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Abstract

It is often examined in the literature whether the dividend yields of stocks correlate with their total returns. This paper analyzes the effect of dividend yield on return as well as on risk and on performance of stocks and stock portfolios. Not only the influence of dividend yield but also of dividend stability is subject of our analysis. Furthermore, tax aspects are considered. Our data set comprises daily adjusted stock prices and dividend payment data from the German capital market over the period 2000 to 2006. We use stocks from the HDAX, which include blue chips (DAX), stocks of medium-sized companies (MDAX), and stocks of technology firms (TecDAX). Our findings suggest that the performance generally improves with an increasing dividend yield. However, this result is rather based on risk reduction than on a higher return where risk reduction diminishes by increasing the degree of diversification.

Keywords: dividend yield, dividend stability, diversification, performance

JEL classification: G11, G14

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1 Introduction

There are two popular reasons to invest in high-dividend stocks. On the one hand, like bonds, stocks with high dividend yields provide relatively stable positive returns in uncertain and stagnating markets. On the other hand, investors suppose that an outperformance can be achieved by composing portfolios solely consisting of stocks with the highest dividend yields. One of these so-called dividend yield strategies is known as the "dogs of the Dow" or "top ten strategy".[1] It means to invest in the ten stocks of the Dow Jones Industrial Average (DJIA) or another major stock index which provide the highest dividend yields and to readjust the portfolio once a year. A modification of this strategy is called "small dogs" or "low five depot".[2] Here, only the five (of the ten) stocks with the lowest price per share are chosen.[3]

Deutsche Börse picked up the idea of high-dividend portfolios and introduced the DivDAX on March 1, 2005. By means of this index, Deutsche Börse allows for the fact that dividend yield is a favorite criterion to choose stocks. The DivDAX is the first German stock index which is based on the dividend yield. The index consists of the 15 DAX stocks with the highest dividend yields over the last year. Like the DAX, the DivDAX is recomposed once a year in September.

It is a common practice in Germany to pay dividends only once a year. This simplifies the computation of dividend yields. The dividend yield to determine the composition of the DivDAX is calculated as follows:

$$DY_i^{(y)} \;\; = \;\; \frac{D_{i,t}^{(y)}}{P_{i,t-1}^{(y)}} \tag{1}$$

with $DY_i^{(y)}$ denoting the dividend yield of stock i in year y, $D_{i,t}^{(y)}$ denoting the dividend on stock i in year y (paid on day t), and $P_{i,t-1}^{(y)}$ denoting the closing price of stock i in year y on day $t-1$. Therefore, dividend yield is just the quotient of dividend and closing price of the stock on the day preceding the dividend payment.

Similar to the DAX, the DivDAX is weighted based on free float market capitalization with the additional requirement that the fraction of one stock must not exceed ten percent.[4] Obviously, two aspects seemed to be important for Deutsche Börse when creating the DivDAX: a high dividend yield and a high liquidity of the stocks included. The latter is guaranteed by choosing only blue chips. In addition, with the DivDAX, Deutsche Börse wanted to create a high-performing stock index to support the development of derivative products such as index certificates and warrants. Deutsche Börse counted back the

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[1] See, e.g., Siegel (2002), pp. 334–337.
[2] See, e.g., Kotkamp and Otte (2001).
[3] Kotkamp and Otte (2001) examined whether such strategies worked at the German stock market, i.e., by using the DAX.
[4] See Deutsche Börse (2007).

DivDAX from February 28, 2005 (the day before the DivDAX was introduced) to September 20, 1999, and compared its development with the one of the DAX to illustrate its performance potential (see figure 1).[5]

Figure 1: **Development of the DivDAX and the DAX from September 20, 1999, to February 28, 2005**
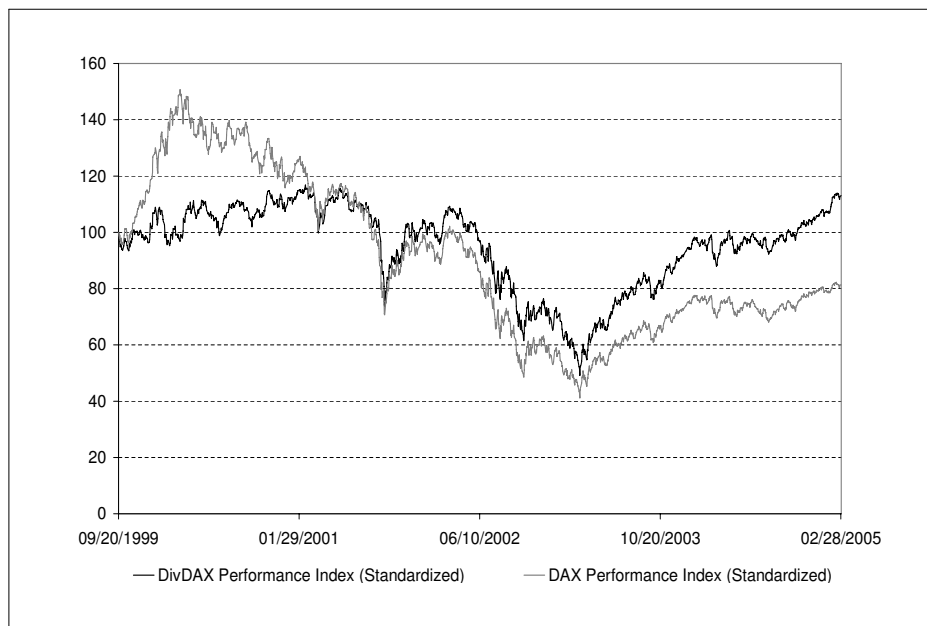
In this paper, we examine high-dividend stocks and portfolios. In contrast to Deutsche Börse and most of the literature, we are not only interested in return but also in risk and performance in terms of risk-adjusted return. Our analysis does not only include blue chips but also stocks of medium-sized companies and technology firms. Hence, liquidity is not emphasized in our analysis.

In the following, the relation between dividend yield and different performance measures is examined. Therefore, we look at alternative calculations of dividend yields in section 2 and at various traditional performance measures in section 3. Section 2 also includes some aspects concerning the taxation of capital gains and dividend income in Germany. A literature overview is given in section 4. Our data set and the adjustments made are described in section 5. The empirical analysis is part of section 6. We start analyzing the relation between dividend yield and excess return, followed by the relation between dividend yield and risk, and finally combine risk and return to examine the relation between dividend yield and performance. Risk is measured not only as total risk but also as deviations from the market portfolio and as systematic and idiosyncratic risk. Performance is shown by traditional performance measures. We also check whether the results change when using portfolios instead of single stocks. Besides the in-sample tests, out-of-sample tests are implemented to analyze whether investment strategies based on

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[5]See Deutsche Börse (2005).

dividend yields can be derived. Furthermore, we look at the influence of dividend stability to find out whether this is an indicator of a stock's risk. Finally, it is examined whether the relation between dividend yield and total return is influenced by German taxation rules. Our paper concludes with a brief summary in section 7.

2 Dividend Yields and Taxation of Dividends

2.1 Alternative Calculations of Dividend Yields

A first approach to compute dividend yields was introduced in equation (1). The idea behind this formula is to invest in a stock one day before the dividend payment and to interpret the dividend as the investment's return. In the U.S. and in the U.K., dividends are usually paid quarterly or even monthly. Therefore, some authors such as Litzenberger and Ramaswamy (1979) and Clinebell, Squires, and Stevens (1993) used the stock's closing price in the month preceding the dividend payment to compute the dividend yield. Blume (1980), Keim (1985), Chen, Grundy, and Stambaugh (1990), Christie (1990), Nelson and Kim (1993), Gombola and Liu (1993a and b), Morgan and Thomas (1998), and McManus, ap Gwilym, and Thomas (2004) measured dividend yield as the ratio of the sum of dividends paid over the last twelve months to the stock price at the beginning of this period. Naranjo, Nimalendran, and Ryngaert (1998) used four times a corporation's most recently declared quarterly dividend and its current share price to compute the corporation's annual dividend yield. This measure is used by the Wall Street Journal.[6]

The implied assumption of equation (1) is that the stock price on the day of the dividend payment does not deviate significantly from the stock price one day before. What actually happens is that stock prices fall on the dividend payment day approximately by the amount of the dividend. This leads to a different way of computing dividend yields. Here, ex-dividend stock prices are used. Analogously to the group of authors mentioned above, Black and Scholes (1974), Levis (1989), and ap Gwilym, Morgan, and Thomas (2000) measured dividend yield as the ratio of the sum of dividends paid over one year to the stock price at the end of this year. This corresponds to the definition of dividend yield used by the Financial Times.[7]

Fama and French (1988) added up the monthly dividend payments over one year and computed the ratio of this sum to both the stock price at the beginning and at the end of this year. They found that by using the price at the beginning of the year instead of using the year end price, it was more likely to avoid the false conclusion that dividend yields track expected returns. Blume (1980) assumed that using the beginning-of-period

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[6]See Naranjo, Nimalendran, and Ryngaert (1998).

[7]See ap Gwilym, Morgan, and Thomas (2000).

price instead of using the period's end price leads to a more accurate measure if dividend levels are adjusted quickly.

Hodrick (1992) and Goetzmann and Jorion (1993 and 1995) computed the ratio of the sum of the compounded dividends of the previous eleven months and the current dividend payment to the current stock price. Kotkamp and Otte (2001) computed the dividend yield for every trading day as the ratio of the last dividend payment to the current stock price. Their idea was to consider an investor who wants to pursue a certain dividend yield strategy by using the most current data. Since this strategy should be independent of the starting time, they afterwards computed an average dividend yield of the year.

2.2   Taxation of Capital Gains and Dividend Income in Germany

In the U.S. and in Germany, dividend payments are subject to a higher tax level than earnings from stock price increments. There is a so-called speculation period in Germany which lasts one year after buying a security. Apart from a tax exemption limit, half of the price change is subject to an investor's individual tax rate if she sells the security during the speculation period. If the security is sold outside the speculation period, apart from special cases such as loss carryforwards, neither profits nor losses are subject to taxation.

For business years beginning after December 31, 2000, the taxation of dividend payments in Germany is carried out by using the half-income system. Here, the gross dividend is subject to a corporation tax of 25 percent and leads to the so-called cash dividend paid to the shareholder. Then, half of this payment is again subject to taxation but by applying the shareholder's individual tax rate.

For business years that started before January 1, 2001, the full imputation system was used to tax dividend payments. Here, the gross dividend was subject to a corporation tax of 30 percent and led to the cash dividend as well. The whole gross dividend was also subject to taxation by using the shareholder's individual tax rate. Hence, the cash dividend equaled the shareholder's after-tax dividend if her individual tax rate was 30 percent. The shareholder had to pay additional taxes in case of a higher individual tax rate, she received a tax credit if her individual tax level was lower. Thus, the corporation tax could be interpreted as a tax payment in advance from the shareholder's point of view.

By using cash dividends to compute after-tax dividend yields from a shareholder's point of view, the implicit assumption under the full imputation system is a shareholder's individual tax rate of 30 percent. In contrast, the implicit assumption under the half-income system is a shareholder's individual tax rate of zero. By employing cash dividends to compute adjusted stock prices from an investor's view, similar assumptions are used implicitly because shareholders can only reinvest after-tax dividends. Nevertheless, we employ cash

dividends to compute dividend yields since these are the dividend yields offered from a corporation's view, without assuming a certain individual tax rate of its shareholders.

3 Return, Risk, and Performance Measures

Performance measurement in finance means to adjust the realized return by the incurred risk. Often the excess return of an investment is considered instead of using the total return with excess return defined in the following as the difference between total return and return of a benchmark such as the risk-free asset or a market index.

The incurred risk can be measured in different ways. A first one is to regard the total risk, i.e., the standard deviation of the investment's (excess) return. According to the market model, the total risk of an asset consists of a systematic part that reflects the reaction of the asset's return towards changes in the market return and an idiosyncratic part, which reflects the corporation's individual risk and is independent of market changes.

The capital asset pricing model (CAPM) postulates that, in the market equilibrium, all investments are to be found on the security market line. Although the CAPM is empirically falsified, it is often used in performance measurement to provide benchmark strategies. The benchmark strategies (passive strategies) are to invest in a portfolio of risk-free asset and market index, which is used as a proxy for the tangency portfolio. An investment outperformed the market if its historical mean return is higher than the mean return of the appropriate benchmark strategy. Jensen's alpha, α_i, measures the difference between the mean returns of investment i and the benchmark strategy with the same systematic risk, normalized to the beta coefficient, $\beta_{i|M}$:

$$\alpha_i = \bar{r}_i - \beta_{i|M} \cdot \bar{r}_M \tag{2}$$

with $\bar{r}_i$ and $\bar{r}_M$ denoting the mean excess return of investment i and the market index, respectively.[8]

Only systematic risk is incurred by pursuing a benchmark strategy. Therefore, an outperformance according to Jensen's alpha necessarily requires to incur non-systematic risk. Adjusting Jensen's alpha by non-systematic risk allows a ranking of different investments and leads to Treynor and Black's appraisal ratio, AR_i, of investment i:

$$AR_i = \frac{\alpha_i}{\sigma_i(\varepsilon)} \tag{3}$$

$$\text{with} \quad \sigma_i(\varepsilon) = \sqrt{\sigma_i^2 - \beta_{i|M}^2 \cdot \sigma_M^2}$$

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[8]We use discretely compounded single returns of investments i, the market index, and the risk-free asset to compute these mean excess returns. This is in contrast to the literature where continuously compounded returns are usually employed. Our approach is due to the portfolio-related perspective of our study. Discretely compounded returns are employed in the CAPM and, consequently, in traditional performance measurement; see also Dorfleitner (2002).

with σ_i and σ_M denoting the standard deviation of the excess return of investment i and the market index, respectively.

Outperformance according to Jensen's alpha requires that the total risk of the investment is higher than the total risk of the benchmark strategy since the latter only incurs systematic risk. Therefore, it also makes sense to compare the mean returns of the investment and the benchmark strategy with the same total risk. The difference between the mean returns of the benchmark strategy with the same total risk and of the one with the same systematic risk can be achieved by diversification and only the (positive) difference between the realized mean return of the investment and of the benchmark strategy with the same total risk requires (good) selectivity skills of the investor. Fama called this difference the net selectivity, NS_i, of investment i:

$$\text{NS}_i \quad = \quad \alpha_i - \frac{\sigma_i}{\sigma_M} \cdot \bar{r}_M. \tag{4}$$

Given a risky investment that has a higher mean return than the corresponding passive strategy, for any level of systematic risk, a combination of this risky investment and the risk-free asset offers a higher mean return than a combination of the market index and the risk-free asset. This means a steeper slope of the line connecting the risk-free asset and the risky investment than the slope of the security market line. This slope is known as Treynor's reward to volatility ratio, TR_i, of investment i:

$$\text{TR}_i \quad = \quad \frac{\bar{r}_i}{\beta_{i|M}}. \tag{5}$$

Systematic risk is relevant for an investor who holds a well-diversified portfolio and is only interested in the additional risk of a new investment. An investor who wants to invest in a single or few stocks only has to take total risk into account and should therefore adjust the mean excess return of the investment by its total risk. This leads to Sharpe's reward to variability ratio, SR_i, of investment i:

$$\text{SR}_i \quad = \quad \frac{\bar{r}_i}{\sigma_i}. \tag{6}$$

By modifying the Sharpe ratio by employing the market index instead of the risk-free asset (to compute excess returns), the new mean excess return is adjusted by the so-called tracking error (TE). It is necessary to deviate from the market portfolio to achieve an excess return in comparison to the market. Therefore, additional risk has to be incurred, which is illustrated by the tracking error. This measure is called selection Sharpe ratio or information ratio, IR_i, of investment i:

$$\text{IR}_i \quad = \quad \frac{\bar{r}_i^{(M)}}{\text{TE}_i} \tag{7}$$

with $\bar{r}_i^{(M)}$ and TE_i denoting the mean excess return of investment i with respect to the market return and the tracking error of investment i, respectively.

The influence of the dividend yield on some of these return, risk, and performance measures is studied in the literature. The following literature review shows this development over the last decades in brief.

4 Literature Review

One of the first who considered dividend payments and their effects on the value of a corporation were Graham and Dodd. They observed in 1934 that the payment of a liberal portion of the earnings in dividends adds to the attractiveness of a stock (formally the dividend discount model). They also recognized that this involves a curious paradox: Stock value increases when taking away value from the capital and surplus fund, i.e., the more the shareholders subtract the larger is the value placed upon what is left.[9]

Black and Scholes (1974) were one of the first who considered returns instead of prices and dividend yields instead of dividend payments. They extended the CAPM equation by a dividend yield term and considered portfolios instead of single stocks to include diversification effects. Using New York Stock Exchange (NYSE) data from 1926 to 1966, they showed that dividend yields did not have a consistent impact on expected returns and, given a certain level of risk, maximizing the portfolio return by considering dividend yields may lead to a poorly-diversified portfolio with a lower expected return compared to the one of a well-diversified portfolio. While Black and Scholes took tax effects into account by considering two different subperiods with different tax laws, Litzenberger and Ramaswamy (1979) used an extension of the CAPM, which accounts for the taxation of dividends. Analyzing data from 1936 to 1977, they found a significantly positive relation between (before tax) expected returns and dividend yields for NYSE stocks.

As a result of Blume's (1980) cross-sectional regressions using NYSE data from 1936 to 1976, the average returns of non-dividend paying stocks for a given beta coefficient exceeded the average returns of all dividend-paying stocks as a group. Only those stocks with extremely high dividend yields showed a higher return on average. Therefore, Blume was the first who mentioned the so-called "U-shape" between dividend yield and total return. He concluded that taxation did not affect the relation between dividend yield and pre-tax return. Keim (1985) also observed a U-shape between dividend yield and return for NYSE data from 1931 to 1978 and confirmed the hypothesis that tax effects cannot explain this effect. He explained the U-shape by firm size: Small corporations were concentrated in the zero dividend yield group and in the highest dividend yield group while the largest corporations were not the largest dividend yield corporations. Another result by Keim was a significant January effect, i.e., by using separate slope coefficients for January and non-January dividend yields, the first one was significantly larger. Christie (1990) analyzed differences in returns between dividend paying and non-paying corporations from the

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[9]See Graham and Dodd (1976), p. 336.

NYSE. By analyzing the period 1926 to 1985, the familiar U-shape was present but, by starting in 1946, the returns of non-paying corporations were negative (except in January) resulting in an increasing return-dividend-yield function. However, by analyzing the years following classification changes (between dividend paying and non-paying), he showed that dividend expectation effects were at least as important as tax effects.

Fama and French (1988) analyzed stocks from the NYSE during the period 1927 to 1986. By regressing future returns on current dividend yields and using different time horizons to compute returns, they observed that the longer this time horizon the larger was the variation of the returns that could be explained by the variation in dividend yields. Hodrick (1992) examined whether dividend yields had some predictive power to explain returns by regressing the compounded return on the preceding dividend yield, regressing the return on the preceding compounded dividend yield, and using vector autoregression (VAR) to generate one-step-ahead linear predictions to avoid biases driven by autocorrelation. Analyzing NYSE data from 1926 to 1987, he found that dividend yields had predictive power to explain returns for all three methodologies but this predictive power decreased when returns were computed over longer time horizons. Goetzmann and Jorion (1993) used S&P 500 index data from 1927 to 1990, whereas Nelson and Kim (1993) examined S&P Composite Index data from 1871 to 1987 and the same data set as used by Fama and French (1988). Comparing the results of an ordinary least squares (OLS) regression with the results of simulations, both studies imply that the t-statistics generated by an OLS regression on lagged dependent variables are biased upward to an extend that often leads to false inferences. Goetzmann and Jorion (1995) examined whether dividend yields could predict long-horizon stock returns. Using NYSE data on a monthly basis and U.K. stock exchange data on a yearly basis from 1872 and 1871, respectively, to 1992, they could not find strong evidence for this forecasting power. Furthermore, they inferred from their study that using long time series is not a remedy but can seriously bias inference when survivorship is an issue.

A first examination of the influence of dividend yields on stock returns for the London Stock Exchange (LSE) was given by Levis (1989). Using returns from 1961 to 1985 and constructing portfolios in different ways, he found that dividend yield and price-to-earnings (PE) ratio had a stronger effect on return than market value and share price. Morgan and Thomas (1998) expected a negative relation between dividend yield and total return (with the latter capturing capital gains and dividends) due to the higher rate of taxation on capital gains relative to dividend income in the U.K. Actually, using data from 1975 to 1993, their results indicated the U-shape observed by Blume (1980) and Keim (1985) for U.S. data. Morgan and Thomas explained this non-linearity by the size effect and a seasonal effect for the zero-dividend portfolio, which had significantly larger returns in January and April with the latter suggested to be due to the end of the U.K. tax year.

Examining NYSE data from 1943 to 1978 and creating portfolios according to market value and dividend yield with excluding zero-dividend stocks, Chen, Grundy, and Stambaugh (1990) found that dividend yield and return were related over time but at least part of this relation could be attributed to dividend-related changes in risk measures. In case of the beta coefficient as the only risk measure, dividend yield as an additional regressor had a significantly positive influence on the return. However, by including the sensitivity of the return to the excess return of junk bonds as another risk measure, the significant influence of dividend yield on return vanished. Furthermore, Chen, Grundy, and Stambaugh's study did not clearly indicate a tax-induced penalty on cash dividends. McManus, ap Gwilym, and Thomas (2004) analyzed the influence of the payout ratio on the relation between dividend yield and stock return from 1958 to 1997 using U.K. market data. They found that the payout ratio had an important impact on the statistical significance of dividend yield in explaining return.

Clinebell, Squires, and Stevens (1993) analyzed whether high-dividend paying stocks had lower systematic risk (beta coefficient) in down markets than in up markets. Using U.S. market data from 1966 to 1989, this could not be confirmed, which means that high-dividend-yield stocks did not offer a special downside risk protection as had often been suggested. Using U.S. market data from 1970 to 1984, Gombola and Liu (1993b) found that dividend yield was positively related to return during bear markets but negatively related to return during bull markets.

One of the first who considered also dividend stability were again Gombola and Liu (1993a). By analyzing the period 1969 to 1984, they found not only a negative relation between systematic risk and dividend yield but also a significantly positive alpha for corporations paying high and stable dividend yields. Using LSE data from 1975 to 1997, ap Gwilym, Morgan, and Thomas (2000) found that systematic risk rose with decreasing dividend stability and increasing dividend yield within all non-zero dividend yield groups, whereas the zero-dividend portfolio had the highest systematic risk. Alpha decreased very sharply when considering portfolios with lower dividend yields. As Gombola and Liu, ap Gwilym, Morgan, and Thomas found a significantly positive alpha for corporations paying high and stable dividend yields.

Filbeck and Visscher (1997) examined the dogs of the Dow strategy for the U.K. market using data of the Financial Times Stock Exchange (FTSE) 100 Index. Based on returns, the Sharpe ratio, and the Treynor ratio, the dividend yield strategy could not be seen as an effective way of consistently beating the market between 1984 and 1994. Visscher and Filbeck (2003) made a quite similar examination for the Canadian stock market by comparing the performance of the Toronto 35 top ten strategy with the one of the Toronto 35 Index itself and with the one of the Toronto Stock Exchange (TSE) 300 Composite Index between 1987 and 1997. Their results show a success of the dividend yield strategy against both benchmarks and based on all three measures for different holding periods with just a few exceptions for the shortest holding period. Kotkamp and Otte (2001) examined

the DAX top ten strategy, the DAX low five depot, and the DAX low one depot. They found that all three strategies had a positive mean excess return in comparison to the DAX and the whole German stock market from 1961 to 1998 with most of these results being highly significant. This also held when transaction costs were taken into account and returns were computed on a risk-adjusted basis using the Sharpe ratio.

5 Data Set and Adjustments

5.1 Data Set

Our data set comprises 54 stocks from the German capital market. We used stocks from the HDAX (110 stocks), which include blue chips (DAX, 30 stocks), stocks of medium-sized companies (MDAX, 50 stocks), and stocks of technology firms (TecDAX, 30 stocks). We used only those stocks that belonged to the HDAX at the end of 2005 or at the end of 2006 (in total 120 stocks) and for which the following data were available:

▷ a complete time series of daily unadjusted Xetra closing stock prices from January 3, 2000, to December 29, 2006;

▷ information about all dividend payments (exact amount and payment date) over this period, including bonus dividends;

▷ information about all other corporate events that have to be considered for adjusting stock price series such as stock splits, capital increases both by issuing new shares and by capitalizing reserves, and spin-offs.

Therefore, the data set was reduced to 54 stocks. Since there was no selection process based on financial criteria, the whole data set can be seen as a random sample of the HDAX. We were able to include medium-sized and technology corporations besides blue chips by constructing the sample in the way described above. Medium-sized companies often pay high dividends, while technology corporations sometimes pay no dividend at all. If we had only concentrated on blue chips, we would not have been able to include these corporations that are of particular interest to answer the question whether dividend yield is an indicator of stock performance.

As a proxy of the German stock market, we used the CDAX performance index for two reasons: At first, it comprises all German stocks traded at the Frankfurt stock exchange under EU-regulation.[10] Secondly, it is adjusted for corporate events. We employed daily returns to compute excess return, risk, and performance measures with using the EONIA as a proxy of the risk-free asset's return.

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[10]The CDAX is the all-share index of Deutsche Börse with the largest number of stocks included. 684 stocks belonged to the CDAX on December 29, 2006; see www.deutsche-boerse.com.

5.2   Stock Price Series Adjustments

Although dividend yields were computed according to equation (1), i.e., by using unadjusted stock prices, adjusted stock price series were employed to compute the return, risk, and performance measures. The adjustments were carried out by pursuing the idea of the opération blanche, which means that the returns of the adjusted price series equal the ones computed under the assumption that all proceeds from a stock investment, i.e., dividend payments, proceeds from the sale of subscription rights, and proceeds from the sale of new shares subsequent to a spin-off, are reinvested in this particular stock. Capital increases by capitalizing reserves, exchanges of share certificates, and bonus shares were treated like stock splits.

Cash dividends were used to adjust the stock price series for dividend payments. The idea behind this is to consider a stock price that would have resulted in case of reinvesting instead of distributing gains. Adjustments for the sale of subscription rights were carried out by using the theoretical value of the subscription right on its first trading day by employing the closing price of the stock as a proxy of the current stock price. The closing price of the new corporation's stock on its first trading day was used to calculate the proceeds in case of a spin-off.

6   Empirical Study and Results

All analyzed stocks ranked from high to low by their mean dividend yield from 2000 to 2006 are presented in table 1. Motivated by Gombola and Liu (1993a) and ap Gwilym, Morgan, and Thomas (2000), the standard deviation (std. dev.) of the single dividend yields is given as a measure of dividend stability. However, our observed period from 2000 to 2006 was characterized by a sharp decline of stock prices first and a recovery afterwards. Therefore, the standard deviation of dividend yields does not seem to be an appropriate measure of dividend stability in our study. Investors might define a stable dividend as a dividend of constant amount instead of constant yield since a stock offering a stable dividend amount protects the shareholders from losses up to a certain level. Thus, we also employed the mean-adjusted standard deviation (adj. std. dev.) of dividend payments, which equals the standard deviation of the single dividend payments divided by their mean.

The last but one column of table 1 contains the stocks' mean yearly total returns. These values will be used later to provide information whether the U-shape seen by Blume (1980) and Keim (1985) for the U.S. market and by Morgan and Thomas (1998) for the U.K. market is also observable at the German stock market or whether the relation between dividend yield and total return corresponds to the German tax system. The last column of

Table 1: **Overview of Analyzed Stocks (2000–2006)**

Stock	Index	Dividend Yield		Dividend	Yearly Total Return	
		Mean	Std. Dev.	Adj. Std. Dev.	Mean	Effective
IKB Dt. Industriebank AG	MDAX	4.26 %	0.95 %	0.04	15.26 %	13.21 %
Douglas Holding AG	MDAX	4.19 %	2.35 %	0.75	8.29 %	4.32 %
DaimlerChrysler AG	DAX	3.76 %	0.99 %	0.30	1.37 %	−2.65 %
TUI AG	DAX	3.66 %	1.29 %	0.09	−10.25 %	−12.35 %
E.ON AG	DAX	3.62 %	1.63 %	0.82	18.96 %	15.54 %
ThyssenKrupp AG	DAX	3.61 %	0.41 %	0.23	15.46 %	5.65 %
IWKA AG	MDAX	3.60 %	1.72 %	0.44	6.65 %	2.05 %
BASF AG	DAX	3.14 %	0.56 %	0.22	10.38 %	9.19 %
Bayer AG	DAX	2.95 %	1.16 %	0.37	7.57 %	2.30 %
HOCHTIEF AG	MDAX	2.87 %	0.87 %	0.22	18.34 %	9.92 %
IVG Immobilien AG	MDAX	2.87 %	0.88 %	0.17	19.89 %	14.42 %
RWE AG[c]	DAX	2.79 %	0.77 %	0.24	19.68 %	14.75 %
MAN AG[c]	DAX	2.73 %	0.78 %	0.37	21.43 %	11.73 %
METRO AG[c]	DAX	2.69 %	0.61 %	0.00	6.42 %	2.08 %
Leoni AG	MDAX	2.69 %	0.65 %	0.24	25.93 %	23.10 %
Linde AG	DAX	2.51 %	0.60 %	0.10	11.17 %	9.02 %
Volkswagen AG[c]	DAX	2.49 %	0.77 %	0.17	16.10 %	9.54 %
Deutsche Lufthansa AG	DAX	2.47 %	1.96 %	0.74	10.40 %	1.41 %
Merck KGaA	MDAX	2.43 %	1.01 %	0.09	22.46 %	17.20 %
Karstadt Quelle AG	MDAX	2.18 %	1.76 %	0.69	10.91 %	−3.53 %
Hannover Rückversicherung AG	MDAX	2.18 %	1.52 %	0.91	7.95 %	6.69 %
Heidelberger Druckmaschinen AG	MDAX	1.98 %	1.73 %	0.94	2.45 %	−3.06 %
Celesio AG	MDAX	1.93 %	0.22 %	0.24	16.37 %	14.78 %
AT&S Austria Tech. & System. AG	TecDAX	1.86 %	0.72 %	0.30	6.59 %	−0.69 %
Pfeiffer Vacuum Technology AG	TecDAX	1.82 %	0.68 %	0.46	23.88 %	16.11 %
Medion AG	MDAX	1.80 %	1.46 %	0.32	−18.29 %	−20.50 %
Schering AG	DAX	1.79 %	0.41 %	0.49	22.13 %	16.78 %
Continental AG	DAX	1.72 %	1.05 %	0.59	32.83 %	26.87 %
Altana AG	DAX	1.67 %	0.35 %	0.47	24.53 %	16.24 %
HeidelbergCement AG	MDAX	1.66 %	0.97 %	0.51	14.55 %	7.84 %
Commerzbank AG	DAX	1.65 %	0.98 %	0.83	12.00 %	−1.45 %
Henkel KGaA[p]	DAX	1.63 %	0.20 %	0.12	11.04 %	10.00 %
ProSiebenSat.1 Media AG	MDAX	1.62 %	1.38 %	1.10	32.51 %	8.60 %
BMW AG[c]	DAX	1.47 %	0.31 %	0.16	8.88 %	7.29 %
Fresenius Medical Care AG & Co. KGaA[c]	DAX	1.43 %	0.49 %	0.20	9.35 %	4.44 %
Jenoptik AG	TecDAX	1.40 %	1.42 %	1.01	−0.70 %	−7.69 %
GEA Group AG	MDAX	1.36 %	1.24 %	0.78	8.75 %	−0.97 %
Münchener Rück AG	DAX	1.28 %	0.95 %	0.47	1.45 %	−6.41 %
Allianz SE	DAX	1.27 %	0.79 %	0.15	1.09 %	−7.30 %
Beiersdorf AG	MDAX	1.26 %	0.42 %	0.27	15.34 %	12.40 %
Software AG	TecDAX	1.24 %	1.36 %	0.85	22.68 %	0.74 %
adidas-Salomon AG	DAX	1.13 %	0.23 %	0.17	13.81 %	12.48 %
United Internet AG	TecDAX	0.83 %	1.24 %	1.17	36.63 %	14.78 %
Bayerische Hypo- und Vereinsbank AG	MDAX	0.81 %	0.84 %	1.08	3.28 %	−5.20 %
IDS Scheer AG	TecDAX	0.80 %	0.33 %	0.40	13.70 %	−3.72 %
mobilcom AG	TecDAX	0.63 %	1.07 %	1.31	39.84 %	−16.88 %
SAP AG	DAX	0.58 %	0.22 %	0.45	2.87 %	−3.80 %
Aixtron AG	TecDAX	0.56 %	0.95 %	1.02	−13.04 %	−28.18 %
SGL Carbon AG	MDAX	0.00 %	0.00 %	0.00	−1.82 %	−15.14 %
ADVA AG Optical Networking	TecDAX	0.00 %	0.00 %	0.00	7.98 %	−35.98 %
Evotec AG	TecDAX	0.00 %	0.00 %	0.00	15.03 %	−20.85 %
MorphoSys AG	TecDAX	0.00 %	0.00 %	0.00	68.09 %	9.94 %
QIAGEN N.V.	TecDAX	0.00 %	0.00 %	0.00	14.40 %	−7.00 %
Singulus Technologies AG	TecDAX	0.00 %	0.00 %	0.00	−7.58 %	−12.88 %

[c] indicates common stock.　　　[p] indicates preferred stock.

table 1 contains the effective yearly total returns of the stocks since these returns illustrate the development of the corporations over the whole period better than the mean returns.[11]

6.1 Dividend Yield versus Performance

Two types of regressions are presented in the literature to study the influence of dividend yield on total return. In the first type, the time series of returns of a stock or stock portfolio is regressed on the time series of corresponding dividend yields. Mostly, future returns are regressed on current dividend yields, using lagged variables, to examine whether dividend yields are able to predict future returns. This type of regression is often employed in the Anglo-American literature. However, dividends are paid at least quarterly in the U.S. and in the U.K. In contrast, dividends are usually paid once a year in Germany. Therefore, yearly data have to be used, which leads to a quite small data set.[12]

In the second type of regressions, cross-sectional pairs of dividend yields and total returns for several stocks or stock portfolios are used. Often, multilinear regressions are employed with dividend yield being one of several independent variables like payout ratio, size etc. Some authors such as Blume (1980), Levis (1989), and Christie (1990) started with grouping stocks or portfolios by systematic risk, size or other criteria. Our data set of 54 stocks does not allow such grouping due to the heavy loss of degrees of freedom.

We used several cross-sectional two-variables linear regressions to examine whether there was a relation between dividend yield and mean return, dividend yield and risk, and dividend yield and performance. At first, single stocks were analyzed, both in-sample and out-of-sample. In case of in-sample tests, the mean return, risk or performance over the period from 2000 to 2006 was regressed on the mean dividend yield over the same period. Since we did not use lagged variables, a different approach to analyze the predictive power of dividend yields had to be used. Therefore, out-of-sample tests were employed regressing the mean return, risk or performance over the period from 2003 to 2006 on the mean dividend yield over the period from 2000 to 2002. This is consistent with an investor's strategy to look at past dividend yields first and subsequently measure the performance of her investment composed according to these dividend yields.

In addition to regarding single stocks, portfolios were created. This is due to our assumption that diversification effects might influence the impact of dividend yield on risk and

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[11]Table 1 impressively shows what may happen when switching over from arithmetically computed to geometrically computed mean returns. This reduces the mean returns and might also lead to a different ranking of investments when using discretely compounded returns. The difference between the two mean returns is the higher the more the single returns vary over the period; see Spremann (2003), pp. 70–72.

[12]Besides, Fama and French (1988), Hodrick (1992), Nelson and Kim (1993), and Goetzmann and Jorion (1993 and 1995) mentioned problems arising in such regressions, which often lead to false inferences; see section 4.

performance. Usually, the more stocks are contained within a portfolio the higher is the degree of diversification.

We started with portfolios of two stocks with the first comprising the two stocks with the highest and the second highest mean dividend yield, the second comprising the two stocks with the third highest and the fourth highest mean dividend yield, and so on. We proceeded with portfolios comprising three stocks, four stocks, and five stocks, respectively, with the first portfolio consisting of the stocks that offered the highest mean dividend yields and constructing the following ones analogous to the described pattern. Stocks with a mean dividend yield of zero were omitted. The last stocks of the ranking according to mean dividend yield were left out if the number of stocks with a non-zero mean dividend yield was not a multiple of two, three, four, and five, respectively.

The portfolios were equally weighted at the beginning and two strategies were pursued. The first one is a buy-and-hold strategy with an equally weighted portfolio at the beginning and no adjustments made over time. However, investors typically readjust their portfolio composition over time. Since we do not want to assume a certain adjustment frequency, we only regarded the extreme strategy with a daily adjustment, which results in a new equally weighted portfolio every day. Again, in-sample and out-of-sample regressions were run for every portfolio construction and both strategies.

As seen in section 4, a lot of empirical studies concentrate on the relation between dividend yield and return. We also started with this analysis and ran linear regressions with mean dividend yield as the regressor and mean excess return according to equation (2) and (7), respectively, as the regressand. We do not want to concentrate solely on the return but also include the risk of an investment. Therefore, linear regressions were done for total risk, tracking error, beta coefficient, and non-systematic risk as the regressands as well. These risk measures were computed according to equations (2), (3), and (7). After all, our study focuses on the relation between the dividend yield of stocks and their performance. That is why linear regressions were also run for Jensen's alpha, appraisal ratio[13], net selectivity, Treynor ratio, Sharpe ratio, and information ratio. These measures were computed according to equations (2) to (7). Daily adjusted stock prices were used to compute the regressands, i.e., the number of observations equals 1,781 in case of in-sample

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[13]According to equation (3), an investment has a higher performance for a given selectivity measured by Jensen's alpha if the incurred risk is smaller. However, this only holds in case of positive alphas. Otherwise, the performance would increase with a higher idiosyncratic risk. Therefore, we omitted investments (single stocks or portfolios) showing a negative alpha from the regression of the appraisal ratio on the dividend yield. This means in turn that we lost degrees of freedom (dgf). For example, in the case of single stocks, we have 52 dgf for all regressions except for the ones with the appraisal ratio as the regressand, while in these latter regressions only 42 and 39 dgf are given in case of in-sample and out-of-sample tests, respectively. The more stocks are incorporated in a portfolio the more the number of dgf decreases. In case of five-stock portfolios, the number of dgf is reduced to seven and six, respectively, depending on the regressand, the strategy, and the observation period. Hence, we did not consider portfolios consisting of more than five stocks.

tests and 1,022 in the out-of-sample case. The results for the slopes of the regression lines are presented in the tables 2 to 5.

Our study shows that the (mean) dividend yield had no significant influence on the mean excess return of an investment.[14] All slopes of the regression lines are not significantly different from zero except for the out-of-sample case of two-stock portfolios. There is even no general tendency of this influence. Thus, our results do not support the findings that the dividend yield is an indicator for the total return of an investment.

A completely different result can be seen for the risk measures. At first, it seems that dividend yield had a negative influence on the total risk of an investment. The same applies to the tracking error. All results in the in-sample study are significant at least on the five percent confidence level and in most cases on the one percent level as well. In the out-of-sample study, only the single stocks (total risk and tracking error) and the two-stock portfolios (only total risk) results are significant. Interestingly, the influence of dividend yield on the total risk decreased with an increasing degree of diversification except for the daily-adjustment strategy in the in-sample study. Again, a similar result applies to the tracking error.

Figure 2 exemplarily shows the influence of an investment's dividend yield on its total risk (measured by the standard deviation of daily excess returns) for the in-sample study of the buy-and-hold strategy. For presentational purposes, only the data and regression lines of the single stocks, three-stock portfolios, and five-stock portfolios are shown. It can be seen that there was a negative influence of dividend yield on total risk with this influence diminishing when the degree of diversification increased.

Dividend yield also tended to affect systematic risk, represented by the beta coefficient, in a negative way. However, these results are more often not significant. Furthermore, one cannot clearly see a decreasing influence with an increasing number of stocks in a portfolio due to the fact that the systematic risk of a portfolio does not depend on its degree of diversification. Like total risk and tracking error, idiosyncratic risk was influenced by dividend yield in a negative way with a similar significance. Again, this influence generally decreased with an increasing degree of diversification.

Dividend yield had an ambiguous impact on performance. A clear pattern can only be seen for the out-of-sample study of the buy-and-hold strategy. Here, a positive influence of dividend yield on all performance measures was found both for single stocks and portfolios with just one exception (information ratio in case of five-stock portfolios). These results are often significant for a low degree of diversification, even at the one percent level. A similarly clear pattern can also be seen for the out-of-sample study of the daily-adjustment strategy when excluding the five-stock portfolios from consideration. In sum, it does not hold that the influence of dividend yield on stock performance depends on the performance

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[14]Although $\bar{r}_i$ and $\bar{r}_i^{(M)}$ differ for a certain corporation i, the slope of the regression line is, of course, not affected by the definition of the excess return.

Table 2: **In-Sample Study (2000–2006) of the Buy-and-Hold Strategy**

	Slope of the Regression Line (t-Value)				
	Single Stocks	Two-Stock Portfolios	Three-Stock Portfolios	Four-Stock Portfolios	Five-Stock Portfolios
$\bar{r}, \bar{r}^{(M)}$	-0.002942 (-0.555)	0.538405 (1.365)	0.008588 (1.459)	0.007409 (1.142)	0.005302 (0.725)
σ	-0.712751 $(-6.595)^{**}$	-0.552072 $(-2.780)^{**}$	-0.362035 $(-3.632)^{**}$	-0.313733 $(-3.300)^{**}$	-0.181449 $(-2.389)^{*}$
TE	-0.654053 $(-5.982)^{**}$	-0.521267 $(-2.596)^{**}$	-0.304929 $(-3.492)^{**}$	-0.246938 $(-3.161)^{**}$	-0.136899 $(-2.255)^{*}$
β	-16.16908 $(-4.427)^{**}$	-8.676522 $(-1.745)^{*}$	-11.00180 $(-2.002)^{*}$	-10.24821 $(-2.186)^{*}$	-5.901595 (-1.290)
$\sigma(\varepsilon)$	-0.043642 $(-4.938)^{**}$	-0.031448 $(-1.985)^{*}$	-0.010842 $(-3.167)^{**}$	-0.008025 $(-2.965)^{**}$	-0.003719 $(-2.417)^{*}$
α	-0.002493 (-0.468)	0.538646 (1.365)	0.008894 (1.485)	0.007693 (1.178)	0.005465 (0.739)
AR	0.364583 $(2.093)^{*}$	0.387709 (0.920)	0.045631 (0.105)	0.200545 (0.345)	0.344243 (0.528)
NS	-0.001576 (-0.300)	0.539463 (1.366)	0.009282 (1.550)	0.008010 (1.223)	0.005649 (0.766)
TR	0.010233 (1.147)	0.637523 (1.375)	0.010164 (1.084)	0.009912 (1.097)	0.007219 (0.590)
SR	0.306215 $(1.681)^{*}$	8.758655 (1.436)	0.551128 (1.599)	0.528052 (1.315)	0.457515 (0.845)
IR	0.285630 (1.498)	8.911513 (1.435)	0.700992 $(1.869)^{*}$	0.698259 (1.394)	0.646779 (1.028)

*   indicates significance on the five percent confidence level of a one-sided test.
** indicates significance on the one percent confidence level of a one-sided test.

Table 3: **Out-of-Sample Study (2000–2002 versus 2003–2006) of the Buy-and-Hold Strategy**

	Slope of the Regression Line (t-Value)				
	Single Stocks	Two-Stock Portfolios	Three-Stock Portfolios	Four-Stock Portfolios	Five-Stock Portfolios
$\bar{r}, \bar{r}^{(M)}$	-0.002063 (-0.307)	0.009750 $(1.729)^*$	0.009904 (1.457)	0.008017 (1.038)	-0.002161 (-0.217)
σ	-0.255372 $(-4.841)^{**}$	-0.096439 $(-2.226)^*$	-0.084549 (-1.728)	-0.070314 (-1.359)	-0.045463 (-0.779)
TE	-0.241446 $(-4.197)^{**}$	-0.045006 (-1.135)	-0.035901 (-0.882)	-0.070472 (-1.476)	0.010801 (0.219)
β	-5.643391 $(-1.824)^*$	-6.854519 (-1.474)	-5.978889 (-1.152)	-1.480618 (-0.391)	-4.476507 (-1.008)
$\sigma(\varepsilon)$	-24.58875 $(-4.393)^{**}$	-0.001176 (-1.202)	-0.000863 (-1.135)	-0.001639 (-1.728)	-0.000235 (-0.264)
α	0.002580 (0.367)	0.015389 $(2.375)^*$	0.014823 $(2.138)^*$	0.009235 (1.240)	0.001521 (0.160)
AR	0.139142 (0.534)	0.664896 (1.367)	0.476807 (0.989)	0.417574 (0.512)	0.315592 (0.301)
NS	0.015992 $(2.375)^*$	0.016569 $(2.670)^{**}$	0.015882 $(2.356)^*$	0.012988 (1.640)	0.001053 (0.130)
TR	0.012866 (1.232)	0.022623 $(2.848)^{**}$	0.022868 $(3.080)^{**}$	0.014688 (1.591)	0.009003 (0.747)
SR	0.597289 $(2.109)^*$	1.021586 $(2.765)^{**}$	1.090527 $(2.656)^{**}$	0.965975 (1.776)	0.242752 (0.382)
IR	0.204679 (0.632)	0.758281 (1.645)	0.890998 (1.508)	0.719220 (0.901)	-0.261662 (-0.245)

*   indicates significance on the five percent confidence level of a one-sided test.
** indicates significance on the one percent confidence level of a one-sided test.

Table 4: **In-Sample Study (2000–2006) of the Daily-Adjustment Strategy**

	Slope of the Regression Line (t-Value)				
	Single Stocks	Two-Stock Portfolios	Three-Stock Portfolios	Four-Stock Portfolios	Five-Stock Portfolios
$\bar{r}, \bar{r}^{(M)}$	-0.002942 (-0.555)	-0.002738 (-0.482)	-0.004129 (-0.863)	-0.003453 (-0.704)	-0.004314 (-0.731)
σ	-0.002942 $(-6.595)^{**}$	-0.002738 $(-4.003)^{**}$	-0.004129 $(-2.451)^*$	-0.003453 $(-2.990)^{**}$	-0.004314 $(-2.314)^*$
TE	-0.654053 $(-5.982)^{**}$	-0.341480 $(-3.580)^{**}$	-0.207931 $(-2.081)^*$	-0.260839 $(-3.071)^{**}$	-0.118869 $(-2.826)^*$
β	-16.16908 $(-4.427)^{**}$	-11.39110 $(-2.339)^*$	-11.48862 $(-2.163)^*$	-10.76865 $(-2.147)^*$	-5.069986 (-1.107)
$\sigma(\varepsilon)$	-0.043642 $(-4.938)^{**}$	-0.015036 $(-3.038)^{**}$	-0.008054 $(-2.034)^*$	-0.008327 $(-2.728)^*$	-0.003023 $(-2.872)^*$
α	-0.002493 (-0.468)	-0.002421 (-0.421)	-0.003810 (-0.785)	-0.003154 (-0.638)	-0.004173 (-0.702)
AR	0.364583 $(2.093)^*$	0.461383 (1.293)	-0.154123 (-0.443)	0.195528 (0.427)	0.055991 (0.095)
NS	-0.001576 (-0.300)	-0.001960 (-0.344)	-0.003587 (-0.740)	-0.002845 (-0.575)	-0.004020 (-0.680)
TR	0.010233 (1.147)	0.004417 (0.461)	-0.002853 (-0.320)	-0.000435 (-0.058)	-0.003193 (-0.321)
SR	0.306215 $(1.681)^*$	0.220947 (0.687)	-0.046589 (-0.146)	0.070065 (0.206)	-0.056072 (-0.127)
IR	0.285630 (1.498)	0.163039 (0.463)	-0.048643 (-0.145)	0.097954 (0.236)	-0.058542 (-0.118)

*   indicates significance on the five percent confidence level of a one-sided test.
** indicates significance on the one percent confidence level of a one-sided test.

Table 5: **Out-of-Sample Study (2000–2002 versus 2003–2006) of the Daily-Adjustment Strategy**

	Slope of the Regression Line (t-Value)				
	Single Stocks	Two-Stock Portfolios	Three-Stock Portfolios	Four-Stock Portfolios	Five-Stock Portfolios
$\bar{r}, \bar{r}^{(M)}$	-0.002063 (-0.307)	0.011741 $(2.014)^*$	0.010874 (1.725)	0.010159 (1.326)	0.000658 (0.111)
σ	-0.255372 $(-4.814)^{**}$	-0.093340 $(-1.988)^*$	-0.084617 (-1.641)	-0.056661 (-1.087)	0.024965 (0.449)
TE	-0.241446 $(-4.197)^{**}$	-0.065286 (-1.562)	-0.051558 (-1.443)	-0.057887 (-1.799)	0.000390 (0.011)
β	-5.643391 $(-1.824)^*$	-4.908355 (-1.065)	-5.121298 (-0.921)	-1.769467 (-0.410)	1.805003 (0.307)
$\sigma(\varepsilon)$	-24.58875 $(-4.393)^{**}$	-0.001691 (-1.690)	-0.001122 $(-1.902)^*$	-0.001176 (-1.789)	0.000196 (0.471)
α	0.002580 (0.367)	0.015779 $(2.261)^*$	0.015087 $(2.068)^*$	0.011614 (1.272)	-0.000827 (-0.133)
AR	0.139142 (0.534)	0.519766 (1.449)	0.119605 (0.261)	0.090167 (0.116)	-0.163157 (-0.216)
NS	0.015992 $(2.375)^*$	0.018340 $(2.598)^{**}$	0.016856 $(2.214)^*$	0.014165 (1.467)	-0.001107 (-0.204)
TR	0.012866 (1.232)	0.021426 $(2.364)^*$	0.021717 $(2.231)^*$	0.012684 (1.056)	-0.003334 (-0.297)
SR	0.597289 $(2.109)^*$	1.072244 $(2.692)^{**}$	1.078297 $(2.228)^*$	0.946923 (1.433)	-0.132935 (-0.284)
IR	0.204679 (0.632)	0.891241 $(1.915)^*$	0.913479 (1.663)	1.003955 (1.261)	0.140938 (0.184)

*   indicates significance on the five percent confidence level of a one-sided test.

** indicates significance on the one percent confidence level of a one-sided test.

Figure 2: **Impact of Dividend Yield on Total Risk for the In-Sample Study (2000–2006) of the Buy-and-Hold Strategy**
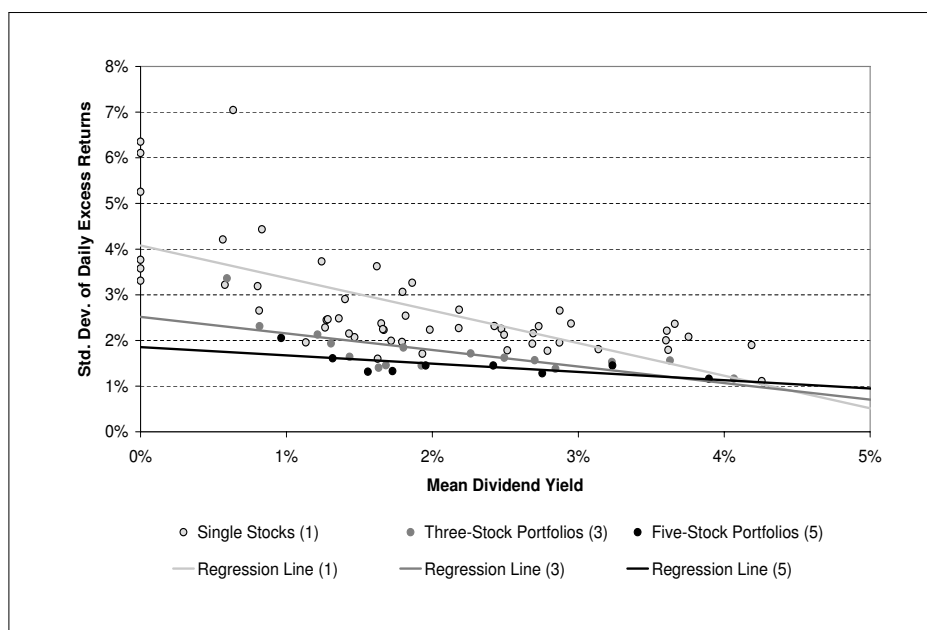
measure used, i.e., it does not matter what kind of risk was considered. This is likely due to the similar pattern of the dividend yield's impact on all risk measures.

The findings of the buy-and-hold and the daily-adjustment strategy do not differ much in case of restricting the considerations to the significant results. This may be a hint that the adjustment frequency of the portfolio composition does not matter in case of ignoring transaction costs and taxes. The consideration of transaction costs would result in a lower return in case of adjustments, which leads in turn to a lower performance of any adjustment strategy compared to the buy-and-hold strategy. The consideration of taxes influences all kinds of strategies but in particular those with adjustments made during the speculation period.

In short, the above results show that for an investor who wanted to follow a buy-and-hold strategy, who was interested in low risk or high performance instead of just looking at the return, and who wanted to invest in a few stocks, only a strategy based on dividend yield seemed to had been appropriate.

6.2   Dividend Stability versus Performance

We now look at the influence of dividend stability on return, risk, and performance. The idea behind our analysis so far was that investors might compose portfolios and pursue certain investment strategies according to dividend yields. In contrast, it does not seem to be plausible that investors create portfolios or employ investment strategies according

to dividend stability. Therefore, we only investigate single stocks and the in-sample case in the following.

Motivated by Gombola and Liu (1993a) and ap Gwilym, Morgan, and Thomas (2000), the standard deviation of a stock's single dividend yields first serves as a measure of dividend stability. We start analyzing all stocks, i.e., even the zero-dividend stocks. These stocks, of course, have a standard deviation of the dividend yields of zero and thus suggest an exceptionally high dividend stability. However, this is not in the spirit of our study. Hence, the second step is to eliminate the zero-dividend stocks from consideration.

The results of these two analyses are shown in the second and in the third column of table 6. It can be seen that dividend stability measured as standard deviation of dividend yields did not have strong influence neither on mean return, nor on risk or performance. Considering all stocks, there was only a weakly significant influence of dividend stability on total risk and systematic risk. This influence was negative, which means that a higher dividend stability (lower standard deviation of the single dividend yields) resulted in higher risk. This result is in contrast to the findings of ap Gwilym, Morgan, and Thomas (2000) and therefore our study does not support the supposition that low risk is a characteristic of stocks offering stable dividend yields. When excluding zero-dividend stocks, only the negative influence of dividend stability on the performance measures Treynor ratio, Sharpe ratio, and information ratio is weakly significant. The interpretation is that a higher dividend stability resulted in a better stock performance. An interesting fact that emerges when excluding zero-dividend stocks from the analysis is that the influence of dividend stability on risk completely reverses although the results are not significant.

However, in particular for observation periods characterized by a high volatility of stocks, the standard deviation of dividend yields does not seem to be an appropriate measure of dividend stability. Therefore, we employed another measure of dividend stability which is the standard deviation of the single dividend payments divided by their mean. This is to take into account that investors might define a stable dividend as a dividend of constant amount.[15] We proceeded in the same way as for the standard deviation of dividend yields starting with examining all stocks first and excluding the zero-dividend stocks from consideration in a second step.

The results can be seen in the fourth and in the fifth column of table 6. Here, no influence of dividend stability on mean return, risk, and performance is observable when analyzing all stocks. However, a (highly) significantly positive influence of dividend variations on all risk measures can be seen when zero-dividend stocks are excluded from consideration. This means in turn that the higher the dividend stability, measured as the mean-adjusted

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[15]Gombola and Liu (1993a) and ap Gwilym, Morgan, and Thomas (2000) also used a measure of dividend stability based on dividend payments. In contrast to our study, their measure only takes dividend cuts into account.

Table 6: **Influence of Dividend (Yield) Stability on Mean Return, Risk, and Performance (2000–2006)**

	Slope of the Regression Line in Case of Single Stocks (t-Value)			
	Std. Dev. of Dividend Yields		Adj. Std. Dev. of Dividends	
	Including Zero-dividend Stocks	Excluding Zero-dividend Stocks	Including Zero-dividend Stocks	Excluding Zero-dividend Stocks
$\bar{r},\ \bar{r}^{(M)}$	−0.013748 (−1.295)	−0.015743 (−1.413)	0.000058 (0.344)	0.000107 (0.653)
σ	−0.493951 (−1.709)*	0.247985 (0.916)	0.005535 (1.213)	0.016815 (5.421)**
TE	−0.445754 (−1.584)	0.257375 (0.968)	0.005265 (1.189)	0.015863 (5.075)**
β	−15.59740 (−1.852)*	0.070106 (0.008)	0.028571 (0.211)	0.269646 (2.095)*
$\sigma(\varepsilon)$	−0.032419 (−1.525)	0.016189 (0.806)	0.000372 (1.111)	0.001113 (4.559)**
α	−0.013315 (−1.247)	−0.015745 (−1.401)	0.000057 (0.338)	0.000100 (0.602)
AR	−0.073759 (−0.205)	−0.586335 (−1.510)	−0.001426 (−0.238)	−0.012854 (−1.851)*
NS	−0.012801 (−1.219)	−0.016219 (−1.468)	0.000047 (0.285)	0.000075 (0.459)
TR	−0.021317 (−1.179)	−0.045419 (−2.170)*	−0.000148 (−0.521)	−0.000348 (−1.105)
SR	−0.410400 (−1.094)	−0.947852 (−2.204)*	−0.003604 (−0.612)	−0.008412 (−1.303)
IR	−0.419277 (−1.073)	−0.941516 (−2.089)*	−0.002605 (−0.424)	−0.006996 (−1.032)

* indicates significance on the five percent confidence level of a one-sided test.
** indicates significance on the one percent confidence level of a one-sided test.

standard deviation of the single dividend payments, the lower was the risk of a stock, independent of the risk measure used.

6.3 Influence of Taxes

There is a tax-induced penalty for dividend income in contrast to capital gains in Germany if the investment is held for at least one year. Non-institutional investors usually pursue a buy-and-hold strategy, which results in a holding period of more than one year. Basically, the total return of a stock consists of the pure capital gains and the dividend yield. Due to tax effects, stocks exhibiting a high dividend yield should also have higher pre-tax total returns compared to stocks exhibiting a low dividend yield to be similarly attractive.

To identify this effect, we grouped the 54 stocks in one zero-dividend subset with six stocks (referred to as "Zero") and three subsets with an equal number of 16 stocks according to their mean dividend yield. The subset with the highest dividend yield is referred to as "High". The other subsets are referred to as "Medium" and "Low", respectively. We used the mean yearly total return shown in table 1 for every stock and averaged these values in every subset. We tested for every pair of subsets whether there are differences between these average returns.

The results are shown in table 7. The average yearly total returns of the subsets "High", "Medium", and "Low" were quite similar, whereas the average yearly total return of the subset "Zero" was the highest one. However, all differences are not statistically significant. In general, unlike Christie (1990), our findings do not support the hypothesis of higher pre-tax returns of stocks offering higher dividend yields. This is in line with most of the literature, which suggests that differences in total returns are not due to differences in dividend yields.

Blume (1980) and Keim (1985) found the U-shape with the zero-dividend subset showing a completely different behavior with exceptionally high returns compared to dividend-paying stocks. Morgan and Thomas (1998) who examined the U.K. market also observed the U-shape although there is a tax-induced penalty for capital gains compared to dividend income in the U.K. We did not find a certain U-shape although the zero-dividend stocks offered the highest yearly total returns since the average yearly total return did not decrease steadily across the subsets of dividend-paying stocks.[16]

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[16]Although this has nothing to do with the tax effects described, an interesting result arises when using effective yearly total returns instead of mean yearly total returns. Then the average yearly total returns of the subsets "High", "Medium", "Low", and "Zero" amount to 6.47 %, 7.96 %, −0.87 %, and −13.65 %, respectively. The differences between the average yearly total returns of the subsets "High" and "Low", "High" and "Zero", "Medium" and "Low", and "Medium" and "Zero" are significant at the five percent confidence level, whereas the difference between the average yearly total returns of the subsets "Medium" and "Low" is significant even at the one percent level. This shows a significantly worse development of non-dividend and low-dividend stocks over the whole period.

Table 7: **Average Yearly Total Returns (2000–2006) of Different Subsets of Stocks**

Subset	Average Yearly Total Return	t-value for the Difference between the Average Yearly Total Returns (dgf)		
		"Medium"	"Low"	"Zero"
"High"	12.28 %	−0.330 (28)	0.001 (25)	−0.332 (5)
"Medium"	13.49 %		0.262 (28)	−0.221 (17)
"Low"	12.28 %			−0.322 (6)
"Zero"	16.02 %			

7 Conclusion

The objective of our study was to examine whether dividend yield and dividend stability influenced the return, risk, and performance of stocks and stock portfolios at the German capital market. The main findings are that, on the one hand, dividend yield had no influence on excess return and, on the other hand, there was a negative relation between dividend yield and risk. The influence of dividend yield on risk decreased with an increasing degree of diversification. As far as we know, there is no study yet that incorporates this kind of diversification effects. Hence, our result can be seen as an additional contribution to the existing literature.

Regarding dividend stability as the standard deviation of dividend yields, we cannot support the hypothesis that higher dividend stability leads to lower risk of a stock, which is in contrast to the literature. Nevertheless, when regarding dividend stability as the mean-adjusted standard deviation of dividend payments and excluding zero-dividend stocks from consideration, we found a strong relation between dividend stability and risk. The more stable the dividend payments the lower was the risk of the stocks. This means that, by using the latter approach, dividend stability served as an indicator for risk.

By considering the relation between dividend yields and pre-tax total returns, we could not find that stocks with higher dividend payments exhibited higher pre-tax returns. This does not correspond to the German tax system, which penalizes dividend income in comparison with capital gains. The often mentioned U-shape could also not be observed, although the zero-dividend stocks showed the highest yearly total returns on average.

Of course, all results were inferred from quite a small data set of 54 stocks and a time horizon of just seven years. However, our data set covers a longer time period than the one used by Deutsche Börse to illustrate the performance potential of the DivDAX, comprises more than twice as many stocks as included in the DAX, and is not restricted to blue chips. We could show that it is indeed meaningful to create a stock index based on dividend yields but it also makes sense to include stocks of medium-sized corporations in addition to blue chips due to their comparably high dividend yields and total returns.

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