A Volatility Based Contrarian Strategy in the German Stock Market

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Abstract

In this paper we investigate if the German implied volatility index, VDAX, could be used as a good sentiment indicator for a contrarian strategy. For such a strategy to be legitimate there must exist price inefficiencies in the market, which requires that the efficient market hypothesis does not hold. We compare broader index-based contrarian strategies with a buy and hold strategy in the German stock index DAX from 1992-2012. The results shows that the contrarian strategy performs better in bearish periods but that it does not outperform the buy and hold strategy in the overall sample period.

Key words: DAX, VDAX, Implied volatility, Contrarian strategy, The efficient market hypothesis, Behavioral finance, Market timing
Acknowledgement

We would like to thank our supervisor Bujar Huskaj for his valuable insights and fast response to queires.

“We simply attempt to be fearful when others are greedy and to be greedy only when others are fearful.”

–Warren Buffett
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1. Introduction

The efficient market hypothesis (EMH) has been dominating the finance and economic curriculum in educational establishments all over the world for decades. With time, market crashes and stock price anomalies that could not be explained within the framework of this theory raised questions regarding the theory's validity. The arguments have mostly been focused toward the assumptions about agents being fully rational and prices reflecting all available information, which have lead to an increasing focus on the field of behavioral finance for explanations.

Behavioral finance assumes that market anomalies and investor biases do exist, i.e. that the prices in the market do not always reflect the true value of an asset, but the area more rarely describes what methods a rational investor could in fact use to exploit these anomalies. In recent years, strategies aiming to exploit market anomalies have provided interesting findings concerning serial correlation over various time horizons (see, for example, Campbell, Grossman & Wang, 1993). These strategies imply that investors can achieve an excess return through active trading by exploiting assumed contrarian and momentum effects.¹

Most of the research on contrarian and momentum type investment strategies have employed the procedure of taking positions in individual stocks (see, for example, Fama and French (1988), Jagadeesh and Titman (1993) and

¹ In short, a contrarian strategy is when an investor takes a long position in ‘losing’ stocks and short positions in ‘winning’ stocks, i.e. buying weakness. A momentum strategy implies that an investor takes a positions predicting a price continuation in the security, i.e. buying strength (Simon & Wiggins, 2001).
Conrad and Kaul (1998)). The purpose of this thesis is to combine previous research on price inefficiencies with the most prominent way of measuring implied volatility in order to evaluate a broader index-based short term strategy, acting conversely relative to the general sentiment of other investors. That is, we evaluate the performance of a contrarian strategy which aims to exploit any short term market anomalies with the use of the implied volatility as an indicator. The most known implied volatility index is the VIX, also referred to as the ‘Fear index’, which measures the markets’ general sentiment of the 30 day future volatility. The implied volatility index in the German stock market, which we use in our contrarian strategy, is called VDAX. The contrarian strategy is then compared to a buy and hold strategy in the German stock index DAX for the period 1992-2012.² The main reason for investigating the German stock market is the lack of research on VDAX relative to the VIX. The German stock market deviates from the U.S. stock market in that it is less liquid with a lower number of investors holding big shares and banks being the main source for external capital (Achleitner, Christian, Betzer, & Weir, 2008). The concentration of ownership could affect the outcome of a contrarian strategy since large shareholders’ risk aversion is given a too heavy weight. However, we have not found evidence that this will affect our strategy significantly and therefore conclude that our strategy should work roughly the same on the German stock market as compared to the implementation on the U.S. market as in accordance

² The DAX consists of Germany’s 30 biggest companies based partly on their market to book value and represents around 80 percent of the German stock market capitalization. It consists solely of ‘Blue chip companies’ which are companies that are considered reliable in the long term regardless of the state of the market.

The results show that our contrarian strategy performs better in the aftermath of a bearish period as well as when we increase the trading. However, we do not outperform the buy and hold strategy, indicating that the weak form of the efficient market hypothesis holds.

The paper is constructed as follows. In Section 2, we describe relevant theory for understanding the implications of and the dominating arguments against a contrarian strategy. Theory from the behavioral school of economics will be presented together with examples of the most important biases as well as the systematic over and underreaction phenomena that those might cause. These so-called price continuation and reversal effects are further examined in the following section on contrarian and momentum strategies. Also, a detailed description of the VDAX will be provided in order to illuminate this relatively new tool which we use to get information about the notion of the overall market. In Section 3, we describe the method and the restrictions that we have applied to our strategy. In Section 4 we present the results and in Section 5 we give a brief conclusion on the paper as well as directions for further research that we see appropriate.
2. Theory

2.1 The Efficient Market Hypothesis

The efficient market hypothesis (EMH) was first introduced by Fama (1970) and it was widely acknowledged for the applicability that it presented. The hypothesis states that all relevant information is directly reflected in the price of assets and therefore it is not possible to outperform the market portfolio. The hypothesis assumes that (1) all investors are rational, well informed and prefer more to less; (2) information is available and free for everybody; and (3) there are no taxes or transaction fees. The EMH is also based on the assumption that the price follows a random walk. The implications of a random walk is that since the price of a stock instantly changes in response to information, which is irregular and random, so is the movement in price (Malkiel, 2003). Thereby, the EMH states that there are no arbitrage opportunities since the price in the market always reflects a stocks´ fundamental price (Statman, 2008).

The efficiency of the market can generally be divided into three levels; weak form efficiency, semi-strong form efficiency and strong form efficiency. Weak form efficiency implies that it is not possible to predict future price movements by observing historical data, i.e. with the use of technical analysis or time series analysis. Thus, the accuracy of this form of market efficiency is relevant for the usability of our active trading strategy. With this type of market efficiency it is possible for investors to achieve excess return in the short run with the use of
fundamental analysis. *Semi-strong form efficiency* implies that all publicly traded
information is reflected in the stock price and therefore neither technical nor
fundamental analysis is of any use. Insiders may still be able to make an excess
return based on exclusive information. Finally, *strong form efficiency* implies that
all information is reflected in the market price and not even insider information is
of use for determining future price movements (Bodie, Kane & Marcus, 2011).

The EMH has been criticized for the limitations regarding its assumption
about rational investors. By implication it states that market bubbles should not
occur in an efficient market where the price of a stock will always be the same as
its fundamental value. However, Malkiel (2003), a intercessor of the efficient
market hypothesis, acknowledge that irrationalities can occur as with the IT-
bubble in the late 1990’s, where external factors were not enough to explain the
extreme price movements observed in the market. Other academics, such as De
Bondt and Thaler (1985) also give support to the fact that investors are not
always rational, but that they in many instances can be overly optimistic or
overly pessimistic, which is an important assumption in the area of behavioral
finance.

### 2.2 Behavioral Finance

While conventional economic theories like the EMH presume that investors
are fully rational, behavioral finance starts with the assumption that they might
not be. Behavioral finance is concerned with how market participants make
systematic errors as a result of an increase in the amount of irrational investors, so called noise traders. This would have a perverting effect of the stock prices of which market economies rely on to allocate resources efficiently. Even though the area of behavioral finance influenced John Maynard Keynes (among others) as early as in the 1920’s the theory still remains relatively unexplored today (Gervais, 2010). In addition, models aiming to take the behavioral aspect into account, such as the Behavioral Asset Pricing Model, have not penetrated the praxis of the industry (Statman, 2008).

2.2.1 Limitations of Arbitrage

Two implications of the EMH are that security prices accurately reflect all available information and that active strategies will therefore fail to outperform the buy-and-hold strategy of the market index. Even if this does not hold and behavioral economist are right in that security prices are misleading, it can still be difficult to exploit the anomalies. These difficulties are by the behavioral school referred to as limitations of arbitrage. In other words, although an arbitrage opportunity may exist, this is not in itself a guarantee for making a risk free excess return. Two examples of limitations of arbitrage are noise trader risk and implementation costs. Noise trader risk implies that a mispricing that is being exploited by an arbitrageur worsens in the short run due to irrational investors further widening the gap between the price and the intrinsic value. In a situation like this an arbitrageur risks being forced to liquidate his positions prematurely, and thereby recieve a negative return (Barberis & Thaler, 2003).
Implementation costs refer to the costs of taking a short position, i.e. transaction costs such as commissions, borrowing rates for short sales and bid-ask-spreads.

Virtually everyone agrees that if prices are the same as the intrinsic value there are no easy profit opportunities. But the reverse does not have to be true because of these limits of arbitrage. And the existence of irrational investors does not necessarily make a market irrational because arbitragers are expected to act on these anomalies until the price has adjusted so that it corresponds to its intrinsic value (Bodie, Kane & Marcus, 2011). These examples of limitations of arbitrage imply that even if there are mispricings in securities, an arbitrageur may not be able to exploit these efficiently because of the risk and cost that comes with taking a position. These factors could thereby leave the gap between intrinsic value and price unaffected. This means that even if a momentum or contrarian effect exist in the market, the potential profits of exploiting these might not be enough to motivate traders to take action since the costs and risks might exceed the upside of the potential trade (Barberis and Thaler, 2003).

2.2.2. Biases

Psychology composes a major part of behavioral economics, offering explanations on systematic irrationalities that the adherents of the behavioral school argue contradict the EMH. These systematic irrationalities, or biases, can be divided into two categories: the first is that investors fail to process information correctly and the second is that given a probability distribution of
returns, investors often make systematically suboptimal decisions. One of the more important examples in the first category is representativeness. It occurs because people tend to neglect the importance of sample size and behave as if a small sample was as representative of a population as a large one. It could result in a premature recognition of sample patterns which are not observed in the population as a whole and thereby causes systematic overreactions in the financial markets (Chopra, Lakonishok & Ritter, 1992). An example with an exact opposite effect to the representativeness bias, i.e. which causes systematic underreaction, is the conservatism bias, which describes when there is a delay in investors’ response to new evidence. A correction of the price then follows the underreaction in order to reflect the new information now available, resulting in a price continuation (Ritter, 2003).

The field of behavioral finance assumes that even if biases concerning information processing did not exist, investors’ decisions would still not necessarily be rational. This is because of the existence of behavioral biases. Behavioralists argue that behavioral biases have a substantial effect in situations where people make judgements about the risk-return relationship in decision making.³ If these biases exist one should be able to make an excess return using a contrarian or momentum strategy, provided that you have an effective strategy for exploiting the over and underreactions (Bodie, Kane & Marcus, 2011).

³ Like our examples show, different biases have contrary systematic effects, making overreaction as well as underreaction explainable by a wide variety of different biases. This has caused the behavioral school to receive critique for essentially letting any fact to be explained ex post by an arbitrary psychological phenomenon (Barberis and Thaler, 2003).
2.3 Contrarian and Momentum Strategies

Contrarian and momentum effects in stock prices are closely related to the field of behavioral finance since they result from systematic inefficiencies caused by market players not acting completely rational. If a stock price deviates from its fundamental value and an investor has a good strategy for exploiting this, the theory states that the investor could make an excess return in comparison to the index (Statman 2008). For example, if there is not even weak form market efficiency and over and underreactions can be observed, it would be possible for investors to profit from price continuations and reversal effects, i.e. with technical analysis.

There are many different studies of the weak form of market efficiency and whether traders could make money from finding trends in past prices or not (see, for example, Jagadeesh & Titman (1999) and Simon & Wiggins, (2001)). One way to distinguish trends in stock prices is to measure the serial correlation, that is to say how stock returns correlate to past returns. Positive serial correlation occurs when positive returns follow positive returns, i.e. a momentum type effect. Negative serial correlation is when negative returns are followed by positive returns and vice versa, i.e. a correction type effect (Bodie, Kane & Marcus, 2011). De Bondt and Thaler (1984) discovered weak forms of market inefficiencies where investors overreact to unexpected events and news. They found that prior ‘loser’
portfolios tended to do better than prior ‘winner’ portfolios.\textsuperscript{4}

Conrad and Kaul (1998) argue that both momentum and contrarian strategies are equally likely to be successful but that these diametrically opposed strategies work simultaneously for different time horizons. The momentum strategy showed to be most profitable at medium horizons of 3-12 months. The contrarian strategy was profitable during both a short term weekly or monthly investing horizon and a long term period of three to five years, but only during the sub period between 1926-1947. This result is consistent with Fama and French’s (1988) research where they argue that a slowly mean-reverting component of stock prices tends to induce negative autocorrelation in returns over a three to five year horizon. In addition, Jagadeesh and Titman (1993) concluded that over a holding period of 3-12 months, buying stocks which have performed well and selling stocks that have performed poorly (thus adopting a momentum strategy) makes profits that are not due to additional systematic risk.

2.4 VDAX

Volatility is an important concept in finance and is central in areas such as portfolio selection, asset pricing and management of risk. Projection of future volatility can be evaluated through analyzing historical returns or with the use of a tool that measures the markets’ expectation of the future volatility. In 1993 the

\textsuperscript{4} Three years after the portfolios were created the ‘loser’ portfolio earned about 25% more than the ‘winner’ portfolio even though it carried significantly less risk. Effects were observed five years after the creation of the portfolio and the results indicated that the effects were not attributed to changes in risk.
Chicago Board Options Exchange (CBOE) introduced the VIX, an index measuring the implied volatility as a weighted average of some near the money S&P100 options with the use of the Black & Scholes formula (BS) (1973). In 2003 the CBOE started using a new way of calculating the VIX, which does not require using the BS formula and switched the benchmark index from the S&P100 with the S&P500. The German equivalent VDAX-New is calculated in the same way as the new VIX but with the DAX as the underlying index. VDAX-New (hereafter referred to as VDAX) was introduced in 2003 and has been backward projected to 2 January 1992 (Frankfurt stock exchange, n.d.). One advantage of the new way of calculating the implied volatility is that you can use both near the money and out of the money options, making the estimate more robust than when using only near the money options (Rhoades, 2011). The VDAX expresses the expected future volatility of option contracts on the DAX index over a 30-day period (Frankfurt stock exchange, n.d.).

Implied volatility indexes are often referred to as 'fear indexes' because when there is a great deal of uncertainty regarding the future development of the market and investors are in fear, the implied volatility will rise. The reason for this is that when markets are dominated by uncertainty the demand for puts will increase as investors seek to hedge their portfolios, which will be followed by a raise in their price. In accordance with the put-call parity, an increase in the price

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5 For specifics on how to calculate VDAX-New visit <http://www.boerse-frankfurt.de/en/glossary/v/VDAX-new+1091>
of a put leads to an increase in the price of a call on the same stock.\textsuperscript{6,7} By implication this states that a net increase in the sales of options leads to a higher implied volatility in the market (Rhoads, 2011).

VDAX is generally acknowledged for having a strong negative correlation with DAX, and is therefore by many, for example Simon & Wiggins (2001), considered a good tool for managing portfolio risk. This means that when the market portfolio falls, VDAX will rise and vice versa. When using a contrarian strategy one should, in appliance with behavioral finance, go long when VDAX is considered high and the market may be overly pessimistic, and go short when VDAX is considered low and the market is overly confident (Rhoades, 2011).

\textsuperscript{6} The put-call parity defines the relationship between a European put option, \( p \), and a European call option, \( c \), with the same strike price, \( K \), and time to maturity, \( T \), that must exist for there to be no arbitrage opportunities. \( p + S = c + ke^{-rT} \) were \( S \) defines the strike price, \( ke^{-rT} \) defines the discounted value of the exercise price of the option.

\textsuperscript{7} An increase in the implied volatility can also stem from a rise in demand of calls as a substitute to long positions.
Figure 1 shows the fluctuations in the VDAX and DAX indexes from 1992 to 2012.

Figure 1. VDAX and DAX 1992-2012

The left axis describes the basis points of the DAX and the right axis describes the VDAX expressed in percent of DAX. As you can see, the indexes appear to be negatively correlated with some exceptions in 1992-1994, 1996-1998 and 2006-2008.

Table 1 describes the statistical properties of the VDAX and DAX for our sample period 1992-2012.
Table 1. Statistical Properties of VDAX and DAX for the sample period 1992 – 2012

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>Median</th>
<th>Min</th>
<th>Max</th>
<th>St. dev</th>
<th>Variance</th>
<th>Skewness</th>
<th>Kurtosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>VDAX</td>
<td>23.56</td>
<td>21.19</td>
<td>9.35</td>
<td>83.23</td>
<td>10.01</td>
<td>100.23</td>
<td>1.576</td>
<td>3.033</td>
</tr>
<tr>
<td>DAX</td>
<td>4620.98</td>
<td>4836.90</td>
<td>1420.30</td>
<td>8105.69</td>
<td>1861.69</td>
<td>3465709</td>
<td>-0.108</td>
<td>-1.185</td>
</tr>
</tbody>
</table>

The VDAX has a mean value of 23.56% with a standard deviation of approximately 10% as well as a positive skewness of 1.576. The fact that the VDAX exhibits a kurtosis larger than three implies that the likelihood for extreme values is higher than if the index would have followed a normal distribution (Gujarati, 2006). The Dax has an average negative kurtosis, indicating that it has a flatter distribution as compared to the normal distribution (DeCarlo, 1997). The maximum value of VDAX (83.23%) occurs during the subprime crisis in 2009 and is almost 6 standard deviations away from the mean value in our data.

3. Method

We investigate a 20 year consecutive time period of daily data reaching from 1992 to 2012. We collect our data of VDAX and DAX from the market leading database Thomas Reuters Datastream. A comparison will be made between the active contrarian strategy based on sentiment indicators from VDAX and a benchmark buy and hold strategy. In the buy and hold strategy we take a position in the DAX and hold this position throughout a 30 day investment horizon. In the contrarian strategy we calculate our trigger points with the use of one, two and three deciles, extending the method used by Cacia and Tzetkov.
(2008), who only tested a two decile strategy. For example, in the first decile strategy we go long when the VDAX reaches over the 9th decile and we go short when the VDAX goes below the 1st decile. We calculate the trigger points on a daily basis based on the previous 30 day period for every decile strategy during our 20 year sample period. By doing this we take into consideration the appropriate amount of information that an investor could have had at the time for the decision and also to account for changing market conditions.

Our strategy implies taking both long and short positions in the DAX with the purpose to making money regardless of the market conditions. For example, if we are holding a long (short) position for 30 days and the VDAX is higher (lower) than the top (bottom) decile, on day 31, we renew the position for another 30 days. If the VDAX is between the decile trigger points, we close the position until VDAX exceeds a decile limit again. All signals are registered at the market closing price and a position is taken the following day at the market open price. To make sure that we do not implement several positions based on the same news and events we take only one short and/or one long position at a time during a 30 day window. After the 30 day period we either close or renew our previous position depending on the value of VDAX and the relevant trigger points at the time. We receive an average annual interest rate of 3.5% when we go short as well as on days when we do not take a position, and we simplify our analysis by assuming that there are zero transaction costs and no taxes.\(^8\) Furthermore, we

\(^8\) We collected the information regarding the German interest rate from the Deutsche Bundesbank web page (www.bundesbank.de)
assume that we start out with an initial amount of one euro.

The daily return of a strategy is calculated as

\[ R_t = HPR_{t,S} + HPR_{t,L} + r_t, \]

were \( r_i \) is the daily interest rate that we receive for going short and \( HPR_{t,L} \) (\( HPR_{t,S} \)) is the daily holding period return from a long (short) position, calculated as

\[ HPR_{t,L} = \frac{DAX_t - DAX_{t-1}}{DAX_{t-1}}, \]

\[ HPR_{t,S} = \frac{DAX_{t-1} - DAX_t}{DAX_{t-1}}. \]

We also calculate the Sharpe ratio, which is a measurement of the return of per unit of risk, calculated as

\[ Sharpe \ ratio = \frac{\text{Return} - \text{The risk free interest rate}}{\text{Standard deviation}}. \]

4. Results

Table 2 shows the average return, standard deviation and the Sharpe ratio for the contrarian strategy (calculated with the second decile strategy) and the buy and hold strategy over two-year intervals. We chose the second decile strategy for comparison based on the research done by Cacia and Tzetkov (2008).
Table 2. Periodic measurements of the strategy

<table>
<thead>
<tr>
<th></th>
<th>Contrarian strategy</th>
<th></th>
<th>Buy and hold strategy</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Average return</td>
<td>Standard deviation</td>
<td>Sharpe ratio</td>
<td>Average return</td>
</tr>
<tr>
<td>02/1992 - 02/1994</td>
<td>-13,69%</td>
<td>11,67%</td>
<td>-1,50</td>
<td>11,59%</td>
</tr>
<tr>
<td>02/1994 - 02/1996</td>
<td>-5,85%</td>
<td>12,14%</td>
<td>-0,79</td>
<td>6,85%</td>
</tr>
<tr>
<td>02/1996 - 02/1998</td>
<td>-0,03%</td>
<td>13,72%</td>
<td>-0,28</td>
<td>33,69%</td>
</tr>
<tr>
<td>02/1998 - 02/2000</td>
<td>-12,57%</td>
<td>20,85%</td>
<td>-0,79</td>
<td>-13,12%</td>
</tr>
<tr>
<td>02/2000 - 02/2002</td>
<td>-18,83%</td>
<td>25,65%</td>
<td>-0,88</td>
<td>-20,07%</td>
</tr>
<tr>
<td>02/2002 - 02/2004</td>
<td>-3,35%</td>
<td>35,25%</td>
<td>-0,20</td>
<td>-2,15%</td>
</tr>
<tr>
<td>02/2004 - 02/2006</td>
<td>2,54%</td>
<td>10,21%</td>
<td>-0,12</td>
<td>19,56%</td>
</tr>
<tr>
<td>02/2006 - 02/2008</td>
<td>8,77%</td>
<td>17,04%</td>
<td>0,29</td>
<td>9,29%</td>
</tr>
<tr>
<td>02/2008 - 02/2010</td>
<td>-13,47%</td>
<td>22,71%</td>
<td>-0,76</td>
<td>-4,84%</td>
</tr>
<tr>
<td>02/2010 - 02/2012</td>
<td>12,60%</td>
<td>23,78%</td>
<td>0,37</td>
<td>13,27%</td>
</tr>
</tbody>
</table>

Note: We are comparing the buy and hold strategy to the second decile contrarian strategy.

The table shows that our active strategy tends to have a lower volatility than the benchmark strategy. We believe this originates from our strategy’s restrictions of a maximum holding of one long and/or one short position at a time. This will at times create fully hedged zero net positions and these situations will be equivalent to being outside the market, receiving interest only on the bank cash balance. Thus, this has a suppressing effect on the active strategy’s overall volatility. The buy and hold strategy exhibits a higher Sharpe ratio than the contrarian strategy for every period with the exception of 1998-2002. We believe that this too is a result of the net zero position effect because scenarios where an investor is positioned as if being inactive will benefit him in declining markets relative to a long position in the index. Consequently, we argue that the slightly higher Sharpe ratios for the active strategy is not because of our strategy’s superiority in bear markets but that it could rather be explained as a
phenomenon of the inactivity that seems to be inherent in the way the restrictions were created.

The contrarian strategy generates a negative return in every period except for the periods 2004-2008 and 2010-2012. Both of these periods are subsequent to economic crisis - the World Trade Center crisis in 2001 and the subprime crisis in 2008 - so we receive a higher return in the aftermath of negative market shocks. These findings indicate that the market timing signal from the VDAX works better during these periods. During the crisis we also observe, in accordance with the results of Cacia and Tzvetkov’s (2008), a highly negative correlation.

Table 3 shows the correlation over two year periods for VDAX and DAX.

<table>
<thead>
<tr>
<th>Period</th>
<th>Correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td>02/1992 - 02/1994</td>
<td>0.140</td>
</tr>
<tr>
<td>02/1994 - 02/1996</td>
<td>-0.480</td>
</tr>
<tr>
<td>02/1996 - 02/1998</td>
<td>0.849</td>
</tr>
<tr>
<td>02/1998 - 02/2000</td>
<td>-0.352</td>
</tr>
<tr>
<td>02/2000 - 02/2002</td>
<td>-0.667</td>
</tr>
<tr>
<td>02/2002 - 02/2004</td>
<td>-0.635</td>
</tr>
<tr>
<td>02/2004 - 02/2006</td>
<td>-0.505</td>
</tr>
<tr>
<td>02/2006 - 02/2008</td>
<td>0.165</td>
</tr>
<tr>
<td>02/2008 - 02/2010</td>
<td>-0.725</td>
</tr>
<tr>
<td>02/2010 - 02/2012</td>
<td>-0.734</td>
</tr>
</tbody>
</table>

Note: Correlation for the second decile strategy

The VDAX is often referred to as being a good hedging tool because of its negative correlation with the stock index. Table 3 shows that the VDAX has a positive correlation with the DAX during 1992-1994, 1996-1998 and 2006-2008. However, this is not particularly surprising since a raise in both asset prices and
the nervousness of the market can be observed during shorter periods (Rhoades, 2011). What is interesting is that the correlation over the entire 20 year period exhibits a positive correlation of approximately 0.13. The remarkably high positive correlation in the period 1996-1998 could be due to the Asian crisis during which the German stock market was very turbulent (Kaminsky & Reinhart, 2001). The three periods of positive correlation all have in common that the DAX is on average rising during them. Furthermore, we observe that all of these intervals of rising markets are subsequent to an already occurring bullish trend or to a period that is relatively stable.

Table 4 displays some properties for the performance of the different strategies, the number of positions we take and how many of them that return positive results. Also, it shows the percentage of the number of positions that generated a positive return.

Table 4. Strategy performance 1992-2012

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Contrarian</th>
<th>Buy and hold</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Decile 1</td>
<td>Decile 2</td>
</tr>
<tr>
<td><strong>Performance</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average return</td>
<td>-10.84%</td>
<td>-13.14%</td>
</tr>
<tr>
<td>Risk**</td>
<td>19.11%</td>
<td>18.25%</td>
</tr>
<tr>
<td>Sharpe ratio</td>
<td>-0.23</td>
<td>-0.85</td>
</tr>
</tbody>
</table>

| Positions           |            |              |           |
| Number of positions | 211        | 239          | 262       | -        |
| - Long wins         | 54/94 (57%)| 67/113 (50%) | 51/123 (41%)| -        |
| - Short wins        | 40/117 (34%)| 89/126 (71%)| 48/139 (35%)| -        |
| Total wins          | 94/211 (45%)| 156/239 (65%)| 99/262 (38%)| -        |

*Note: *Average annualized performance  
**Risk is calculated as the standard deviation of the strategies

The table reveals that our strategy performs worse the more active the
trading gets. This is consistent with the fundamental theories in the capital asset pricing model (CAPM) of Sharpe (1964) & Lintner (1965) and the EMH which argue that a passive holding of the market portfolio is the optimal decision. If there are any systematic errors in pricing as described by behavioral finance and previous research on contrarian trading strategies, our strategies fail to exploit these. The Sharpe ratios are also consistent with the CAPM theory that the buy and hold strategy is superior to all of our active strategies. The trading strategy using the top and bottom 2 deciles as trigger points shows a fairly good trait as it receives a positive return in 65.27% of the total positions taken. This does not make it profitable since the losing trades, even though they are fewer in numbers, heavily outweigh the profits from the winners. Table 4 shows that an increase in trading activity lowers the risk. This might seem counter intuitive, but we believe this fact originates from the same strategy restrictions of maximum one long and short position at the time (as we mentioned earlier in the commentary of Table 2). An easier triggered strategy takes more positions and consequently creates more zero net positions that lower the risk of the overall strategy. Lower deciles also open more single long and short positions as well. Thus, the dampening effect on volatility of the net zero positions outweigh the diametrically opposed effect of increased volatility caused by additional single long and short positions. This may suggest that we trade too actively for the type of restriction presented in this paper.
Table 5 describes the average annualized return for the whole sample period (1992-2012) for the long and short positions independently within each strategy.

<table>
<thead>
<tr>
<th>Decile</th>
<th>Long position</th>
<th>Short position</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0,01%</td>
<td>-15,76%</td>
</tr>
<tr>
<td>2</td>
<td>-1,78%</td>
<td>-17,06%</td>
</tr>
<tr>
<td>3</td>
<td>-2,08%</td>
<td>-16,75%</td>
</tr>
</tbody>
</table>

Interestingly, Table 5 shows that the short positions performs substantially worse than the long positions. Since our short strategy is based on taking short positions when the market is considered overly confident it indicates that these trigger points provided by the VDAX are not as strong signals as when the market is in fear. We reason that this might stem from the fact that fear leads to quicker responses in the market than a state of market calmness, which is built up more gradually.

5. Conclusion and Directions for Further Research

In order to investigate whether or not our short term contrarian strategy is profitable we backtested and analyzed a strategy where we went long or short in the DAX as an opposite reaction of the general market sentiment provided by the VDAX. The German marketplace was chosen because of the lack of research on VDAX trading strategies relative to studies made on VIX. VDAX itself was chosen for its alleged ability to reflect the markets collective sentiment of the implied volatility in the near future.
We conclude that we are not able to make an excess return based on sentiment indicators from the VDAX. We discovered that the VDAX has historically not been as strong and consistently negative correlated with the DAX as we had thought. Since our contrarian strategy was based partly on this presumption we feel it might have been a contributing factor to the negative results. However, during the periods where we observed a highly negative correlation we still failed to generate a positive return, implying that the findings of positive correlation can not single-handedly explain the failure of the strategy. We also discovered that our strategy performed best during bearish periods.

We feel that a good direction for further research would be to test our strategy using smaller percentiles and thereby limit our trading since we found that this gave better results. The strategy could also be altered in regards to the restriction of how many positions you may take during a time window, since our strategy unwittingly held a substantial amount of net zero positions leaving us outside the market in many instances. Also, the time window could be shortened since market conditions can change a lot during a 30 day period.

6. References


