as they discipline management. Still, Ross (1977) concludes that market value will increase with leverage. The reasoning behind this is that the market perceives a higher value as a result of increased leverage signaling management's increasing optimism.

3.4.2 Liquidity

Arnold (2005) argues the importance of ratios of internal liquidity in the fair evaluation of a company. These ratios provide insight to the firm's ability to service its short-term financial obligations.

The current ratio reveals how much excess cash the company has on its balance sheet. In addition to being an inefficient and costly allocation of capital, large positions of excess cash make the firm a more attractive takeover target (Brunner, 1988) and should therefore not be desirable. However, excess cash and easily marketable assets lend management financial slack and increased flexibility to swiftly pursue investment opportunities when they arise, as discussed by Graham and Harvey (2001).

The interest coverage ratio gives an indication of the firm's ability to service its current debt with the cash flows it generates. A good ability to pay makes it easier for the firm to attract new debt capital for new profitable investments (Arnold, 2005). On the other hand, Jensen (1986) argues that a threat of failing to service debt may motivate management to make the organization more efficient.

3.4.3 Efficiency

The discriminant power of a set of efficiency ratios is analyzed based on the previously discussed notion that managers of underperforming firms have incentives to reallocate the firms' funds to more efficient use and thereby create value to shareholders. While many other ratios can be deteriorated or improved by macro economic factors, such as shifts in demand for the firm's products or supply of commodities, or capital, firm efficiency is more directly under management's control (Palepu et al., 2007).

Firms with low asset turnover ratios tie up more capital than their peers and thereby accrue a higher total cost of capital in relation to earnings. These firms can decrease their need for capital, and thereby create value by improving turnover of different assets. Should the firms prove to be more efficient in their use of capital in the year prior to the transition into the growth segment, this could be an indication of the market being slow to react to improved efficiency. Such findings would lend support to Black's (1993) and Malikel's (2004) arguments that the market does eventually price assets correctly, albeit may be slow to react to new information.

3.4.4 Investment Rate

The ratios describing investments are chosen to cover not only investments made over the past years, but also the potential future investments. While the scale of investments in past years can easily be identified in the financial accounting data, one has to look at other ratios to make assumptions about future investments. Managers who expect their companies to be able to make investments with a higher expected return than the shareholder's alternative cost of capital should be retaining earnings. This is in line with the previous discussion of Ross (1977) concluding that a low payout ratio signals the firm's management expecting to be able to create shareholder value.

3.4.5 Profitability

The measures of profitability are included in order to determine the impact of past performance on future performance. Improving returns in recent years could be seen as an indication of further value creation in the next period. However, profitability measures such as return on equity, return on assets, and return on invested capital do not take into account differences in risk. Comparing the different measures of profitability to each other can also give indications on what the capital structure looks like and how it may have changed.

3.4.6 Risk

As presented earlier in this thesis, Black (1993) argues that a higher risk taking, measured as beta, motivates a higher expected return on investment in the CAPM framework. He also argues that the value premium could only exist due to temporary mispricing in the market. It is possible that stocks which are about to increase in market value already have increased their risk profile without the markets having fully realized it and adjusted stock prices accordingly. However, as Fama and French (1992) argue beta to be insufficient for capturing default risks, it may be reasonable to look at other ratios, such as leverage, to asses the true risk profile of the firm.

3.4.7 Size

Measures of size in terms of total asset value and sales reveals whether growth tends to prevail more ubiquitously in smaller or larger companies. In their 1992 article, Fama and French find that the size of the company has explanatory power over the expected return on its stock. Assuming that they are right, value stocks turning into growth stocks should be larger than those remaining value stocks.

Should the value creating firms be likely to be smaller, it is possible that the value creating firms are relatively new. If the opposite is true and the value creating firms are larger companies, these are possibly fallen angels which are regaining efficiency after a period of suboptimal performance. According to Jiang and Koller (2007), such turnarounds are often the result of new management taking charge of the company and the value creation is unlikely to come from growth in revenue or profit. Rather, if value creating companies are fallen angels regaining their vigor, size in combination with measures of efficiency or profitability are likely to have strong discriminative power between value adding and non-value adding firms.

4 Empirical Results

In chapter 4 provides a step-by-step walkthrough of the empirical analysis and the results it yields.

4.1 Financial Ratio Analysis

4.1.1 Data Preparation and Treatment of Outliers

The discriminant analysis approach relies on the assumption of multivariate normally distributed explanatory variables. Unfortunately, in practice financial ratios are usually highly skewed and contain lots of outliers (Frecka and Hopwood, 1983). Ohlson (1980) argues that the normality assumption for predictor variables can be neglected in case of models that are solely used for discriminating purposes. However, in order to be able to analyze significances of predictor variables using the independent sample t-test, it is necessary to reduce the violation of the normality assumption to a minimum (Watson, 1990). Thus, stocks with extreme values in certain ratios that would dominate other observations in the analysis are excluded from the analysis. However, univariate normal distributed variables do not imply a multivariate distribution of the variables in the final discriminant function. In this case however, the discriminant function is solely used to classify stocks into movers and non-movers, which does not require an overall multivariate normal distribution (Ohlson, 1980).

In this analysis observations are considered to be extreme values, if the observed value is more than 3 times the interquartile range below the first quartile or above the third quartile. Thus, an outlying observation is deleted if one of the following inequations holds:

$$Q_1 - 3*(Q_3 - Q_1) > X \quad or \quad Q_3 + 3*(Q_3 - Q_1) < X$$

In addition to the outlier problem, not every financial variable has been available for each observation. In order to assure consistency of model, all stocks missing one or more values have been removed from the original sample.

After performing the adjustment described above, the final sample is reduced to 56 observations, with 28 stocks in each group. Both, the univariate statistics as well as the discriminant analysis in the next chapter are based on this sample data, which will from this point on be referred to as the "small sample". An overview of the companies included in the small sample is provided in the appendix. The large sample, which consists of the original 289 observations, is used to test the adequacy of the final model. Table 2 provides an overview of both samples:

Number of Observations	**Group 1 (movers)**		**Group 2 (non-movers)**	
	large sample	small sample	large sample	small sample
Basic Materials	8	3	10	2
Consumer Goods	16	3	24	6
Consumer Services	13	0	3	0
Healthcare	37	3	3	2
Industrials	32	12	41	13
Oil & Gas	11	0	10	0
Technology	33	7	11	3
Telecommunications	1	0	0	0
Utilities	1	0	35	2
TOTAL	152	28	137	28

Table 2: Sample Overview

4.1.2 Univariate Analysis

After the adjustment for outlying and missing values, each financial variable has been checked to determine whether it follows a normal distribution. The method applied is the Shapiro-Wilk test, which tests under the null hypothesis of normal distribution. For some ratios the hypothesis of normal distribution has to be rejected at a five percent significance level. This result can be explained by the use of a high factor for the interquartile range when detecting the outliers. By applying a factor of three, only the most extreme values have been identified. However, an examination of the variable histograms indicates an approximately normal distribution. Only the measures of company size, total assets and sales, need to be adjusted through logarithmic transformations. It has been refrained from transforming the remaining variables, for the reason that a logarithmic transformation would reduce the discriminant power of the model. Altman, Avery et al. (1981) states that such transformations result in rescaling effects, giving more weight to differences in lower values when performing the discriminant analysis. Moreover, the t-test proved to be robust against deviations from the normality assumption.

The independent-sample t-test applied on all variables indicates that the mean of two financial variables significantly differ among both groups of observations. Table 3 shows a summary of the results of the univariate t-test.

As can be seen, the difference in group mean for retained earnings per total assets is highly significant at 1% level. The 28 observations that are considered movers show a group mean in retained earnings per total assets of -0.0092, which implies that moving stocks have on average negative retained earnings. Compared to that, the non-movers-group has on average a positive retained earnings ratio of 0.3265. The difference in both means is 0.3357. Thus, the ratio retained earnings per total assets is the first variable that needs to be included in multivariate discriminant function.

The second variable that needs to be considered is the dividend payout ratio. While the difference in the means of this variable is not as significant as the retained earnings ratio, the null hypothesis of equal group means can still be rejected at a 10% level. On average, the stocks that move from value to growth payout 1.1% of their earnings, while non-movers payout 12.4%.

A correlation coefficient of 0.1 indicates a low correlation between both ratios, which justifies the considerations of both variables in the discriminant analysis simultaneously. However, both measures have been classified as proxies for investment intensity. Thus, a non-linear relationship between both ratios might be expected. On the other hand, retained earnings measure the cumulative profitability of a company, which can be considered as a proxy for historical investment activities as well as the age of the company, while the dividend policy accounts for the current reinvestment rate. Therefore, both variables will be included in the initial multivariate discriminant function.

	T-test for Equality of Means				
	t-value	df	Significance (2-tailed)	Mean Difference	Std. Error Difference
Current Ratio	-0.397	49.315	0.693	-0.1334	0.3359
Interest Coverage	-0.346	53.990	0.731	-0.5810	1.6787
Net Debt / Equity	0.857	47.501	0.396	0.1504	0.1754
Interest Exp / Debt	0.158	53.801	0.875	0.0014	0.0088
D/TA	0.197	53.757	0.844	0.0064	0.0324
Sales/WC	1.207	50.907	0.233	1.6512	1.3683
Asset Turnover	1.066	52.289	0.291	0.1382	0.1296
Receivables Turnover	0.984	53.698	0.330	0.6802	0.6916
Inventory Turnover	-0.689	48.449	0.494	-0.4985	0.7230
FA turnover	-0.127	49.339	0.900	-0.0898	0.7093
RoIC (5year IC)	0.046	51.713	0.963	0.0010	0.0225
RoIC (t-1 IC)	0.187	43.109	0.853	0.0055	0.0296
RoA	0.154	46.639	0.878	0.0033	0.0212
Profit Margin	-0.990	53.990	0.326	-1.8150	1.8324
FCF/TA	0.403	53.850	0.688	0.0061	0.0152
RoE (t-1 Equity)	-0.330	39.435	0.743	-0.0155	0.0469
RoE (5 year Equity)	-0.662	44.423	0.511	-0.0265	0.0400
ln(Sales/TA)	1.154	52.611	0.254	0.1313	0.1137
ln(TA)	-0.955	47.409	0.345	-0.4468	0.4679
ln(Sales)	-0.692	44.987	0.493	-0.3155	0.4560
Capital Exp. / TA	-1.021	53.583	0.312	-0.0064	0.0062
Capital Exp. / Sales	-1.559	53.116	0.125	-0.0095	0.0061
R&D/Sales	0.760	45.950	0.451	0.0124	0.0163
Dividend Payout Ratio	-1.814	43.629	0.077	-0.1127	0.0621
Sust. Growth	-0.343	40.864	0.733	-0.0149	0.0434
Ret. Earnings /TA	-3.869	46.196	0.000	-0.335798	0.0868
Beta	1.001	46.914	0.322	0.3729	0.3724

Table 3: T-Statistics for Equality of Group-Means

4.2 Discriminant Analysis

Based on the preceding univariate analysis, the following multivariate model has been set up by successively adding variables to the initial function, which consists of retained earnings per total assets and dividend payout-ratio.

To be included in the discriminant function, a variable has to add additional information to the model, independently upon its individual univariate significance. The explanatory power of the discriminant function is measured by the between-groups variance, i.e. the squared deviation of the group centroids from the overall mean, in relation to the overall variance of the model. As a measure of goodness serves the Wilks' Lambda, which is inversely related to the separation of group means. Therefore, the smaller the value of Wilks' Lambda, the more adequate is the discriminant function to separate both groups.

$$Wilks'\,Lambda = \frac{SS_w}{SS_b + SS_w} = \frac{not\ explained\ variance}{total\ variance}, where$$

$$SS_b = \sum_{g=1}^{G} I_g (\bar{Y}_g - \bar{Y})^2 = variance\ between\ groups$$

$$SS_w = \sum_{g=1}^{G} \sum_{i=1}^{I_g} (Y_{gi} - \bar{Y}_g)^2 = variance\ within\ groups$$

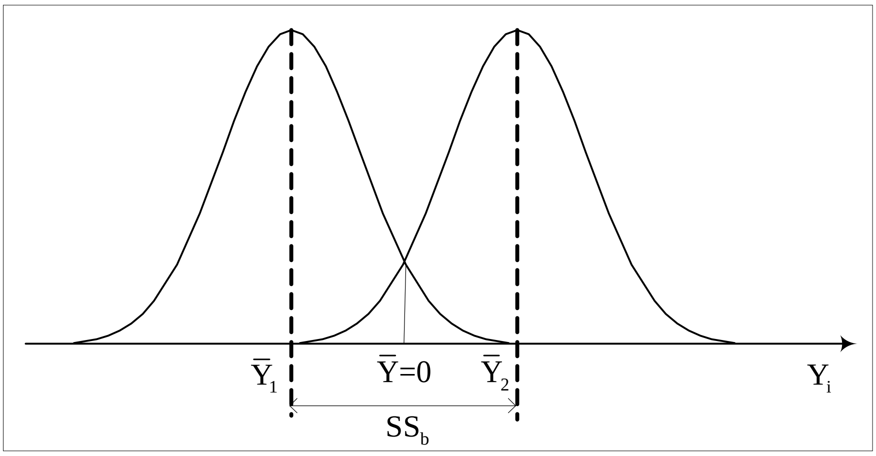

Figure 3: Discriminant Analysis; Source: Backhaus (2003)

In order to perform a hypothesis test, Wilks' Lambda is transformed into a variable which follows a χ^2 - distribution. The discriminant functions are tested under the null hypothesis that the groups do not differ.

From the initial list of 27 financial variables, two financial ratios have already been selected through the preceding univariate analysis. Through analysis of variable intercorrelations and the relative contribution to the overall quality of the model, two additional variables have been identified as being most adequate to discriminate between the two groups. The following discriminant function has proven to be the best ratio combination among a large number of different variable profiles that have been evaluated:

$$Y = -0.344 + 2.921X_1 + 1.993X_2 - 2.749X_3 - 0.378X_4,\ \textit{where}$$
$$X_1 = \textit{retained earnings/total assets}$$
$$X_2 = \textit{dividend payout ratio}$$
$$X_3 = \textit{return on equity (5-year average book value)}$$
$$X_4 = \textit{net debt/equity}$$

It has to be noted that the functions contains a constant term, which has no explanatory power. The constant standardizes the average discriminant score (cut-off score) at zero. Therefore, a negative discriminant score indicates a moving stock, while companies with positive scores have to be assigned to the non-movers-group.

As can be seen in Table 4, the four-variable discriminant function yields to a χ^2-value of 14.527. Under the null hypothesis of equal groups, a value of 4 would have been expected, which indicates that the combination is highly significant at a level of 0.003. Thus, with an error probability of 0.3% it can be presumed that the two groups differ in regards of the four characteristics.

In addition to the four-variable-model a second discriminant function has been evaluated in the further analysis. This function includes the logarithm of total assets as a measure of size in addition to the other four variables. While this model is still highly significant, the additionally explained variance of 0.3% is rather low.

However, it is reasonable to compare the predictive power of both functions in continuative tests.

Test of Function	Wilks' Lambda	Chi-square	degrees of freedom	Sig.
2 variables	0.760	14.527	2	0.001
4 variables	0.732	16.253	4	0.003
5 variables	0.729	16.261	5	0.006

Table 4: Wilks' Lambda - Initial Sample

Table 5 shows the standardized discriminant coefficients which indicate the discriminatory power of each independent variable. A standardization adjusts the functions for scaling effects by multiplying the coefficients with the standard deviation of the explanatory variables. For instance, the ratio retained earnings/total assets has the highest impact on the group determination, while the company size is rather low weighted compared to the other variables. The consideration of the fifth measure did not change the order of the variables, but reduced the relative importance of the return on equity. The individual sign of the coefficient has to be neglected in this context.

Function	Discriminant Variable	Standardized Coefficients
4 variables	Ret. Earnings /TA	0.948
	Dividend Payout Ratio	0.463
	RoE (5 year Equity)	-0.411
	Net Debt / Equity	-0.248
5 variables	Ret. Earnings /TA	0.912
	Dividend Payout Ratio	0.434
	RoE (5 year Equity)	-0.434
	Net Debt / Equity	-0.352
	ln(TA)	0.156

Table 5: Standardized Discriminant Function - Initial Sample

As can be seen in Table 6, moving stocks are on average significantly less profitable, have lower cumulative retained earnings and are more levered than non-moving stocks. Moreover those companies pay hardly any dividends and are smaller concerning their total asset value.

Group	Variable	Mean	Std. Deviation	Number of Obs.
1	Ret. Earnings /TA	-0.0092517	0.38573392	28
	Dividend Payout Ratio	0.0110856	0.16644759	28
	Net Debt / Equity	0.6305192	0.76814082	28
	RoE (5 year Equity)	0.0028429	0.18102513	28
	ln(TA)	12.2954224	2.05145997	28
2	Ret. Earnings /TA	0.3265458	0.24921929	28
	Dividend Payout Ratio	0.1238231	0.28358673	28
	Net Debt / Equity	0.4801486	0.52095541	28
	RoE (5 year Equity)	0.0293143	0.10949028	28
	ln(TA)	12.7421984	1.38653907	28
Total	Ret. Earnings /TA	0.1586471	0.36364230	56
	Dividend Payout Ratio	0.0674543	0.23730857	56
	Net Debt / Equity	0.5553339	0.65470742	56
	RoE (5 year Equity)	0.0160786	14.88307296	56
	ln(TA)	12.5188104	1.74944638	56

Table 6: Group statistics – Initial Sample

In order to evaluate their predictive power, both functions have been applied on the initial sample consisting of 28 stocks in each group. Table 7 and 8 show the classification results. Besides the overall predictable power, the level of type 1 errors is of particular importance, since it indicates the ratio of stocks that are incorrectly attributed as mover-stocks.

In the initial sample both groups of stocks are equally sized, which implies a 50% of hitting a moving stock by randomly picking one observation out of the sample. In comparison to this, the four-variable yields to a satisfactory result of 76.8% correctly predicted stocks with a type I error of 21.4%. The five-variable model proved to be even more appropriate with 78.6% correctly classified observations. Even though this increase is not extensive, it has to be noted that the increase is due to a decrease in type II error to 21.4%. However, since the model is directly derived from the same sample, a good result has been expected.

4 variables		**Group**	Predicted Group Membership 1	2	**Total**
Original Group	**Count**	**1**	21	7	28
		2	6	22	28
	%	**1**	75.0%	25.0%	100%
		2	21.4%	78.6%	100%
Overall correctly identified: 76,8%					

Table 7: Classification Results with 4 variables - Initial Sample

5 variables		**Group**	Predicted Group Membership 1	2	**Total**
Original Group	**Count**	**1**	22	6	28
		2	6	22	28
	%	**1**	78.6%	21.4%	100%
		2	21.4%	78.6%	100%
Overall correctly identified: 78,6%					

Table 8: Classification Results with 5 variables - Initial Sample

4.3 Empirical Testing

4.3.1 Testing the Original Model

The first test applied on both discriminant functions is a secondary sample test. In this case, the large sample that still contains outliers and missing values serves as hold-out sample. The sample consists of 289 observations with 152 stocks attributed as movers and 137 stocks as non-movers. The results of the secondary test are described in table 9 and 10. Interestingly, the classification results did not deteriorate. Using the four-variable model, 74.05% of the stocks have been correctly predicted, while the five-variable model predicts 78.89%. Thus, the result of the five-variable model has even improved compared to the initial sample. However, the type I error has increased to 27%. On the other hand, 83.2% of the non-movers have been correctly identified by the five-variable model, reducing the type I error to 16.8%. Since the analysis focuses on reducing type I errors, this result would justify a consideration of company size as a fifth variable.

4 coefficients			Predicted Group Membership		
			1	**2**	**Total**
Original Group	Count	**1**	114	38	152
		2	37	100	137
	%	**1**	75.0%	25.0%	100%
		2	27.0%	73.0%	100%
Overall correctly identified:		**74.05%**			

Table 9: Classification Results with 4 Variables - Large Sample

5 coefficients			Predicted Group Membership		
			1	**2**	**Total**
Original Group	Count	**1**	114	38	152
		2	23	114	137
	%	**1**	75.0%	25.0%	100%
		2	16.8%	83.2%	100%
Overall correctly identified:		**78.89%**			

Table 10: Classification Results with 5 variables - Large Sample

Considering the findings of the secondary test, the estimated model is in fact appropriate to predict significant movements in the book-to-market ratio. In the next step, both functions are applied on financial data two periods ahead of the movement.

The results in table 11 and 12 demonstrate that 70.04% of the four-variable function and 71.12% for five variables respectively remain correctly classified. On the one hand, this outcome supports the results of the preceding test, indicating the possibility of predicting movements even two years ahead. On the other hand these findings indicate that the actual period of the movement is unclear.

4 coefficients			Predicted Group Membership		
			1	**2**	**Total**
Original Group	Count	**1**	98	43	141
		2	40	96	136
	%	**1**	69.5%	30.5%	100%
		2	29.4%	70.6%	100%
Overall correctly identified:		**70.04%**			

Table 11: 2-Periods-ahead Test using 4 Variables

5 coefficients			Predicted Group Membership 1	2	**Total**
Original Group	Count	**1**	97	44	141
		2	36	100	136
	%	**1**	68.8%	31.2%	100%
		2	26.5%	73.5%	100%
Overall correctly identified:	**71.12%**				

Table 12: 2-Periods-ahead Test using 5 variables

4.3.2 Testing a Reduced Model

Different industry types have been considered in the initial sample to assure a sufficient number of observations. Examining the distribution of industry groups indicates that 26% of the large sample is made up by companies from the segments healthcare and utilities. Unfortunately, 97.2% of utilities stocks are attributed as non-movers, whereas 92.5% of healthcare firms are considered as moving stocks. Due to this unbalanced distribution, both segments have been tested for significant differences in the discriminant variables. Based on a univariate t-test, each variable has been compared to the remaining industries with null hypothesis of equal industry means. As outlined in table 13, for the utilities segment the mean of each discriminant variables in fact significantly differs from the rest of the sample. Except for return on equity, the same applies to healthcare stocks. Unlike in a linear regression model, dummy variables cannot be used to account for industry specifics. This has to be reasoned by the assumption of multivariate normality distribution of the explanatory variables (Ohlson, 1980).

	T-test for Equality of Means				
	t-value	df	Significance (2-tailed)	Mean Difference	Std. Error Difference
Net Debt / Equity	-8.030	116.059	0.000	-0.96789832	0.12053178
RoE (5 year Equity)	-5.190	191.426	0.000	-10.76017	2.07334
Ln(TA)	-10.866	53.431	0.000	-3.08275446	0.28370023
Dividend Payout Ratio	-11.437	65.126	0.000	-0.74211198	0.06488630
Ret. Earnings /TA	-2.887	256.108	0.004	-0.20069024	0.06952635

Table 13: Industry Differences – Utilities

	T-test for Equality of Means				
	t-value	df	Significance (2-tailed)	Mean Difference	Std. Error Difference
Net Debt / Equity	6.397	84.776	0.000	0.83847042	0.13107860
RoE (5 year Equity)	1.294	36.661	0.204	6.99196	5.40284
Ln(TA)	5.414	45.400	0.000	1.80667393	0.33368459
Dividend Payout Ratio	2.107	244.095	0.036	0.09273225	0.04401408
Ret. Earnings /TA	2.748	32.714	0.010	0.81623482	0.29707533

Table 14: Industry Differences – Healthcare

However, motivated by this result, additional test will be performed on a reduced large sample that consists of the industries (1) basic materials, (2) consumer goods and (3) industrials. Those industry groups are considered to be highly correlated and better distributed among both groups.

Applying both versions of the original discriminant function, the classification results in fact improve compared to the initial large sample. Comparing the results in table 15 with those in table 9, the ratio of correctly classified stocks has increased by 6.87% for the four-variable model. Again, the consideration of the fifth variable has no significant advantage.

Taking into account that the improvement is due to a decrease in the type I error, the utilities stocks obviously deteriorated the original result. This can be reasoned by a significantly smaller ratio of utility stocks in the initial small sample compared to the unadjusted large sample.

4 variables			Predicted Group Membership		
			1	**2**	**Total**
Original Group	Count	**1**	42	14	56
		2	11	64	75
	%	**1**	75.0%	25.0%	100%
		2	14.7%	85.3%	100%
Overall correctly identified:	**80.92%**				

Table 15: Classification Results - Initial DF with 4 variables on Reduced Large Sample

5 variables			Predicted Group Membership		
		Group	**1**	**2**	**Total**
Original Group	Count	**1**	43	13	56
		2	11	64	75
	%	**1**	76.8%	23.2%	100%
		2	14.7%	85.3%	100%
Overall correctly identified:		**81.68%**			

Table 16: Classification Results - Initial DF with 5 Variables on Reduced Large Sample

For the purpose of examining the discriminant function and its changes in the coefficient weights, the initial small sample is reduced in the same way the large sample has been before. Thus, the adjusted sample now consists of three industry groups: Basic materials, consumer goods and industrials. Unfortunately the adjustment decreases the number of observation to a critical amount of 20 stocks in each group. However, in this case the number of observations is assumed to be sufficient, since the purpose is not the estimation of a new discriminant function, rather than a brief analysis of the originally derived variables.

It can be seen from table 17 that the original derived variables are less appropriate for the reduced sample, even though the coefficient weights have been adjusted. The four variables explain 21.3% of the overall variance implying a significance level of 0.072 compared to 0.003 in the initial sample. Moreover, the consideration of the company size through a fifth variable even increases Wilks' Lambda and therefore decreases the explanatory power. For this reason, the fifth measure is excluded from here on.

Table 18 describes the changes in relative importance of the four variables. The relative importance of return on equity decreased remarkably. Moreover the weight of dividend payout ratio decreased, while the importance of leverage increased by almost the same amount. Retained earnings/total assets remains the most important variable to distinguish between the two groups.

	Wilks' Lambda	Chi-square	Degrees of freedom	Significance
4 coefficients	0.787	8.603	4	0.072
5 coefficients	0.786	8.532	5	0.129

Table 17: Wilks' Lambda – Reduced Initial Sample

4 variables	Standardized Coefficient	Δ
Ret. Earnings /TA	0.902	- 0.046
Dividend Payout Ratio	0.300	- 0.163
RoE (5 year Equity)	-0.108	+ 0.303
Net Debt / Equity	-0.399	-0.151

Table 18: Standardized Discriminant Function - Reduced Sample

The result of the classification test on the reduced large sample is outlined in table 19. At first sight, the model seems to yield a fairly good result. However, even though the level of type I errors is remarkably low, the increase of type II errors overweighs. For this reason, the overall quality of the model is 0.72% lower than the original discriminant model applied on the same sample.

4 variables		**Group**	Predicted Group Membership 1	2	**Total**
Original Group	Count	**1**	38	18	56
		2	8	67	75
	%	**1**	67.9%	32.1%	100%
		2	10.7%	89.3%	100%
Overall correctly identified:	**80.15%**				

Table 19: Classification Results - new DF with 4 Variables on Reduced Large Sample

The lower predictive power of the new function, which has been adjusted for the model, is surprising. Obviously, the originally selecting variable profile is not appropriate for the reduced sample, i.e. for those three industries the original discriminant function has been suboptimal.

4.3.3 Summary of Results

The preceding results of the analysis have shown that the discriminant function consisting of four financial ratios proves to be adequate for predicting significant increases in market-to-book value. While a good result for the inner sample test has been expected, the accuracy of the function has not deteriorated for a significantly larger sample containing extreme values. In addition, applied on financial data two periods ahead of a movement, the model still yields sufficient results.

Yet, an industry specific test reveals weaknesses of the function to correctly classify companies of the utilities segment. In fact, the function has been derived from a sample containing 3.6% of this segment, whereas the secondary sample contains 12.5% of stocks attributed to this industry. For this reason, the original secondary sample has been condensed to three comparable industries. While the original function still yields to a good result on this reduced sample, an adjustment of the discriminant coefficients deteriorates the results. Therefore, estimated on a reduced sample the initial derived variables are not optimal for discriminating the two groups. However, the initially estimated function has proven to be adequate for the original as well as for the reduced sample. Thus, this function can be judged as appropriate for a broad range of industries, even though there might exist better functions for specific industries.

The variable total assets has been examined as a fifth variable through the whole analysis. However, this variable has not proven to increase the quality of the model significantly. Moreover, the five-variable function turned out to be less appropriate than the four-variable model after reestimating the coefficients on the reduced sample. Thus, the discriminating power of the company size seems to be low as well as industry specific. Therefore the four-variable function containing retained earnings/total assets, dividend payout ratio, return on equity (5y-book equity) and net debt/book equity, appears to be the appropriate model to distinguish movers from non-movers.

5 Evaluation of Empirical Findings

In chapter 5, the empirical findings are analyzed related to the discussion found in previous literature.

Having derived a discriminant function which can successfully single out future growth stocks from a portfolio of value stocks, gives insight into what characteristics in a firm makes investors expect it to be able to generate higher future returns. The relative weights of the variables in the function reveals that almost all of the difference in expected returns can be explained by how much earnings the company has been able to retain historically in combination with how much of its current earnings are retained. The two other ratios included in the function states the differences in profitability and capital structure between the two groups of stocks.

5.1 Retention of Earnings

The value of *retained earnings / total assets* ratio of stocks about to become growth stocks is significantly lower than of those which will remain in the value segment. The reason for this ratio to be low could be either a lack of earnings to reinvest or lack of profitable investment opportunities in the past. The fact that the mean value of this ratio is negative among movers indicates that some of these firms have made high losses which have deteriorated the book value of equity. Another explanation of a negative *retained earnings / total assets* ratio is that the firm is relatively young and has not yet made any earnings to reinvest (Altman, 2000). However, since retained earnings serve as a buffer that protects lenders from the risk of default, companies with low or negative earnings must be considered to be risky investments. Thus, they are expected to have a higher cost of capital, as lenders will demand a compensation for additional risk (Moore, 1993). A higher cost of capital would in turn implicitly reduce the number of profitable investment opportunities (Koller et al., 2005).

The variance in the *retained earnings / total assets* ratio does reveal that there are firms among the movers which have higher *retained earnings / total assets* ratio than the average non-moving firm. The group of value stocks moving into the growth segment may therefore include both firms which have not yet been profitable and fallen angels about to be revitalized. The moving firms can, however, not be absolute upstart companies. Due to the criteria in the sample selection that the analyzed stocks must have at least three years of trading history on the stock market it is traded on, the sample is biased away from the very young companies.

In the year prior to value stocks turning into growth stocks the *dividend payout ratio* is significantly lower than that of stocks remaining in the value segment. As a lower *dividend payout ratio* means that the firm is retaining a greater part of its earnings, this can be interpreted as moving firms having opportunities for profitable investments to a higher degree than non-moving companies. This contradicts Modigliani and Miller’s (1961) hypothesis that the share price is independent of the firm’s dividend policy in a perfect market environment. However, evidence is found that if a company faces e.g. financial constraints, internal financing turns out to be advantageous over external sources of finance (Fazzari, Hubbard, Petersen, Blinder and Poterba, 1988). In addition, Myers and Majluf (1984) state that the market suffers from a lack of information about the company’s investment opportunities, which ends up in an undervaluation of those investment projects. Therefore, firms should prefer internal funds in the prospective of positive investment opportunities; a finding that is commonly referred to as the *pecking order theory*.

Therefore it can be concluded that the value stocks about to become growth stocks have gone from lacking profitable investment opportunities to expecting an above market average return on new equity capital. It appears as though the market does not immediately price potential investment opportunities that have been identified by the management.

5.2 Changing Capital Structure

The discriminant function gives high discriminant power to the return on equity (5 year equity) ratio, which states the returns as a fraction of the average book value of equity over the past five years. While the mean of this ratio is very different between the two groups, the mean of the return on equity (t-1 equity), which is solely based on last year's book value of equity, does not differ as significantly between the two groups. At the same time, there is no big difference in the means of the two ratios within the group of non-movers. This indicates a change in capital structure away from equity among the firms in the mover group, while the capital structure has not changed as much among non-moving companies. Such change can be achieved by taking on debt and paying out an extraordinary dividend to the shareholders. One might argue that the change in book-to-market value is solely explained by the decrease in the book-value of equity, which in-turn reduces the nominator of the ratio. However, since the change in capital structure is exclusively observable using the five-year average book-value of equity, the increase in leverage has obviously taken place two till five periods ahead of the actual increase in book-to-market value. This is in support of Jensen's (1986) argument for the possibility of creating organizational incentives which lead to increased efficiency through issuing debt to buy back stocks.

While the measures of return on equity indicates a change in capital structure among the moving firms, the inclusion of net debt / equity as one of the variables in the discriminant analysis reveals that the level of leverage has a power in identifying movers. Because debt is generally a cheaper form of capital than equity, a firm with higher leverage has a lower weighted cost of capital (WACC) and can therefore profitably invest in projects with a lower expected return. Hence, the stocks considered as movers, which in fact have higher average leverage than other value stocks, have an advantage over its competitors by having access to a larger number of profitable investment projects.

5.3 Risk

Although not deemed statistically significant, a higher average beta is observed in the group of movers than among non-movers. In addition to this, the measure retained earnings / total assets has the highest power in the discriminant function. In the calculation of Altman's Z-score, this ratio is one of the variables which are used for predicting financial distress risk (Altman, 1968). Thus, moving value stocks can be considered riskier than non-moving stocks. This motivates a higher expected return and therefore a lower market price. While the empirical results of this study shows that the moving value stocks have in fact recently taken on additional debt, the results are in line with the findings of Penman (2000) who found a negative correlation between additional debt and expected returns.

A possible explanation for the market valuing the moving stocks at a higher price, despite additional leverage, may be that management has been able to reduce volatility in cash flows, thereby increasing the ability to service debt and consequently reduced the risk of financial distress (Ross, 1977). The data presented here is, however, not sufficient to confirm this hypothesis. However, the findings support Jensen's (1986) argument that added debt, and thereby increased risk of not being able to service debt, will motivate management to make the organization more efficient.

Additional explanation may be provided by the agency theory. For instance, taking on additional debt allows the company to shift risk from shareholders to creditors. Because equity can be considered as a call option on the firm's assets, increased risk is beneficial to the shareholder. While the downside risk of the shareholder is limited to the paid in equity, the upside potential is unlimited. Furthermore, increased leverage might have a beneficial tax shield effect. (Ogden et al., 2003)

5.4 Mispricing

It does not appear as though the value stocks about to turn growth stocks were originally priced at a low market-to-book value due to irrational behavior in the market. A lack of profitable investment opportunities together with a high cost of capital and high ratio of non-value creating risk would cause rational investors to value the equity of these firms low on the market. However, what separates these stocks from other value stocks is that the firms appear to have undertaken value creating activities. Through optimizing their capital structure, the firms have become more cost efficient but they have also created real options on profitable investments. Facing lower capital costs, the companies are now able to take on investments with lower expected payoffs, which have not been profitable before. Although the moving firms have not necessarily yet taken advantage of these new investment possibilities, the option to do so should have been priced by the market immediately. However, such real options may be difficult for investors to identify and price. It may also take the market time to accurately determine the new weighted average cost of capital and price the stock accordingly. This hypothesis finds support in Malkiel’s (2004) and Black’s (1993) statements that the market may be slow to react to new information.

6 Conclusion

The 6th and final chapter concludes the findings of the thesis and provides suggestions for future research.

The aim of this analysis has been to identify patterns in financial data signaling the ability of companies to create value. A firm has been considered value creating if it experiences a significant increase in market-to-book value in relation to the market. A multivariate discriminant function proves capable of distinguishing value creating companies from those which will remain at a constantly low market value. Moreover, the model yields sufficient accuracy in classifying stocks for which the actual group membership was presumed unknown, indicating its appropriateness for predicting the creation of value in the future.

The analysis does not support the theory of the market significantly mispricing value stocks. Rather, evidence is found of value stocks excelling to growth stocks having in fact been underperforming in the past. A significant increase in leverage prior to the transition indicates value creation through an improvement of capital structure. Having optimized their capital structures, ability to take on new profitable investments improves expected future returns, which explains the significant increase in market value. Noting that moving companies on average are generating positive income which is not paid out to the shareholder indicates the availability of profitable investment opportunities. However, the increased ability to generate future earnings seems to be priced by the market with a certain time lag.

Considering no significant differences in market beta, while moving stocks tend to have lower retained earnings supports the theory of the CAPM being unable to capture all fundamental business risk. However, following this theory, the observed significant increase in leverage would in turn lead to the expectation of the market value to decrease. Rather, it appears that the increase in investment opportunities, due to lower costs of capital, creates value which more than compensates the additional accounting risk. As a result, the overall risk profile improves yielding a higher market value of the moving company.

The results presented in this thesis can be implemented by active investors following the value investing strategy. When forming portfolios, the discriminant function provides the investor with a standardized approach to reduce the probability of selecting unsuccessful value stocks. Moreover, the composition of the function gives managers of companies trading at a low market-to-book ratio guidance in increasing market value.

6.1 Future Research

The derived discriminant function has proven appropriate through several empirical tests. However, future research may derive additional functions which more accurately predict increases in market-to-book value in single industries. The derived function has already shown weakness in predicting increases in market-to-book value among stocks in the utilities industry. In addition, this study has also assumed that high leverage has different meaning to financial firms than to other companies and therefore excluded financial firms from the analysis. Performing industry specific tests will determine whether this exclusion has been reasonable.

In order to evaluate whether the factors identified as value driving are not specific to firms traded on the three major U.S. stock exchanges, further testing of the discriminant function on international stock markets is needed. Comparing the results of additional may reveal differences in what investors perceive as value creating in different markets. Furthermore, the consideration of additional stock markets would potentially allow the use of data from a shorter time period.

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Appendix

	Group 1 - Movers		Group 2 - Non-Movers	
	Company Name	**Industry**	**Company Name**	**Industry**
1	Aerosonic	Industrials	AAR	Industrials
2	Allegheny Techs.	Basic Materials	ACME United	Consumer Goods
3	Amer. Technical Ceramic	Industrials	Aeroflex	Industrials
4	BE Aerospace	Industrials	Analogic	Healthcare
5	Cal. Micro Devices	Technology	Bowater	Basic Materials
6	C-Cor	Technology	Carpenter Tech.	Basic Materials
7	Ceradyne	Industrials	Centex	Consumer Goods
8	Constellation Brands	Consumer Goods	Chesapeake	Industrials
9	Cummins	Industrials	Coherent	Industrials
10	Dentsply Intl.	Healthcare	CTS	Industrials
11	DRS Techs.	Industrials	Cubic	Industrials
12	EXX	Industrials	Culp	Consumer Goods
13	FEI	Technology	Duquesne Light	Utilities
14	Fleetwood Ents.	Consumer Goods	Electro Science Inds.	Industrials
15	Foster Wheeler	Industrials	EMS Techs.	Technology
16	Furniture Brands Intl.	Consumer Goods	Esterline Techs.	Industrials
17	Hexcel	Industrials	Evans & Suth. Cmp.	Technology
18	Interphase	Technology	Griffon	Industrials
19	Kulicke & Soffa	Technology	Kellwood	Consumer Goods
20	Milacron	Industrials	Key-Tronic	Technology
21	Nexxus Lighting	Industrials	Mine Safety App.	Industrials
22	Pactiv	Industrials	Napco Security Sys.	Industrials
23	RTI Intl. Metals	Basic Materials	New Bruns. Scientific	Healthcare
24	Ryerson	Basic Materials	Newport	Industrials
25	Stratasys	Technology	Northwest Ntrl. Gas	Utilities
26	Sunlink Health Sys.	Healthcare	R.G. Barry	Consumer Goods
27	United Stationers	Technology	Timken	Industrials
28	Uroplasty	Healthcare	Wolverine WWD.	Consumer Goods

Table 20: Stocks included in Initial Sample