Value vs. Growth: Evidence from the German Stock Market

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ABSTRACT
This thesis examines if a rational-minded security analysis based on historical data and with a focus on firms with low price-to-earnings, price-to-book and price-to-cash-flow ratios helps an investor to maximize returns. The underlying idea that firms with low multipliers - commonly known as value stocks - outperform firms with high multipliers known as growth stocks - has found wide acceptance in the literature and refers to a concept called value investing. Previous research provides evidence that in many international markets firms with low valuations and the above-mentioned ratios tend to outperform firms with high valuations. There is, however, a gap in the literature as only a few studies examine this effect for the German stock market. This study covers the period from 2005 to 2014 and includes all German stocks listed in the DAX, MDAX, and SDAX index. In the course of this paper, value and growth portfolios are constructed to examine differences in portfolio return. In addition to comparing value with growth, this study also examines if a particular multiplier provides higher returns than other multipliers. The results show a value premium in the German stock market. This paper finds that value stocks outperform growth stocks on the basis of the price-to-cash-flow ratio, which is consistent with previous research. Furthermore, I find statistical evidence that the price-to-earnings and price-to-cash-flow ratios offer higher value premiums than the price-to-book ratio.

Supervisors Xiahong Huang, Henry van Beusichem, Peter-Jan Engelen, Samy A.G. Essa, George Iatridis, Rezaul Kabir, Siraj Zubair

Keywords
Value stocks, growth stocks, stock market, Germany, portfolio return, Price-to-earnings, Price-to-book, Price-to-cash-flow

5th IBA Bachelor Thesis Conference, July 2nd, 2015, Enschede, The Netherlands.

1. INTRODUCTION

1.1 Background

'Value investors are not concerned with getting rich tomorrow. People who want to get rich quickly will not get rich at all. There is nothing wrong with getting rich slowly.' – Warren Buffett (Business Insider, 2012)

Of late, the concept of value investing has gained much importance, but it is still an unknown area for many business students, market participants, and even professional investors.

For a long time the efficient market theory implied that prices reflected all available information at any point in time. It was widely accepted and taught at most business schools.

Over the last few decades, however, a number of well-recognized scientists have proven the contrary: prices do not reflect all information available in the market. It indicates that investors can achieve abnormal returns by following certain investment strategies (Bauman, Conover, & Miller, 1999; Cronqvist, Siegel, & Yu, 2015; Fama & French, 1995, 1998).

It is a much discussed economic question whether value or growth stocks promise superior returns. It is widely accepted nowadays that value stocks generate higher returns than growth stocks (Porta, Lakonishok, Shleifer, & Vushny, 1997; Graham & Zweig, 2006).

Value stocks can generally be defined as firms that have recently shown low performance and are expected to show below-average performance in the future, contrary to growth stocks which have shown above-average performance and are expected to continue this trend in the future (Bauman & Miller, 1997). Such stocks are characterized by low market prices in relation to earnings per share, book value per share, cash flow per share, and dividends per share. Growth stocks have the opposite traits such as having high multipliers in relation to the same metrics (Bauman, Conover, & Miller, 1999).

The term 'value' refers to the actual worth of an investment, which, in this case, is a listed stock. This implies that stocks are often traded at values that are different from their true values (Graham & Zweig, 2006).

The superior return earned on value stocks, commonly known as 'value premium', can be traced back to misleading reasoning by investors. Researchers in the field of behavioural finance have found that investors tend to count on the predictors of limited validity, such as short-term earnings, but pay little attention to more valid numbers, such as increasing dividend payments or increasing earnings over a period of at least 10 years (Bauman & Miller, 1997). Furthermore, investors tend to project recent performance of firms too far into the future than can be reliably predicted from the given data. Consequently, investor expectations raise the price of growth stocks and push down the price of the value stocks. As soon as the market recognizes that value stocks' earnings perform better than expected and growth stocks' worse than expected, the value premium becomes evident (Porta, Lakonishok, Shleifer, & Vushny, 1997).

The fundamental idea behind the value approach is to sell overvalued stocks and purchase undervalued stocks (Graham & Zweig, 2006).

Given the evidence that value stocks outperform growth stocks in the US market, this paper examines if this is also true for the German stock market. The German stock market is the world's 10th biggest stock exchange. I hypothesize that there is a value premium in the German stock exchange. Private and institutional investors interested in the German stock market will find this paper highly relevant in their field of expertise.

1.2 Problem discussion

The major part of research investigates if there is a value premium in the US stock market. The credibility of the findings might be criticized while considering their implications on other stock markets. Although a value premium has been confirmed for other international stock markets (Bauman, Conover, & Miller, 1999; Fama & French, 1998), there has been only a very limited amount of research on the German stock market. This is somewhat surprising because the German stock exchange is very important for international institutions and investors.

I assume that different financial, social, or legal conditions influence the manner in which investors react and firms perform. These, in turn, could lead to differences in the manner of performance for value and growth stocks (Bauman, Conover, & Miller, 1999). This is because different tax regulations, industry norms, or degrees of government intervention - all of which clearly differ between countries - are likely to have an effect on a firm's accounting numbers.

Bauman et al. (1999) have examined the value premium among 21 different countries and found evidence for a value premium across borders. They discovered, however, that the extents of such value premiums are very different in nature.

Cronqvist, Siegel, and Yu (2015) assume that the macroeconomic environment - in other words, the investor's experience and their genetic endowment - has a major effect on the investor's preference towards value or growth stocks. This may have a major impact on the value premium (further details are given in Section 2.4).

For the reasons outlined above, the author intends to consider the following question:

'Will an investment portfolio based on value stocks in the long term outperform a portfolio based on growth stocks in the German stock exchange?'

1.3 Structure

The paper is divided into five main parts: Introduction, Literature Review, Methodology, Empirical findings, and Conclusion.

The introduction provides a basic idea of the topic, and discusses the academic and practical relevance of the area of study. The theory section focuses on the findings that have been published about the two distinct investment approaches. This part also defines value and growth stocks, elaborates on the existence of a value premium, explains key financial determinants, and investigates the evidence for a value premium in the German stock market. The methodology section describes the methodological approach to conduct the empirical research. It outlines how and from what sources data would be collected and the way to construct different portfolios. This section also explains the measurements of portfolio return and statistical tests used in this thesis. The analysis section presents and interprets the data to confirm or refute the hypotheses that value stocks provide superior returns than growth stocks. The conclusion section pools the results and interprets them in the full context. The study's limitations are described afterwards, and suggestions are provided for further research.

2. LITERATURE REVIEW

2.1 Efficient market hypothesis

The efficient market hypothesis claims that stock prices reflect all available information at any point in time, which means that investors cannot expect to make above-average returns. This implies that new information will be incorporated in stock prices without any delay (Malkiel, 2003). Incorporation of all new information in stock prices would mean that an uninformed investor holding a diversified portfolio should expect the same rate of return as a professional investor (Malkiel, 2003). A large number of studies provide evidence that professional investors cannot outperform index funds, which supports this argument.

It is a common belief that according to the efficient market theory, market prices always reflect their true intrinsic value. Strictly speaking, this is not true. In fact, the theory predicts that the market price of a given security must not always equal its true value at any given point in time, and that pricing errors are caused randomly and unbiased. So there is an equal chance that securities are under or overpriced. It means that half of the investors are expected to achieve abnormal returns, while the other half will not get such returns (Malkiel, 2003).

When Fama published his paper 'efficient capital markets' in 1970, he made a distinction between three different market efficiency types: weak, semi-strong, and strong. In a weak efficiency market, prices follow a random walk and thus future prices cannot be predicted from historical prices. In the semi-strong market, security prices reflect all publicly available information (e.g., past prices, earning announcements, and economic news). As the market quickly adjusts to public information, security prices are quickly adjusted. In a strong efficiency market, individuals have access to insider as well as outsider information. Fama states that investors cannot make abnormal returns because such 'insider' information will already get reflected in market prices (Fama, 1970).

The German stock market is considered to be a high efficiency market. In 2010, Borges conducted a study comparing the market efficiency of six European countries (Germany, Spain, UK, France, Portugal, and Greece) and showed that Germany has the second most efficient market after Spain. He also showed that Germany meets most traits of random walk behaviour. Keeping this in mind, we can expect that investors will not beat the German stock market (Borges, 2010).

2.2 Value and growth stocks

Supporters of the efficient market theory assume that investors cannot beat the market in the long run. Nevertheless, a wide range of investment strategies promise abnormal returns. Impressive long-term records set by sophisticated investors such as Warren Buffet, Peter Lynch, or Joel Greenblatt challenge this assumption. Buffet outperformed the market from 1976 to 2011 on average by 19% (Swedroe, 2012). It is doubtful that these investors were able to beat the market for several years just by chance.

Investment concepts, such as the January effect, promising abnormal returns are common phenomena in the market. They do not work anymore once they get published. One financial market anomaly that has not declined in significance is the value premium.

The concept of value investing was first elaborated by Benjamin Graham, who is commonly known as the 'Father of Value Investing'. He says that the stock market is only efficient in the long run and therefore an intelligent investor can benefit from overpriced or underpriced valuations in the market (Graham & Zweig, 2006).

Graham preferred stocks with relatively low multipliers and various other characteristics - all of which define the value of a stock. Thomas Rowe Price, in contrast, is dubbed as the 'Father of Growth Investing'. His investment style can be characterized by a strong focus on well-managed firms operating in industries that are considered to show strong expansions. He was interested in firms showing increased earnings and dividends, as they are expected to grow at a faster rate than the economy (Investopedia, 2015).

In the literature, value stocks are generally defined as firms which have recently shown low performance and are expected to show below average performance in the future, in contrast to growth stocks that have shown above-average performance in the past and are expected to continue this trend in the future (Bauman & Miller, 1997).

Growth stocks are generally sold at relatively high prices in comparison with earnings per share, cash flow per share, book-value per share, and dividends per share. Value stocks, however, show the exactly opposite characteristics (Bauman & Miller, 1997).

Value investors are commonly known as bargain hunters because they behave in a very similar way as most people do when paying for goods and services - they try to pay as little as possible. The term 'value' refers to what an investment - in this case a listed stock - is actually worth. This price is often very different from the intrinsic or true value of the security (Graham & Zweig, 2006).

The reason for such over or undervaluation of stocks can be traced back to market inefficiencies, which are caused by wrong expectations of market participants. A company that has shown an outstanding performance with increasing earnings in recent times is likely to attract the attention of professional analysts and investors. Investors will have confidence in the future prospects of such firms and thus be prepared to pay higher prices for their stocks. A factor that is often neglected is that prices could immediately move towards the opposite direction, which would cause share prices to crash.

Value investors aim to benefit from such inefficiencies; their strategy is to buy stocks when they are undervalued and to sell stocks when they are overpriced (Graham & Zweig, 2006; Brooks & Nojin, 2010).

One can see that the efficient market theory is in strong conflict with the assumptions of the value investing approach. During the last decade Stickel (1998), Basu (1977), Fama and French (1995, 1998), and Baumann and Miller (1997) have asserted the existence of a value premium, which contradicts the assumptions of the efficient market theory.

2.3 The value premium

As mentioned previously, a large body of literature provides evidence that value stocks outperform growth stocks in the long term. Dhatt et al. (2004) and Basu (1977) find that stocks with low price-to-earnings ratios (value) generate higher returns than stocks with high price-to-earnings (growth) ratios.

Fama and French (1992, 1995, 1998,) argue that value stocks outperform growth stocks. They say that firms with high book-

to-market ratios (value stocks) represent the characteristics of distressed firms and thus present a higher risk to investors. The value premium can therefore be seen as a compensation for a higher risk acceptance.

If it is true that the value premium is a compensation for risk, it is more than surprising that investors with a higher (lower) risk acceptance generally invest in growth (value) stocks.

Chan, Chen and Lakonishok (2002) wonder how dotcom growth stocks, popularized in the 1990s, having almost no book value but abnormally high market values, could be a safer investment than value-oriented utility stocks with high book equity values and substantial lower market values.

Porta, Lakonishok, Shleifer and Vishny (1997) find that the least distressed firms among those with high price-to-book multipliers are the most profitable. They, therefore, assume that the value premium cannot be explained by risk and that stock prices adjust slowly to public information. It means that investors can take advantage of these market efficiencies as long as prices are not adjusted to their fair values.

Another view that has prevailed over the years is that stock price discrepancies and the value premium can partly be explained by psychological and behavioural elements such as the investor's reaction, reasoning, and decision-making faculty (Malkiell, 2003). It implies that predictions about future prices can be made on the basis of historical stock prices and certain valuation metrics (Malkiell, 2003).

Research shows that investors strongly focus on growth stocks while making investment decisions and are much less concerned about value stocks. This is partly due to the fact that the analysts rarely monitor stocks which have performed poorly in the recent past (value). It is argued that such lack of interest in value stocks leads their prices to depreciate to a value far below their true value, thereby giving investors the chance to benefit from the mispricing errors (Malkiell, 2003).

Researchers in the field of neuroscience have found that the human brain often suspects trends where patterns are non-existent. If an event occurs two or three times in succession, particular areas in the human brain lead us to believe that the trend will continue (Graham & Zweig, 2006). This, in turn, makes investors to believe that the company's earnings will continue to grow for an indeterminate period.

Bondt and Thaler (1985) deal with this problem. They say that investors forecast earnings too far into the future and hence they become unreliable and incorrect. Little (1962) states that the growth rates of earnings are only predictable about one year or two years into the future. It means that any time horizon outrunning this time-span would be dubious and unreliable.

A study that compares analysts' earnings forecasts from 1973 to 1993 reveals that professional advisers make wrong forecasts in 44% of the cases. This indicates that earnings forecasting (growth investing) may be much less reliable than determining a firm's value based on historical earnings (value investing) (Brooks & Nojin, 2010).

Bauman and Miller (1997) show that extraordinary high or low growth rates generally come down to an average level. Therefore, high growth rates of growth stocks tend to decline, while the low growth rates of value stocks tend to increase in the long term. Comparing the performance of value and growth portfolios, it has been found that after the first year of portfolio formation the earnings from growth stocks decline on average by 0.5%, while earnings from value stocks tend to increase by 3.5% (Bauman & Miller, 1997).

Statman (1980) and Banz (1980) disagree with Dhatt et al. (2004) and Basu et al. (2004), saying that the value premium has stronger associations with firm size rather than price-to-book or price-to-earnings valuations. Klein and Bawa (1977) provide a model with the help of a more detailed picture of the firm-size effect. They assume that investors prefer not to hold small cap stocks because information about these firms tends to be limited. Such lack of interest on these stocks negatively affects its stock price so that it starts to decline. This phenomenon is a fundamental rule in economics, and can be compared with the demand and supply of certain products. As the quantity demanded, with unchanged supply, for a product decreases (increases), its price also decreases (increases). As soon as the market recognizes the true value of the stock, the stock price rises to an appropriate level. It implies that the P/E ratio or P/B ratio could equally affect this relationship.

An Internet growth stock that had received great attention in the past is the stock of Inktomi Corporation. Since its initial public offering in 1998 until 2000, when it was valued at $25 billion and sold for $231.625 per share, it had gained an increase in value of 1,900%. Two years later, in 2002, the stock closed at 25 cents—crashing from a market value of $25 billion to $40 million. It is interesting to note that the company's earnings did not depreciate during this time-period and thus the depreciation in value can be explained by market adjustments. The hype of the Internet during the 1990s led to a strong overvaluation of Inktomi's stock, priced at 250 times its earnings, until the market adjusted the price to a value which was equal to 0.35 times the company's earnings (Graham & Zweig, 2006).

The superior performance of value stocks vis-à-vis growth stocks can therefore be explained by an expectation bias. Incorrect expectations about the future performance of growth and value stocks lead investors to drive up the price of growth stocks and pull down the price of value stocks until the market recognizes these inefficiencies.

2.4 Investor preferences

Knowing that value stocks outperform growth stocks and assuming that professional investors also have this knowledge, it is surprising that there exists 70% more growth than value funds in the United States. Common sense tells us that it would be nonsense to put all your savings into funds that are riskier and promise lower returns.

The literature provides two different perspectives that seem to direct investor preference towards growth or value stocks. On the one hand, unsophisticated investors are influenced by profit-oriented financial advisers, while, on the other hand, behaviourists argue that the preference for a certain investment style stays in an individual's genes.

Growth stocks have a fundamental advantage over value stocks as they represent the exciting industries with innovative products which have the potential to become the next 'Windows' (Lynch, 2000). Therefore, a well-managed and strongly performing firm is viewed as a good investment by unsophisticated investors regardless of the price they pay for that investment (Porta, Lakonishok, Shleifer, & Vishny, 1997). Furthermore, financial advisers and analysts tend to promote investments that are easy to sell rather than those that promise the highest value for money.

Psychologists provide a somewhat different explanation for that behaviour: they assume that investor preferences may be partly explained by congenital causes and operating experiences. Cronqvist, Siegel, and Yu (2015) claim that 18% of the

variation for growth or value preferences is affected by an individual's genes. This relates, in particular, to an individual's risk acceptance. Investors with high risk acceptance tend to favour growth stocks, instead of value stocks, as claimed by Fama and French (Cronqvist, Sigel, & Yu, 2015).

Preferences for a certain investment style are, however, not solely determined by an individual's genes but by their experience. It has been shown that individuals who have had disappointing stock market experience do not continue to participate in stock market activities or at least take significantly less risk if they do indeed participate (Cronqvist, Sigel, & Yu, 2015). Investors who have had unfavourable macroeconomic experiences earlier in life are more likely to have a preference for value investing. It has been found that those who underwent the Great Depression in 1929 had maintained portfolios with a P/E ratio that was about 10% lower than that of investors who did not go through the same phase (Cronqvist, Sigel, & Yu, 2015).

Keeping this in mind, we believe that it is possible that European investors have preferences that distinguish them significantly from US investors.

2.5 Multipliers

There exists a wide body of literature focusing on financial ratios in connection with the value premium. Although the largest part of research was conducted on the US market, a smaller part also provides international evidence.

Fama and French find that market capitalization and the price-to-book ratio are the best indicators for measuring stock returns, with the latter being the more reliable indicator. Their investigations show that low P/B firms (value) have on average higher returns than stocks with high P/B multipliers (growth). In another study, they prove the existence of the value premium among 13 countries from 1977 to 1994. They conclude that firms with low price-to-earnings, and price-to-book and price-to-cash-flow multipliers perform better than firms with high multipliers (Fama & French, 1998).

H. Penman (1996) is another economist who has received a lot of attention in this regard. He inspects the relationship between P/E and P/B ratios, and also investigates to what extent those measures can be used to estimate future earnings. Penman (1996) finds that P/E ratios are weak indicators for future growth since they are related to current return on equity; P/B ratios, however, are related to a firm's future profitability and thus happen to be a much better indicator of future earnings. Although Penman grades P/E ratios to be a less appropriate measure, his findings support the proposition forwarded by Fama and French that high P/E firms underperform in comparison with low P/E firms.

One can see that different classification figures have been used to distinguish value from growth stocks. O'Shaugnessy (1998) finds that investment in the 50 lowermost US stocks from 1952 to 1996 had marked excess returns of 1.7% to 3.9% regardless of whether the portfolio was based on P/E, P/B, or P/CF ratios.

Although the major part of the literature suggests that a focus on P/B and P/CF figures will result in the highest returns, it must be said that the yield spreads are much too small to give clear results. Furthermore, it has been shown that fundamental ratios can easily be manipulated and hence the exploration of several financial numbers is likely to bring better achievements.

Earnings, for example, can be transfigured in a way that they present a value way different from their true value. Low P/E values, therefore, do not always typify an undervalued stock.

2.6 German evidence

More than half of the research conducted on the value premium has been carried out in the US stock market. Nevertheless, a series of recent studies focusing on European stock markets have also been published. As Germany is one of the largest economies in the world and has the second largest stock market in Europe, many studies report, albeit indirectly, about the value premium in the Germany stock market.

Fama and French (1998), for example, carry out an investigation on 14 different international stock markets and prove the existence of a value premium in all countries, including Germany. This finding has been also confirmed by Chisolm (1991), who studies the value premium based on the price-to-book ratios in Germany, Japan, France, and the United Kingdom from 1974 to 1989. He finds that stocks with low multipliers have outperformed high multiplier stocks in all the studied markets.

Some other researchers, such as Capaul, Rowley and Sharpe (1993), also provide evidence for the existence of a value premium in the German stock market. It is noticeable, however, that not a single research paper focuses explicitly on the German stock market. This is somewhat surprising because the German stock market is listed as the 10th largest and one of the most influential stock markets in the world. It suggests that international investors are interested in being informed about that stock market.

Based on these findings, we state the following hypotheses:

$H0_1$: Values portfolios generate the same return as growth portfolios.

HA_1: Value portfolios generate higher returns as growth portfolios.

$H0_2$: There exists no difference in the value premium between the different multipliers.

HA_2: There exists a difference in the value premium between the different multipliers.

3. METHODOLOGY

In the literature there exists two distinctive ways to perform research: qualitative and quantitative. Qualitative research, also known as explanatory research, is intended to gain a better understanding of human behaviour, deductive reasoning, opinions and trends - knowledge that cannot be obtained by empirical data collection. Quantitative research attempts to explain certain relationships by collecting and analysing numerical data by using empirical research methods (Australian Bureau of Statistics, 2013). Our research will be based on empirical data, known as quantitative data. The research will follow a deductive approach, which means that we will develop a hypothesis - based on the existing literature - that value stocks outperform growth stocks, which we will subsequently confirm or reject by designing a research construct. A commonly used method to measure the performance of an investment strategy - if it has been used in the past - is the concept of backtesting. The only way we can review the working of an investing strategy is by examining the past stock behaviour and then generalizing on the basis of these observations.

To test our hypothesis, we will collect historical stock data comprising stock quotes, dividend payments, and certain multipliers, and investigate which stock portfolio, growth, or value, averages higher returns over a specified time horizon.

3.1 Separation of value and growth Stocks

As already mentioned in Section 2.5, several financial ratios are used to identify value stocks. We have found that the price-to-earnings, price-to-book, and price-to-cash-flow multipliers are most often used in empirical studies and are most likely to be associated with the value premium (Fama & French, 1998; Penman, 1996; O'Shaugnessy, 1998).

Although it is said that some multipliers may be more strongly associated with the value premium than others, differences in return spreads are too narrow to make a clear assessment about the significance about the different multipliers. Also, use of different multipliers ensures that the study is not biased by country or industry-specific characteristics, which could be the case if we only rely on a single multiplier (Keimling, 2004).

Fama and French (1998) as well as Penman (1996) argue that low P/E firms outperform high P/E firms. This multiplier represents the market value of a stock in relation to its earnings per share. The market price of a stock is defined as the price for what has been traded in the market. This value is determined by calculating the average daily closing price over the year, which provides a solid value in such a way that this number is not biased by temporarily outliers.

$$P/E = \frac{Market\ Value}{EPS}$$

where EPS is earnings per share.

Another multiplier investigated in this research is the price-to-book ratio.

Firms with low price-to-book ratios similarly outperform stocks with high P/B multipliers (Fama & French, 1998; Penman, 1996; O'Shaughnessy, 1998). It has been reported that between 1991 and 2003 low P/B stocks outperformed high P/B stock by 0.8%-21.4% in Japan, France, the US, the UK, Canada, and South Africa (Keimling, 2004). In addition, it has been shown that low P/B stocks have outperformed the individual country indices by 1.4% to 25.1%. Therefore, it can be concluded that the P/B multiplier may be more strongly related to a value premium, as to the P/E ratio. However, we have insufficient evidence to make such a proposition.

The P/B ratio is used to compare the market price of a stock with its book equity value. Broadly speaking, it states the amount of equity that someone needs to pay for each Euro in net assets.

$$\mathrm{P/B} = \frac{\text{Market Value}}{\text{Book Value of Equity}}$$

$$\text{Book Value of Equity} = \frac{\text{Stockholders' Equity} - \text{Preferred Stock}}{\text{Average Shares Outstanding}}$$

The price-to-cash flow ratio is another multiplier that has shown to be a good classification figure to separate growth from value firms. Likewise, low P/CF stocks outperform firms with high P/CF ratios. Keimling (2004) reports that from 1991 to 2003 low P/CF stocks outperformed firms with high P/CF ratios by 4.2% to 21.2% and beat the market by 1.7% to 12.4%.

The P/CF ratio sets a stock's market price in relation to the cash flow it generates on an annual basis per share. The P/CF ratio is often associated with the P/E ratio because both figures give insights into a firm's current and future performance (Fama & French, 1998). Although both ratios seem to be similar, it is reported that the P/CF ratio is often considered to be a more reliable and accurate figure than the P/E ratio. This is because that the P/CF figure is much less vulnerable to accounting manipulations. This can have a major impact on the P/E ratio (Pinkasovitch, n.d.). The P/CF ratio is calculated in the following way:

$$P/CF = \frac{P}{Cash\ Flow\ Per\ Share}$$

where P is the stock price

$$Cash\ flow\ per\ share = \frac{Operating\ cash\ flow - preffered\ dividends}{shares\ outstanding}$$

3.2 Portfolio composition

To perform a thorough investigation into return differences, it is a common practice to form portfolios which will bring the benefit of diversification and hence more reliable results (Fama & French, 1995, 1998; Penman, 1996).

Research shows that it is best to form three distinct portfolios (bottom value, medium values, and top values), instead of dividing the sample into just two portfolios (Fama & French, 1998; Bauman et al, 1998). In the literature, there is some disagreement about the ranges that distinguish these different groups. Also, it is certainly conceivable that these ranges will differ across borders. Various scholars avoid such problems by using percentage ranges (Fama & French, 1998; Bauman, 1998).

Based on the approach of Bauman et al. (1998), we will divide all stocks, for each ratio, into three distinct groups: the bottom 30% are considered to be value stocks (1); the middle 40% presents the area between the extreme values (2); and the top 30% present the growth stocks (3).

The portfolios will be rebalanced each year on the last day of the year (31 December) because multiples are expected to change over time (Fama & French, 1998; Bauman, 1998; Piotroski, 2000). It means that some stocks may change between these groups. Each portfolio comprises information about the individual multiplier, the stock price at portfolio creation, the stock price in the subsequent year, and the dividend paid in the subsequent year.

3.3 Portfolio return calculation

The success or failure of an investment is generally determined by the total return. Most researchers studying the value effect use annual returns to determine the total return (Porter et al, 1997; Bauman et al, 1998; Fama & French, 1998). The calculations applied in this thesis are based on the work carried out by Porter et al. (1997) and Bauman et al. (1999).

We determine the annual return for each portfolio in the following way:

$$Ri = \frac{P1+D1}{P0}1$$

where, Ri is the annual return of stock i, P0 the price of the stock at portfolio formation, P1 the stock price at the subsequent year, D1 the dividend paid in the subsequent year.

$$AAR = \frac{R1 + R2 + Rx}{n}$$

where AAR is the annual return of the portfolio, Rx is the return of stock x, n is the total number stocks.

We need to determine the returns for all three multipliers, for each of its groups, for each fiscal year.

Furthermore, we need to calculate the average return over the whole study period (2005–2014). Two different calculations are used in the literature to determine the average return over the total sample period, namely the arithmetic return and the geometric return.

The arithmetic return is determined by taking the sum of all values and dividing it by the total number of samples.

$$\text{Arithmetic return} = \frac{\text{AAR1} + \text{AAR2} + \text{AARx}}{\text{n}}$$

where, AARx is the return of portfolio x and n is the total amount of portfolios.

It has been reported, however, that the arithmetic return often outnumbers the actual return. This is because the calculation does not take into account volatilities which may influence the compounding effect. The geometric return, in contrast, considers volatilities and therefore is often the more reliable indicator. The geometric return is calculated in the following way:

$$Geometric\ Return = [(1+\text{AAR1})*(1+\text{AAR2}) * (1+AARx)]^{(\frac{1}{n})}$$

where, AARx is the return of portfolio x and n is the total amount of portfolios.

Strictly speaking, the geometric return is only appropriate if you hold an identical investment over a given time period. As we rebalance our portfolios each year, this is, however, not given. It can be observed that many studies under similar conditions still use the geometric return (Bauman et al, 1999; Porter et al, 1997). We will therefore use both the arithmetic and the geometric returns to calculate the total return.

Calculation of the returns of the subsequent portfolios allows us to determine if value or growth portfolios generate higher returns during the sample period. Moreover, we will see which multiplier shows the strongest association with the value premium, if at all.

3.4 Statistical testing and variables

In empirical research it is assumed that making conclusions by comparing different values is not an appropriate or a thorough research method. A widely accepted method is hypothesis testing, which refers to a procedure that uses different statistical tests to refuse or accept a statistical hypothesis (Veaux et al, 2011). This requires one to state a null as well as an alternative hypothesis. One can refuse a hypothesis when the findings are statistically significant, which means that the researcher has evidence to assume that findings have not occurred by chance (Veaux et al, 2011). A common approach is to use a significance level of 0.05, which will also be used in this research. If we find a p-value that is equal or lower than our significance level, then we will refuse our hypothesis.

A statistical test that finds frequent application in the literature is the t-test, which is used to make assumptions about the differences between means of two populations (Fama & French, 1998; Porta et al, 1997). In this study, the populations are portfolios comprising growth stocks and portfolios comprising value stocks.

This paper has one dependent variable and three independent variables. The dependent variable is the return achieved on an investment. The independent variables are the P/E, P/B, and P/CF multipliers.

I will perform a paired t-test to find out if value portfolios outperform growth portfolios. In doing so, I will compare the mean returns of the value and growth portfolio for each multiplier separately. I will also investigate if some multipliers are associated with a larger value premium than others. In order to do this, I will again perform a paired t-test by using the return spreads between value and growth. The spread between value and growth was earlier indicated as the value premium, which provides information about the relevance or usefulness of a given multiplier. Thereby we will elaborate if the value premium is significant higher for any of the multipliers.

3.5 Data collection

This research will focus on the German stock market, which, with a market capitalization of $1,185 billion, is the world's 10th largest stock exchange. As many as 900 stocks are quoted at the German stock exchange, commonly known as 'Deutsche Börse'. The Xetra system, an electronic trading platform, is today the main trading place for German equities.

The three largest indices in the German stock exchange are the DAX, the MDAX, and the SDAX. The DAX consists of a total of 30 stocks and presents the largest and top-selling stocks; the MDAX contains the 50 largest and top-selling medium-sized stocks; and the SDAX contains the 50 largest and top-selling small-sized stocks. The data sample used in this research is composed of all stocks listed in these three indices and hence a total number of 130 stocks.

The decision to select those indices has been made because complete information about firms not listed in these indices was often not provided.

The collected data covers the time period from 2005 until 2014. This period has been selected because we did not have access to data that goes back further. Nevertheless, it is assumed that a period of 10 years will be sufficient to get reliable and meaningful results. The data was collected from the Arivis.de (DAX) and Morningstar.com (MDAX, SDAX) databases, which are considered to be reliable and professional institutions.

Financial figures derived from the databases include stock quotes, dividends paid, P/E ratio, P/B ratio, and the P/CF ratio. As we rebalance portfolios on the last day of the year (31 December), we also need to use the stock closing price on that day. The individual ratios are directly derived from the database and not calculated by the researcher. For some years particular data has not been available. This is because some firms may not be listed at that point in time, have gone bankrupt, or have incomplete data. We assume, however, that this will not affect our study. It means that for some years more data is available than for others. Consequently, this will have an effect on the portfolio size because if we have a larger amount of data available for a specific multiplier, it will also increase the size of the portfolios.

4. EMPIRICAL FINDINGS

As previously stated, the study aims to investigate whether there exists a value premium in the German stock market. Differently put, this study aims to find out if value stocks outperform growth stocks. In this section, empirical findings are presented and analysed by using the knowledge elaborated in previous parts of this paper.

4.1 P/E portfolios

Portfolios ranked in accordance with their P/E ratios were, on average, divided into the following groups: Value (0–11.62), medium (11.63–19.82), and growth (>19.82). This is consistent with the ranges reported in the literature, where growth stocks are considered to have a P/E value of ≥ 20 (Graham & Zweig, 2006). The average P/E values for value and growth are relatively stable over the total time horizon, with the exception of the years 2012 and 2013.

Over the entire study period, from 2004 until 2014, value portfolios outperformed growth portfolios in seven of the nine years. Interestingly, growth stocks only outperformed value stocks in those years when negative returns where recorded

(2007, 2010). It means that an investment in growth stocks within those years would have reduced the investor's losses.

Value stocks achieved a geometric return of 16.9 % over the complete time period, while growth portfolios only yielded a geometric return of 12.6%, thereby indicating an annual underperformance of 4.3%. Bauman et al. (1998) make the same observations. They also find a value premium of 4.3% for the US market.

Table 1 Average Annual Returns For Growth Stocks And Value Stocks Based On The P/E Multiplier

Value and growth portfolios are formed on price-to-earnings. The individual returns for each year are based on the arithmetic return. The row 'outperformance' indicates which portfolio showed superior performance in this year. We denote value as V and growth as G.

Year	Value	Growth	Outperformance
2005	39.64%	27.91%	V
2006	6.10	5.19	V
2007	-43.99	-33.15	G
2008	40.49	21.22	V
2009	45.91	44.06	V
2010	-13.34	-4.42	G
2011	29.62	18.90	V
2012	32.85	28.10	V
2013	14.40	5.36	V
Arithmetic	16.9%	12.6%	
Geometric	12.6%	11.7%	
SD	29.7	22.6	

We can see that the annual returns for both value and growth widely fluctuate over the years, with their peak at 45.9% and the lowest point at -43.9%.

Furthermore, it can be observed that value portfolio returns are much more volatile (SD =29.7) than that of growth portfolios (SD=22.6). In statistics, it is a common practice to make assumption about the volatility of a given dataset by its standard deviation. Hence, it is assumed that a higher standard deviation is associated with a higher volatility.

As I have shown that value portfolios outperform growth portfolios, I also need to verify if these results are statistically significant. To answer this question, I have performed a paired t-test.

Table 2 Average Annual Return Spread Between Value and Growth

The table presents the results of the paired t-test. Mean differences for the returns of value and growth were compared for each multiplier. The column 'Return spread' indicates the difference between the return of the value and growth portfolio.

Time period		Total observations	Value	Growth	Return Spread
P/E	Return	512	16.9%	12.6%	4.3
	P-value				0.188
P/B	Return	512	16.8%	18.3%	-1.5
	P-value				0.197
P/CF	Return	528	20%	12.3%	7.7**
	P-value				0.027

** Significant at the 5% level.

We fail to reject $H0_1$ (p=0.188) and thus there exists no evidence to assume that value portfolios generate higher returns than growth portfolios. As we find a relative high p-value, it is likely that the differences between value and growth were a matter of coincidence. Therefore, there is no verifiable difference. We cannot say with absolute certainty that, based on the P/E ratio, value portfolios do not outperform growth portfolios, but our sample does not support this relationship.

4.2 P/B portfolios

For portfolios ranked in accordance with the P/B ratio, we find average ranges of 0 to 1.2 for the value portfolio; 1.3 to 2.94 for the medium portfolio; and values larger than 2.9 are considered to be growth stocks. Graham and Zweig (2006) argue that value stocks are considered to have a P/B value smaller than 1.5 and growth stocks a P/B value of 3 or larger. This shows that our findings are consistent with P/B ranges reported in the literature. On average, the total sample of stocks shows an average P/B ratio of 2.33, whereby it should be noted that average annual P/B ratios are characterized by moderate to high volatility.

Table 3 Average Annual Returns For Growth Stocks And Value Stocks Based On The P/B Multiplier

Value and Growth portfolios are formed on price-to-book. The individual returns for each year are based on the arithmetic return. The row 'outperformance' indicates which portfolio showed superior performance in this year. We denote value as V and growth as G.

Year	Value	Growth	Outperformance
2005	33.74%	19.43%	V
2006	17.65	15.11	V
2007	-35.41	-23.78	G
2008	49.28	31.26	V
2009	35.17	47.58	G
2010	-13.82	-5.72	G
2011	25.62	28.72	V
2012	26.98	25.24	G
2013	11.94	26.83	G
Arithmetic	16.8%	18.3%	
Geometric	13.6%	16.4%	
SD	26.34	21.3	

Like the P/E portfolio, the P/B-based portfolio also shows a wide spread of returns, which ranges from its lowest point at -35.41% to its peak at 49.28 %. Again, only negative returns are recorded in 2007 and 2010, which can be associated with the global financial and European debt crisis, as in these years Germany's GDP had extensively declined (Statista, 2015).

From Table 3 we can observe that growth stocks (SD=21.3) provide more consistent returns than value portfolios (SD=26.34). The volatility difference between value and growth for the P/B-based portfolios seems to be slightly lower than for the P/E portfolios.

As indicated by Table 3, we find that value stocks underperformed growth stocks in five out of the nine years. Thus, in five of the nine years (2007, 2009, 2010, 2012 and 2013) growth stocks outperformed value stocks. From 2004 until 2014 growth stocks generated an annual geometric return of 16.4%, while value stocks only achieved a return of 13.6 - a deficit of 2.8%. These results are inconsistent with findings reported in the literature. Fama and French (1992, 1995, 1998), Penman et al. (1996) as well as Chisolm et al. (1991) show that low P/B stocks outperform high P/B stocks. Fama and French (1992) as well as Penman et al. (1996) provide evidence that a

portfolio of low P/B ratios outperforms a portfolio of low P/E ratios.

Our results do not support this assumption. This outcome is, however, not entirely surprising. P/B ratios are very sensitive to tax depreciation. As Germany has an industry-heavy economy, it may be more strongly affected by asset depreciation than other countries. Industrial companies generally write off their assets (production facilities etc.) over time and hence they are not represented in the firm's book value, which leads to distorted figures.

Although our results suggest that growth portfolios outperform value portfolios, we could not find any statistical significance for this assumption (p=0.41).

4.3 P/CF portfolios

The P/CF portfolios had average ranges of 0–4.7 for the value portfolio, 4.8–10.2 for the medium portfolio, and values larger than 10.2 were assigned to the growth portfolio. Also, for this multiplier, our findings are consistent with previous research. Graham and Zweig (2006) argue that value stocks should have P/CF multipliers below five, which is very close to the number obtained in this research. I find that average P/CF values fluctuate over the years and range from -6.98 to 15.58, while the average over the total period lies at 4.6.

Annual returns for both value and growth fluctuate over the years, ranging from -37.7% to 53.9%. Again the only negative returns are recorded in the years 2007 and 2010.

Value portfolios (SD=27.1) show a higher volatility than growth stocks (SD=23.59). The difference is, however, smaller than observed for the P/E and P/B portfolios. That value portfolios are more volatile and more risky than growth portfolios is consistent with findings by Fama and French (1995, 1998). They argue that the value premium can be seen as a compensation for a higher risk acceptance.

Table 4 Average Annual Returns For Growth Stocks And Value Stocks Based On The P/CF Multiplier

Value and Growth portfolios are formed on price-to cash flow. The individual returns for each year are based on the arithmetic return. The row 'outperformance' indicates which portfolio showed superior performance in this year. We denote value as V and growth as G.

Year	Value	Growth	Outperformance
2005	36.78%	29.63%	V
2006	12.60	12.35	V
2007	-32.85	-37.73	V
2008	53.58	25.64	V
2009	37.32	36.29	V
2010	-7.28	-10.32	V
2011	24.42	28.05	G
2012	42.94	21.47	V
2013	12.93	5.13	V
Arithmetic	20.1%	12.3%	
Geometric	16.9%	9.6%	
SD	27.1	23.59	

Over the total period, from 2005 until 2014, value portfolios strongly outperform growth portfolios. In eight out of the nine years value portfolios generate higher returns than growth portfolios. Only in 2011, growth portfolios averaged higher returns than value portfolios. Value portfolios yielded an annual geometric return of 16.9%, while growth portfolios only yielded a return of 9.6%. This means that value portfolios outperformed growth portfolios by 7.3%. Comparing this finding with the value premiums reported in previous research, it becomes evident that there is a distinct difference. Bauman et al (1998) find a value premium of 4.3%, which is considerably smaller than the value we have obtained.

The assumption that based on the P/CF multiplier value portfolios outperform growth portfolios is statistically significant (p=0.027) and thus we have evidence to reject $H0_1$. We determined a p-value of 0.027, meaning that if there really exists no difference in returns between value and growth portfolios, we should obtain such a result in 2.7% of the cases, which is very rare. The finding that low P/CF stocks outperform high P/CF stocks is in accordance with several studies conducted in the American and European stock markets (Fama & French, 1998; O'Shaugnessy, 1998).

4.4 Different multipliers

Several academics have argued that P/B and P/C-based portfolios are likely to generate higher returns than the P/E-based ones (Fama & French, 1998; O'Shaugnessy, 1998).

I performed several t-tests to investigate this relationship and found a somewhat different result.

Table 5 Multipliers In Comparison

The table shows the results from the t-tests performed comparing the value premiums from the particular multipliers. The value premium is based on the arithmetic return and is determined by subtracting the return of the growth portfolio from that of the value portfolio.
The column 'spread' represents the difference between the value premiums from the individual multipliers.

Time period		P/CF	P/B	Spread between P/CF and P/B
P/CF > P/B	Value premium	7.76%	-1.50%	9.26% **
	P-value			0.014
		P/CF	P/E	Spread between P/CF and P/E
P/CF > P/E	Return (%)	7.76%	4.28%	3.48%
	P-value			0.171
		P/E	P/B	Spread between P/E and P/B
P/E > P/B	Return (%)	4.28%	-1.50%	5.78% **
	P-value			0.049

** Significant at the 5% level.

Taking a look at table 5, it becomes evident that the P/CF multiplier has the largest value premium (7.8%) and also offers the highest arithmetic return with regard to its value portfolio (20.1%). Statistical testing shows that the value premium, which is the outperformance of value vis-á-vis growth, is significantly higher (p= 0.014) for the P/CF portfolio compared with the P/B portfolio. Comparing the P/CF multiplier with the P/E multiplier indicates that the value premium is larger for the former. Statistical testing, however, shows that there is no significant difference between these multipliers (p=0.171). Hence, I have no evidence to assume that the P/CF multiplier is a better indicator than the P/E multiplier.

Comparing P/E with P/B similarly shows that the value premium is higher for the P/E ratio. Statistical testing confirms this assumption (p=0.049). Based on these findings, we can conclude that the P/E and P/CF ratios are better indicators for the value premium than the P/B ratio. The P/B ratio has shown a negative value premium and is considered to be a weak indicator for a separation between growth and value stocks.

5. CONCLUSION

5.1 Conclusion

Various academics have proven that value premiums exist in international stock markets, or said differently, that value stocks outperform growth stocks. The purpose of this thesis was to investigate whether this can also be confirmed for the German stock market. Our research covered a total sample of 130 firms over a time period of 10 years. The results confirm the existence of a value premium in the German stock market. It may, however, be remarked that our findings are not completely consistent with previous findings on the value premium.

It is widely believed that stock portfolios with low (value) price-to-earnings, price-to-book-value, and price-to-cash-flow ratios generate higher returns than those with high multipliers (growth) (Fama & French, 1995, 1998: Penman et al, 1996).

The statistical evaluations outlined in the former section of this study show that the outperformance of value portfolios vis-á-vis growth portfolios only shows significant results for the price-to-cash flow multiplier. For the price-to-book and price-to-earnings multipliers, the return differences between growth and value portfolios were too small and thus insignificant.

The value portfolio based on the P/CF ratio generated an annual geometric return of 16.9%, while the P/CF-based growth portfolio only achieved an annual geometric return of 9.6%. It means that an investment of €10,000 in the value portfolio from 2005 until 2014 would have turned into €40,769 €, while an investment in the growth portfolio would only have turned the same amount of money to €22,818.

I also find that during the tested period, value stocks classified by their price-to-earnings ratio outperformed growth stocks. Value portfolios showed a geometric return of 12.6%, contrary to growth stocks that recorded a geometric annual return of 11.7%, marking an outperformance of 0.9%. It is important to note, however, that statistical testing has not proven significant return differences between growth and value on the basis of the P/E multiplier. Thus, we cannot make any reliable assumptions towards a value premium.

We also made interesting observations regarding the price-to-book ratio, which is in considerable disagreement with previous findings. The price-to-book ratio, according to Fama and French (1995, 1998) as well as Penman et al. (1996), is the best indicator to identify stocks that offer the largest value premium. Our results, however, show the opposite effect and thus contradict previous findings. Value portfolios underperformed in comparison with growth portfolios in five out of the nine portfolio years, which is indicated by an annual underperformance of 2.8%.

In the literature, it is a common occurrence to verify if the different ratios examined significantly differ in their relevance towards the value premium. The obtained results provide evidence that there is a difference between the returns achieved by the P/E, P/B, or P/CF multipliers. We find that the value premium is significantly larger for the P/E and P/CF ratios in comparison with the P/B ratio. This, however, stands in contrast to the findings of Fama and French (1998) as well as Penman (1996), who state that the P/B ratio is a better indicator than the P/E ratio.

In the light of the above findings we can confirm our hypothesis that value stocks outperform growth stocks in the German stock market. This statement, however, is only valid for the P/CF multiplier. Moreover, I find that the P/CF and P/E ratios are better indicators than the P/B ratio, as they offer larger value premiums.

5.2 Limitations

It became evident that the findings differ to some extent from findings popularized in earlier research. Although the research design of this study is very similar to previous studies, I want to elaborate on certain factors, which may have limited the scope of this study.

One major limitation of this study is the selected time frame. This paper covers the time period from 2005 until 2014, which was characterized by the global financial crisis and European debt crisis. As firms were strongly affected by these crises, it is also possible that the results obtained are biased to some extent. Another limitation, which concerns previous research, is the disregard of transaction costs. As outlined in the methodology section, portfolios were rebalanced each year, which means that stocks which were sold or newly purchased led to substantial transaction costs. Transaction costs will have a major effect on the actual return earned, because they will eat up any modest gain achieved by this investment strategy (Graham & Zweig, 2006; Lynch & Rothchild, 1989). An alternative to this method, for example, is to rebalance portfolios at longer intervals, which will decrease transaction costs.

Another critical point is that there exists a fundamental difference between theoretical value investing and practical value investing. It is a frequent practice to use quantitative measures in empirical studies. This is because it is much harder to obtain and measure qualitative data. In reality, however, qualitative measures are as important as quantitative measures. Sophisticated investors such as Graham, Buffet, or Lynch often rely on qualitative measure such as the firm's image, the quality of its products, or the continuity in dividend payments. One can therefore conclude that ignoring qualitative metrics may have limited the practical relevance of this study.

5.3 Suggestions for further research

By considering the above-mentioned limitations, there are several ways to extend this study. The observation period was restricted to 10 years as we have only limited data. Future research covering a longer observation period could reveal more significant and precise results, which will increase the quality of the study.

The primary aim of this research was to investigate if value stocks outperform growth stocks. Therefore, much less attention has been given to the determinants actually causing the value premium. Even though it is very difficult to give a definite answer to this question, one could conduct research in the area of behavioural finance or examine the size effect, popularized by Fama and French (1992), towards the value premium in the German stock market.

6. ACKNOWLEDGMENTS

I would like to thank Dr Viehweger for his advice and support regarding statistical testing. Also, I would like to thank Mrs Huang for her valuable feedback that kept me on track.

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