CAN STOCK PRICE MOMENTUM BE EXPLAINED BY ANCHORING?

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ABSTRACT

Using German stock data from 1980 to 2008, this study tests whether stock price momentum can be explained by anchoring – a specific form of non-rational behavior. Three different empirical tests indicate that anchoring is the driver of the 52-week high strategy which is long in stocks with a price at or close to their one year high price and short in stocks with a price far from their 52-week high. With sorting and regression approaches, it is further shown that the 52-week high strategy itself largely dominates the momentum strategy and that the distance of a stock's price to its 52-week high price is a better predictor of future returns than the momentum criterion.

JEL: G12, G14

INTRODUCTION

While most researchers agree on the existence of the momentum effect, no consensus has been reached why momentum portfolios are profitable. Supporters of the risk-based explanation view the excess returns of momentum strategies as rational compensation for risk. Researchers of the behavioral finance field, however, explain its profits with a deviation of prices from their fundamental values due to a non-rational behavior of at least some investors. Based on the behavioral approach, the momentum effect represents a serious challenge to the Efficient Market Hypothesis (EMH), which is not the case according to the risk-based explanations. The potential consequences of the momentum phenomenon on the EMH make the search for its driver an important field of research.

This work can be assigned to the behavioral field and tests whether anchoring, a specific form of non-rational behavior, can explain the momentum effect. It builds on the work of George and Hwang (2004). They hypothesize that momentum can be largely explained by a strategy that is long in stocks with a price at or near their 52-week high price (the highest price of the stock in the past one year) and is short in stocks with a price far from their 52-week high. The profitability of the 52-week high strategy is assumed to be explained by "anchoring", a type of irrational behavior which states that people use a reference point when forming estimates.

We examine the idea of George and Hwang (2004) and test whether anchoring can explain (indirectly through the 52-week high strategy) the momentum effect. Hence, the null hypothesis states that momentum cannot be explained by anchoring. In order to test our null, we need to examine whether first, the 52-week high strategy dominates the momentum strategy and second, whether anchoring qualifies as explanation for the 52-week high profits. The focus of this paper lies in the exploration of the second relation. Therefore, three different types of tests are proposed. To our knowledge, this study is the first that tests the link between this behavioral pattern and the 52-week high. The first test examines the 52-week high strategy at industry level. According to the anchoring hypothesis, the industry-52-week high strategy should not dominate the 52-week high since the one year high price of an industry is not publicly available and hence does not qualify as a potential reference point. We further test whether a strategy with a ranking criterion that employs the highest price of a stock over a period longer or shorter than one year is more profitable than the 52-week high. The highest price of a stock over most intervals is not published. Therefore, this measure is not easily accessible to investors and cannot be used as reference

point. Thirdly, the profitability of the 52-week high strategy is measured during the dot-com bubble. A couple of papers document irrational behavior such as overreaction or herding as the cause for its emergence. When subjects herd or overreact, they do not suffer from the anchoring bias at the same time. This implies that people should not anchor during the dot-com bubble and hence, the 52-week high strategy is expected to be unprofitable during this period if it is caused by anchoring. Our main finding is that anchoring cannot be rejected as driver of the 52-week high strategy.

We also go further than George and Hwang (2004) by testing the relationship between momentum and the 52-week high. On the one hand, the link between the two strategies is explored more broadly. First, the profitability of both strategies is compared for different ranking and holding periods. This is important as it is not sufficient to compare the 52-week high to only one or two momentum strategies (e.g. the (6/1/6) strategy) in order to document the dominance of the 52-week high. Second, we look at the profitability of both strategies at industry level and find that they generate returns of similar magnitude. The similar profitability of them for industry portfolios further indicates a close relation between momentum and the 52-week high. On the other hand, the link between the two strategies is tested with two sorting and one regression approaches as all methods have strengths but also face substantial drawbacks.

The third contribution of this paper is to present some insights into the momentum literature for non-U.S. data. As most studies examine U.S. stocks, it is important to use a different sample in order to exclude data mining as explanation for the momentum effect. This work shows that the momentum effect still exists after 2001, which is doubted by Henker et al (2006), and Hwang and Rubesam (2007). We therefore support the view of Dimson et al. (2008) that the non-profitability of the momentum strategy after 2001 is only limited to the U.S. sample. Our data sample also allows a closer look at the momentum effect in Germany. Stock price momentum is profitable for the German market. This is shown by using the common methodology of Jegadeesh and Titman (1993). Furthermore, it documents that the industry momentum strategy is profitable. Yet, its returns are in opposite to the U.S. not as large as those of momentum strategies at individual stock level. Finally, this paper presents evidence that the 52-week high strategy of George and Hwang (2004) is also profitable outside the U.S for the total sample, but that it does not work during the dot-com bubble between October 1998 and February 2000.

The remainder of the paper is organized as follows. After a brief review of the literature, the data and the methodology used in the study are presented. Subsequently, the profitability of momentum and 52-week high strategies for German stocks is documented. The dominance of the 52-week high is examined in the fourth section. Then in the following section, we present anchoring and provide three tests whether the 52-week high is driven by this behavioral phenomenon. Section six reports robustness tests and in the last section, we summarize the results and make concluding remarks.

LITERATURE REVIEW

Our study builds on the work of George and Hwang (2004). They hypothesize that momentum can be explained by a strategy that uses the nearness of a stock's price to its 52-week high price as a ranking criterion. Stocks that are close to or near their 52-week high price are included in the winner portfolio while stocks with a price far from the highest price within the last one year are assigned to the loser portfolio. George and Hwang assume that the profitability of the 52-week high strategy is caused by "anchoring", a specific form of irrational behavior that describes the way people make estimations. Tversky and Kahneman (1974) argue that subjects focus too much on a reference point when forming estimates. Applying the anchoring phenomenon to the 52-week high strategy, investors estimate the impact of news on the stock price and therefore use the 52-week high price of a stock as reference point – an easily "accessible piece of information" (George and Hwang (2004)) as it is published in nearly all newspapers reporting on stocks.

If good news has pushed a stock to or close to its 52-week high price, investors are not prepared to bid the price higher even if the information warrants it. Since the information is not completely incorporated in the stock price at once, the price subsequently increases which results in continuation. Similarly, when bad news has pushed the stock price to a level far from its 52-week high, investors are also unwilling to sell the stock for a price as low as it should be based on the bad news. Subsequently, the news is incorporated in the stock price, which results in a decrease. Hence, investors are unwilling to immediately revise their beliefs. This unwillingness is largest for stocks close to or far from the 52-week high. For stocks that are traded neither close to nor far from their 52-week high, news is faster incorporated into the stock price which does not result in any observable predictability.

In order to examine whether anchoring qualifies as explanation for the momentum effect, it is important to examine the relation between the momentum strategy and the 52-week high strategy but also to test whether the 52-week high strategy is driven by anchoring. The examination of the second link is important as it indicates whether any evidence is found in momentum against the EMH. Without clear indication for investors' non-rationality driving the 52-week high, the relation between momentum and the 52-week high only states that one strategy is explained by another although the drivers of both are unknown and could also be linked to risk factors.

DATA AND METHODOLOGY

Our sample includes all listed stocks on German exchanges that were traded during the period January 1980 and March 2008, a total of 339 months. For each stock and each month, the price (adjusted for subsequent capital actions), the market value, the 52-week high price and the 52-week low price are obtained from Datastream. The intraday high price of each stock is collected on a daily basis. To mitigate microstructure effects that are associated with low-priced and illiquid stocks, only stocks with a price larger than one Euro and a market value above 50 Mio. Euro are considered for the ranking in month t. On average, the number of stocks available is 750 per month. Our sample includes both surviving and non-surviving stocks and does not suffer from a survivorship bias.

Portfolios for all strategies are constructed as in Jegadeesh and Titman (1993). At the end of each month, all traded stocks are ranked in ascending order based on the strategy's respective ranking criterion. The top 30 percent of stocks are assigned to the winner portfolio, the bottom 30 percent to the loser portfolio and the rest to a portfolio that is referred to as the middle one. These portfolios are equally weighted and not rebalanced during the holding period. To be precise, this implies that stocks are only perfectly equal-weighted at the date of the portfolio formation. As the portfolios are not rebalanced during the holding period, stocks with a price increase get a larger fraction in the portfolio, while stocks with a negative return during the holding period get a smaller weight. The investment strategy is self-financing, buys winner stocks, and sells loser stocks. Hence, the strategy profits are computed as the arithmetic difference (WML) between the returns of the winner portfolio (r_w) and the returns of the loser portfolio (r_l):

$$\text{WML} = r_w - r_l \tag{1}$$

To abstract from potential microstructure effects and the bid/ask bounce, we skip one month between the ranking and holding period which is common in the momentum literature. If a stock is delisted during the holding period, we follow Forner (2003) and assume that the remaining proceeds are equally invested in the remaining stocks. Consistent with Jegadeesh and Titman (1993), monthly portfolio returns are calculated on an overlapping holding period basis. Compared to non-overlapping returns, this method increases the power of the statistical tests and provides cleaner results as the bid-ask bounce effects are reduced (Moskowitz and Grinblatt (1999)). Hence, measuring returns on an overlapping period basis implies that the monthly average profits to K strategies (with K equals to the length of the holding

period in months) are reported, each beginning one month apart. For example, at the beginning of month t, the winner portfolio with a holding period of 3 months consists of three sub-portfolios: one formed at the beginning of $t-3$, one built in $t-2$ and one started in $t-1$. At the beginning of month $t+1$, the monthly return is measured for the subportfolios constructed in $t-2$, $t-1$ and t, while the portfolio formed in $t-3$ is replaced by the one built in t.

We also conduct an experimental analysis to test whether subjects do in fact suffer from the anchoring bias. Therefore, 105 undergraduate students take part in this test and have to estimate a percentage number. Without their knowledge, students are subdivided into three groups. This is done by giving different information to the participants, which they might employ when estimating the percentage. In order to ensure that the results are not biased by a group dynamic, we make sure that a participant's estimation is not influenced by her neighbor firstly by leaving enough space between the subjects and secondly by ensuring that the information are not the same for students sitting next to each other. Furthermore, as the test is anonymous and as we do not offer payoffs for accuracy, the risk that decisions are made based on other criteria than the own estimate is quite small.

MOMENTUM AND THE 52 WEEK HIGH STRATEGY

Formally, the main difference between the momentum strategy and the 52-week high strategy is the ranking criterion. According to the momentum strategy, stocks are ranked based on their past buy-and hold performance. The 30 percent of stocks that performed best during the ranking period is attributed to the winner portfolio while the 30 percent of stocks with the worst buy-and-hold returns is assigned to the loser portfolio. The notation $(J/S/K)$ applies to the momentum strategies and indicates a ranking period of J months, a skip period of S months and a holding period of K months.

In Panel A of Table 1, average monthly momentum returns are reported for different ranking and holding periods. Winner and loser profits are returns in excess of the Datastream Germany Price Index. Table 1 documents that momentum strategies yield substantial and mainly highly significant profits over the sample period 1980 to 2008. Stocks that were winners over the previous 3 to 12 months continue to outperform past loser stocks over the next 3 to 12 months. All examined momentum strategies yield positive returns. For 12 out of 16 strategies, returns are significant on the 10% level, for 10 strategies on the 5% level and for 4 out of 16 strategies, momentum profits are significant on the 1% level. The highest monthly returns are generated by the (9/1/3) and the (6/1/6) portfolios. At first glance, the momentum profits in Table 1 seem rather low in comparison to the study of Jegadeesh and Titman (1993) reporting an average monthly return of about 1% for U.S. stocks. Yet, this results from the examination of the return differences between the top and bottom tercile while Jegadeesh and Titman (1993) focus on the top and bottom decile. The 30% and 70% breakpoints are chosen for two reasons: First, we use German data. Compared to the number of stocks traded in the U.S., our sample is much smaller which implies that winner and loser portfolios contain fewer stocks. This disadvantage can be reduced by including a larger fraction of stocks in the portfolios. And secondly, in opposite to Jegadeesh and Titman (1993) who are interested in presenting evidence for the existence of the momentum effect, we focus on the *driver* of this phenomenon and therefore, we can put less emphasize on the tails of the distribution. Some papers point out that the momentum effect has disappeared in the post-2000 era (Henker et al (2006), Hwang and Rubesam (2007)). Yet, our results show that this is not the case for momentum in Germany. Between January 1 2000 and March 1 2008, the (6/1/6) momentum portfolios generate an average monthly return of 0.60% (not in the tables). This finding is consistent with Dimson et al. (2008) examining UK stocks and reporting an average monthly profit of 0.86% for momentum portfolios after 2000. Hence, our results indicate that it is premature to pronounce the disappearance of momentum.

Table 1: Profits to Momentum and 52-week High Strategies

Ranking Period (in months)		Holding Period (in months) 3	6	9	12
	Panel A: Average Monthly Returns				
3	Winner	0.0016	0.0019	0.0021	0.0023
	Loser	-0.0006	-0.0013	-0.0016	-0.0010
	Winner-Loser	0.0022	0.0032*	0.0038**	0.0032**
		(1.05)	(1.83)	(2.52)	(2.33)
6	Winner	0.0032	0.0034	0.0031	0.0023
	Loser	-0.0018	-0.0022	-0.0019	-0.0011
	Winner-Loser	0.0049**	0.0056***	0.0050***	0.0034**
		(2.02)	(2.75)	(2.86)	(2.20)
9	Winner	0.0038	0.0034	0.0023	0.0016
	Loser	-0.0024	-0.0019	-0.0014	-0.0005
	Winner-Loser	0.0062***	0.0053***	0.0037**	0.0021
		(2.72)	(2.68)	(2.05)	(1.25)
12	Winner	0.0030	0.0025	0.0019	0.0014
	Loser	-0.0012	-0.0011	0.0002	0.0008
	Winner-Loser	0.0042*	0.0036**	0.0018	0.0006
		(1.95)	(2.07)	(0.92)	(0.32)
	Panel B: Average Monthly 52-week High Returns				
	Winner	0.0036	0.0033	0.0029	0.0024
	Loser	-0.0022	-0.0025	-0.0021	-0.0015
	Winner-Loser	0.0059**	0.0058**	0.0050**	0.0039*
		(2.12)	(2.24)	(2.08)	(1.74)

*This table reports the average monthly portfolio returns in excess of the Datastream Germany Price Index average return from February 1981 through March 2008, for momentum strategies (Panel A) and 52-week high strategies (Panel B). The winner (loser) portfolios on the momentum strategy are the equally weighted portfolios of the 30 percent of stocks with the highest (lowest) return over the ranking period. The winner (loser) portfolios of the 52-week high strategy are the equally weighted portfolios of the 30 percent of stocks with the highest (lowest) quotient of the current price to the 52-week high. For the ranking, all German stocks on Datastream with a price larger than one Euro and a market value above 50 Million Euro are considered; t-statistics (two-tailed) are reported in parentheses. *;**;*** are the significance levels on the 10%, 5% and 1% level.*

The ranking criterion of the 52-week high strategy is the distance of a stock's current price to its 52-week high (PHR^{52}: Price-52-week high ratio). Formally, let $P_{i,t-1}$ be the price of stock i at the first day of month $t-1$ and $H_{i,t-1}^{52}$ stock i's highest price during the one year period ending at the first day of month $t-1$.

$$PHR_{i,t-1}^{52} = \frac{P_{i,t-1}}{H_{i,t-1}^{52}} \tag{2}$$

By construction, PHR^{52} takes positive values but cannot be larger than one. The 30 percent of stocks with a price closest to their 52-week high (stocks with the largest PHR^{52}) are attributed to the winner portfolio and the 30 of stocks with a price furthest from their 52-week high (stocks with the smallest PHR^{52} values) are assigned to the loser portfolio. Panel B of Table 1 shows the average monthly returns of the 52-week high strategy for different holding periods. Stocks with a price close to the 52-week high significantly outperform stocks with a price far from the 52-week high over all four examined investment periods. The profits to the 52-week high strategy are approximately as high as the top momentum strategy for each investment period.

Momentum and 52-week high returns might be influenced by the turn-of-the-year effect: Stocks with a poor performance strongly rebound at the beginning of a new year. According to Roll (1983), Griffiths and White (1993) and Ferris et al. (2001), this anomaly is due to tax loss selling: In order to realize tax loss benefits, investors sell loser stocks at the end of the year. This leads to lower prices at year-end for loser stocks. At the beginning of the following year, the selling pressure vanishes and the prices of the

loser stocks recover. In order to examine momentum and 52-week high profits when the turn-of-the-year effect is excluded, we report the returns for both strategies in non-January months in Table 2. Compared to the results in Table 1, loser portfolio returns are substantially lower for both, the momentum and the 52-week high strategy. This is consistent with the turn-of-the-year effect, which states that loser stocks perform well at the beginning of the year. The exclusion of January returns does also lead to lower profits in the winner portfolios. This is not unusual when the turn-of-the-year effect is excluded (see George and Hwang, 2004). Yet, the decrease of loser returns is larger compared to the decrease of the winner profits which leads to slightly higher average monthly returns for momentum and 52-week high strategies.

Table 2: Profits to Momentum and 52-week High Strategies in Months except January

Ranking Period (in months)		Holding Period (in months)			
		3	6	9	12
	Panel A: Average Monthly Returns				
3	Winner	0.0006	0.0008	0.0010	0.0006
	Loser	-0.0026	-0.0032	-0.0033	-0.0026
	Winner-Loser	0.0032	0.0040**	0.0043***	0.0032***
		(1.58)	(2.37)	(3.08)	(2.70)
6	Winner	0.0022	0.0023	0.0018	0.0011
	Loser	-0.0036	-0.0039	-0.0034	-0.0025
	Winner-Loser	0.0058**	0.0062***	0.0053***	0.0036**
		(2.45)	(3.13)	(3.10)	(2.34)
9	Winner	0.0026	0.0021	0.0010	0.0004
	Loser	-0.0040	-0.0034	-0.0028	-0.0018
	Winner-Loser	0.0066***	0.0054***	0.0038**	0.0022
		(3.01)	(2.76)	(2.06)	(1.23)
12	Winner	0.0017	0.0012	0.0006	0.0002
	Loser	-0.0026	-0.0021	-0.0012	-0.0006
	Winner-Loser	0.0043**	0.0033*	0.0018	0.0007
		(1.98)	(1.85)	(0.90)	(0.38)
	Panel B: Average Monthly 52-week High Returns				
	Winner	0.0029	0.0025	0.0022	0.0017
	Loser	-0.0044	-0.0046	-0.0041	-0.0034
	Winner-Loser	0.0073***	0.0071***	0.0062***	0.0051**
		(2.80)	(2.91)	(2.75)	(2.34)

*This table reports the average monthly portfolio returns in excess of the Datastream Germany Price Index average return from February 1981 through March 2008, for momentum strategies (Panel A) and 52-week high strategies (Panel B) excluding returns in Januaries. The winner (loser) portfolios on the momentum strategy are the equally weighted portfolios of the 30 percent of stocks with the highest (lowest) return over the ranking period. The winner (loser) portfolios of the 52-week high strategy are the equally weighted portfolios of the 30 percent of stocks with the highest (lowest) quotient of the current price to the 52-week high. For the ranking, all German stocks on Datastream with a price larger than one Euro and a market value above 50 Million Euro are considered; t-statistics (two-tailed) are reported in parentheses. *;**;*** are the significance levels on the 10%, 5% and 1% level.*

Our sample period includes the dot-com bubble around the year 2000. In order to ensure that our findings are not driven by this short period, we exclude all months between October 1 1998 and March 1 2000 during which the speculative bubble has grown. March 1 was chosen as the ending date since the German equivalent to the Nasdaq Composite, the NEMAX50, peaked at the beginning of March 2000. The choice of a beginning date is less clear for the dot-com bubble. We decide for October 1 1998 since the NEMAX50 increased by only 1.3% within 6 months before that date and rose by 17% from October 1 1998 to November 1 1998, by 43% until January 1 1999 and by 359% to March 1 2000. Table 3 reports the average monthly momentum and 52-week high returns for all months except for those during the dot-com bubble period. Most momentum returns and all 52-week high profits are higher when the dot-com bubble period is excluded. As in Table 1, the most profitable momentum strategy and the 52-week high yield returns that are approximately similar for each holding period. During the dot-com bubble, neither the momentum nor the 52-week high strategies performed well. Between October 1998 and March 2000, 13 out of 16 momentum strategies yield negative returns and only two have a slightly positive average

monthly return. The four 52-week high strategies perform even worse and generate with -0.8% to -1.3% (not reported in the tables) substantially negative average monthly profits. Hence, momentum and 52-week high strategies seem to be profitable between 1981 and 2008. The profits are not due to the turn-of-the year effect or due to the dot-com bubble period.

Table 3: Profits to Momentum and 52-week High Strategies outside the Dot-com-Bubble Period

Ranking Period (in months)		Holding Period (in months) 3	6	9	12
	Panel A: Average Monthly Returns				
3	Winner	0.0015	0.0016	0.0020	0.0017
	Loser	-0.0008	-0.0017	-0.0019	-0.0013
	Winner-Loser	0.0023	0.0033**	0.0039**	0.0031**
		(1.05)	(1.79)	(2.48)	(2.51)
6	Winner	0.0027	0.0032	0.0030	0.0026
	Loser	-0.0020	-0.0024	-0.0020	-0.0012
	Winner-Loser	0.0048**	0.0057***	0.0051***	0.0038**
		(1.87)	(2.63)	(2.86)	(2.40)
9	Winner	0.0037	0.0033	0.0029	0.0022
	Loser	-0.0024	-0.0020	-0.0012	-0.0003
	Winner-Loser	0.0062***	0.0054***	0.0041**	0.0025
		(2.60)	(2.69)	(2.20)	(1.49)
12	Winner	0.0035	0.0031	0.0027	0.0022
	Loser	-0.0008	-0.0008	0.0004	-0.0010
	Winner-Loser	0.0043**	0.0040**	0.0023	0.0012
		(2.06)	(2.44)	(1.27)	(0.74)
	Panel B: Average Monthly 52-week High Returns				
	Winner	0.0040	0.0040	0.0036	0.0031
	Loser	-0.0018	-0.0028	-0.0031	-0.0016
	Winner-Loser	0.0066**	0.0067**	0.0058**	0.0047**
		(2.36)	(2.50)	(2.45)	(2.16)

*This table reports the average monthly portfolio returns in excess of the Datastream Germany Price Index average return from February 1981 through March 2008, for momentum strategies (Panel A) and 52-week high strategies (Panel B) excluding the period of the dot-com bubble from October 1st 1998 to March 1st 2000. The winner (loser) portfolios on the momentum strategy are the equally weighted portfolios of the 30 percent of stocks with the highest (lowest) return over the ranking period. The winner (loser) portfolios of the 52-week high strategy are the equally weighted portfolios of the 30 percent of stocks with the highest (lowest) quotient of the current price to the 52-week high. For the ranking, all German stocks on Datastream with a price larger than one Euro and a market value above 50 Million Euro are considered; t-statistics (two-tailed) are reported in parentheses. *;**;*** are the significance levels on the 10%, 5% and 1% level.*

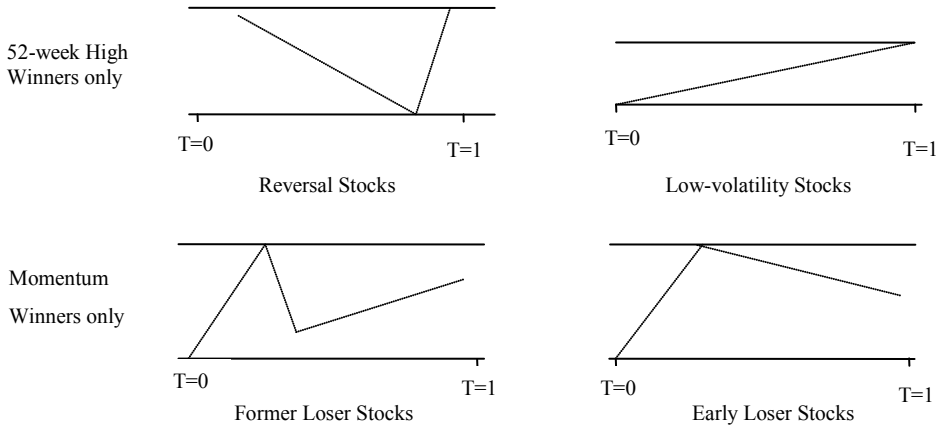
The 52-week High and the Momentum Strategy with a Ranking Period of 12 Months

Momentum strategies with a ranking period of 12 months cover a ranking period which is as long as that of the 52-week high strategies (momentum focuses on the past 12 months performance while the 52-week high uses the highest price over the past one year in its ranking measure). Despite of the identical length of the ranking period, momentum strategies are substantially less profitable for all examined holding periods (see Table 1 – Table 3). This leads to the question, which stocks are included in the winner (loser) portfolio according to the 52-week high criterion but are not in the winner (loser) portfolio based on the 12 months momentum measure and the other way round.

The first line in Figure 1 illustrates two types of stocks that are in the winner portfolio of the 52-week high strategy but not in that of the momentum strategy. In the second line of Figure 1, two types of stocks are illustrated which are in the momentum winner portfolio but not in the 52-week high winner portfolio. Each graphic shows the stock price from $T = 0$ to $T = 1$. This time horizon is defined as 12 months. The top horizontal line represents the 52-week high between $T = 0$ and $T = 1$, while the bottom horizontal line shows the lowest price within this interval. The first graphic illustrates "Reversal Stocks" which lose value at the beginning but recover and are near or close to the 52-week high in $T = 1$. As the

buy-and-hold return between $T = 0$ and $T = 1$ is small, these stocks are not winners according to the momentum criterion. "Low-volatility Stocks" are also 52-week high but not momentum winners. For this type of stocks, the distance between their 52-week high and low is small. In the second line of Figure 1, the price pattern of stocks that are only momentum winners is illustrated. "Former Loser Stocks" suffer from great loses at the beginning and stabilize on a certain level (or slightly recover). They are only momentum winner stocks as the return between $T = 0$ and $T = 1$ is large but do not belong to the 52-week high winners as the stocks trade far from their 52-week high. In the bottom left graphic, the price pattern of "Early Loser Stocks" which yield high returns at the beginning of the period but have a poor performance at the end. As the 52-week high strategy is substantially more profitable than the $(12/1/x)$ momentum strategy, either stocks that are only considered winner stocks by the 52-week high strategy perform well or stocks that are only momentum winners underperform. Hence, either "Reversal Stocks" or "Low-volatility Stocks" have a good performance in the holding periods or "Former Loser Stocks" or "Early Loser Stocks" must perform poorly. Symmetric conclusions can be drawn for loser stocks.

Figure 1: Types of Stocks Responsible for the Difference between the (12/1/x) Momentum and the 52-week High Strategy Performance



The figure shows types of stocks that are 52-week high winners but not momentum winners (H1 and H2) and types of stocks that are included in the winner portfolio by the momentum criterion but not by the 52-week high measure (M1 and M2). Each graphic illustrates the stock's price pattern from $T = 0$ to $T = 1$. This time span between $T = 0$ to $T = 1$ is defined as 12 months. The top horizontal line represents the 52-week high between $T = 0$ and $T = 1$ while the bottom horizontal line shows the lowest price within this interval.

This brief illustration has two interesting implications. First, it theoretically shows that there are types of stocks, which are only considered as winners by one criterion. These types could make the difference in the performance between the 52-week high and the $(12/1/x)$ momentum strategy. Secondly, these four graphics show that the $(12/1/x)$ momentum is slower in identifying future winner stocks: Since it is less profitable than the 52-week high, stocks that are only momentum winners are expected to have a bad or at least modest performance while stocks that are only 52-week high winners are assumed to perform well. "Reversal Stocks" and "Low-volatility Stocks" are assigned to the 52-week high winner portfolio in $T = 1$. Due to their excepted performance, they will also be included in the momentum winner portfolios to a later date. Hence, the 52-week high strategy seems to earlier invest in a future winner stock than the momentum strategy. A similar pattern can be observed for the "Former Loser Stocks" and "Early Loser Stocks". While the 52-week high does not include those stocks in the winner portfolio in $T = 1$, the momentum criterion does. Finally, after $T = 1$, after a bad or modest performance of those stocks, the momentum measure does also refuse to call these stocks winners. Hence again, while the poor performance of these stocks is identified by 52-week high in $T = 1$, the $(12/1/x)$ momentum measure is

much slower. In summary, these four types of stocks indicate that the 52-week high is faster in identifying winner stocks than the momentum strategy with a ranking period of 12 months.

COMPARISON BETWEEN THE MOMENTUM AND THE 52 WEEK HIGH STRATEGY

In Table 1-3, the profitability of momentum strategies with different ranking and holding periods are compared to the returns of 52-week high strategies with different holding periods. Measuring the performance of both strategies over a variety of ranking and holding periods is important in order to completely examine their relationship. For example, it is not sufficient to compare only the (6/1/6) momentum strategy with the 52-week high strategy, since it is not necessarily the most profitable momentum strategy (Rouwenhorst (1998), Forner and Marhuenda (2003), Doukas and McKnight (2005), Agyei-Ampomah (2007)). This section examines whether stock price momentum and the 52-week high are independent or whether one ranking criterion dominates the other. Therefore, with the sorting and the regression approach, two different methods are employed. The sorting approach attributes stocks to different portfolios based on both the 52-week high and the momentum criterion. This method can further be subdivided in a conditional sort and a two-way sort. Based on the conditional sort, stocks are first sorted and collected in different portfolios according to one strategy. Then within the portfolios, stocks are further ranked on the criterion of the second strategy. The two-way method ranks stocks *independently* based on the first and on the second ranking criterion and forms portfolios based on the independent rank of both strategies. For example, winners according to one ranking criterion are subdivided into different portfolios based on the second independent sort. A big advantage of the sorting approach is that this methodology offers a simple and intuitive insight in the relationship between two strategies, as stocks are included in different portfolios of which the returns can be easily compared and interpreted. A potential problem, however, is the unevenly balanced number of stocks within the portfolios. For example, there are more stocks ranked as winners by both criteria than stocks that are momentum winners and at the same time losers based on the 52-week high. A further disadvantage is the construction of test statistics, which is less clear for the sorting approach compared to other methods (Nijman et al. (2004)). Beside sorts, strategies can also be compared by regressions. They allow the incorporation of other effects in addition to the momentum and the 52-week high effects. For example, firm size can be controlled for, as a relationship between firm size and momentum returns is documented in some studies (Rouwenhorst (1998), Hong (2000)). Moreover, the construction of regressions and the interpretation of the obtained results seem to be well understood. Yet, a drawback of regressions is the functional form they impose on the relationship between the exogenous and the endogenous variables (Fama and French (2008)). This form might be incorrect and therefore lead to wrong conclusions. In order to ensure that our results are not driven by the drawbacks of the employed method, we use both approaches to test the relationship between the momentum and the 52-week high strategy.

As a first sorting method, a conditional sort is conducted: Stocks are assigned to different portfolios based on one ranking measure. Then within the portfolios, stocks are further sorted according to the criterion of the second strategy. This test identifies whether the 52-week high strategy still has explanatory power conditional on the momentum ranking, and vice versa. For consideration of space, we only report the results of the comparison between the most profitable momentum strategy and the 52-week high over a holding period of six months (Table 4). Other periods produce similar results. In Panel A of Table 4, stocks are first classified into winner, middle and loser portfolios according to the momentum criterion (the past six-month performance), then each of the three portfolios is further subdivided into winner, middle and loser portfolios based on the 52-week high rankings. Panel B documents the results when stocks are first classified based on the 52-week high performance measure and then sorted according to the momentum criterion within the three portfolios. As above, the top 30% of stocks is assigned to the winner portfolio, the bottom 30% is included in the loser portfolio while the rest (40%) is collected in the middle portfolio. The ranking criterion for the momentum strategy is the past return of a stock during $t-7$ and $t-2$ and PHR^{52} for the 52-week high strategy. Panel B shows

that the (6/1/6) momentum strategy loses its profitability within the 52-week high winner and loser groups. The returns to momentum W-L portfolios are small at 0.28 percent or less and not significant. Excluding the dot-com bubble period (column 2) or the turn-of-the-year effect (column 3) or both (column 4) does not increase momentum profits within the 52-week high winner and loser groups. In opposite, the 52-week high strategy still is profitable after controlling for momentum. This is at least true for non-January returns and outside the dot-com bubble where the 52-week high measure yields large and significant profits (0.38% – 0.56% on average per month). The returns to the 52-week high strategy within the winner and loser momentum portfolio are almost two times higher than the profits to the (6/1/6) momentum strategy within the 52-week high winner and loser groups outside the dot-com period. The dominance of the 52-week high over momentum becomes even more obvious when both the dot-com period and January returns are excluded (column 4). Importantly, for non-January returns or outside the dot-com bubble, the 52-week high strategy remains also profitable within the middle momentum portfolio (with a monthly return of between 0.38% and 0.48%). According to the momentum strategy, these stocks do not have extremely high or extremely low future returns. Hence, if the momentum measure is a powerful predictor of future returns, forming subgroups within the middle portfolios based on the 52-week high criterion should not lead to profits. In contrary, the (6/1/6) momentum measure does not produce large and significant returns within the middle group of the 52-week high. Over the total sample period, however, the dominance of the 52-week high over momentum is less obvious. Although the momentum criterion does not generate significant returns within the 52-week high groups, this is also not the case for the 52-week high measure within the momentum portfolios. As the findings in Table 4 indicate, either this might be due to the turn-of-the-year effect which distorts the results related to the relationship between the 52-week high and the (6/1/6) momentum strategy or it could be influenced by the dot-com bubble period. During this phase, the 52-week high portfolios underperform the momentum ones although both strategies are not profitable.

The relationship between the 52-week high and the momentum strategy is further tested using a two-way sort. Based on the momentum criterion, all stocks are divided into three portfolios (M1, M2, M3). The top 30% of the stocks are included in portfolio M1. Independently from this sort, stocks are arranged in three portfolios (H1, H2, H3) based on the 52-week high criterion, with the 30% of stocks closest to the 52-week high included in portfolio H1. Hence, the portfolio M1H1 consists of stocks that are in the winner portfolio according to both the momentum and the 52-week high ranking criterion. As above, the test is conducted for the relationship between the (6/1/6) momentum and the 52-week high with a holding period of six months (Table 5).

The two-way sort confirms the findings of the conditional sort. Table 5 indicates that the 52-week high dominates the (6/1/6) momentum strategy when the turn-of-the-year effect or the dot-com bubble effect is excluded (Panel B-D). This can be observed in the positive H1-H3 returns that are large and mostly significant. They indicate whether stocks with a price close to the 52-week high outperform stocks with a price far from their one year high within the same momentum portfolio. In opposite, the M1-M3 portfolio returns are small and not significant. They document whether stocks with a good 6-month performance outperform stocks with a poor 6-month return within the same 52-week high portfolio. Hence, the 52-week high strategy seems to dominate the (6/1/6) momentum strategy at least outside the dot-com bubble period or in non-January returns. The results of the two-way sort for the strategies with other holding periods leads to similar conclusions (not reported).

Table 4: Comparison between the (6/1/6) Momentum and the 52-week High Strategy – Conditional Sort

Panel A					
Portfolios Classified by the Momentum	**Portfolios Classified by the 52-Week High**	**Ave. Monthly Return**	**Ex.10/98-2/00**	**Ex. January**	**Ex. Jan. and ex. 10/98-2/00**
Winner	Winner	0.0042	0.0040	0.0032	0.0038
	Loser	0.0016	0.0001	-0.0006	-0.0013
	Winner-Loser	0.0027	0.0040	0.0038	0.0051
		(1.47)	(2.55)**	(2.27)**	(3.10)***
Middle	Winner	0.0008	0.0019	0.0003	0.0018
	Loser	-0.0019	-0.0019	-0.0035	-0.0030
	Winner-Loser	0.0028	0.0038	0.0039	0.0048
		(1.42)	(2.09)**	(2.08)**	(2.57)**
Loser	Winner	-0.0019	-0.0008	-0.0020	-0.0011
	Loser	-0.0043	-0.0051	-0.0077	-0.0082
	Winner-Loser	0.0025	0.0043	0.0056	0.0071
		(0.76)	(2.11)**	(2.22)**	(2.81)**
Panel B					
Portfolios Classified by the 52-Week High	**Portfolios Classified by the Momentum**	**Ave. Monthly Return**	**Ex. 10/98-2/00**	**Ex. January**	**Ex. Jan. and ex10/98-2/00**
Winner	Winner	0.0046	0.0040	0.0032	0.0030
	Loser	0.0020	0.0018	0.0003	-0.0014
	Winner-Loser	0.0026	0.0022	0.0029	0.0016
		(1.58)	(1.37)	(1.74)*	(1.07)
Middle	Winner	0.0017	0.0011	0.0004	-0.0003
	Loser	-0.0010	-0.0005	-0.0014	-0.0011
	Winner-Loser	0.0028	0.0016	0.0019	0.0007
		(1.54)	(1.20)	(1.39)	(0.56)
Loser	Winner	-0.0008	-0.0022	-0.0039	-0.0051
	Loser	-0.0031	-0.0044	-0.0067	-0.0077
	Winner-Loser	0.0024	0.0022	0.0028	0.0026
		(1.30)	(1.20)	(1.67)*	(1.54)

*The table reports the average monthly returns of portfolios that are formed according to the (6/1/6) momentum and to the 52-week high strategy with a 6-month holding period from February 1981 through March 2008. In Panel A, stocks are first sorted on the (6/1/6) momentum ranking criterion and subsequently within the three portfolios based on the 52-week high criterion. In Panel B, stocks are sorted according to the 52-week high measure and then based on the momentum criterion. In column three, the average monthly portfolio returns are reported for the total sample period, in column four for the total period except for the dot-com bubble period between October 1998 and February 2000. Column five reports non-January returns and the last column non-January returns outside the dot-com bubble. The t-statistics are in parentheses. *;**;*** are the significance levels on the 10%, 5% and 1% level.*

As a third method to examine the relationship between the momentum and the 52-week high strategy, Fama-MacBeth (1973) style cross-sectional regressions similar to those in George and Hwang (2004) are conducted. As above, we compare the (6/1/6) momentum strategy to the 52-week high with a holding period of six month length. Dummy variables that indicate whether a stock is included in the winner or loser portfolios by a strategy are regressed on the month t return of stock i. In order to control for firm size, the market capitalization of firm i is taken as explanatory variable with a lag. With the return of stock i in $t-1$ as explanatory variable, a second control variable is employed to isolate the bid-ask bounce impact on the coefficient estimates. Hence, the coefficients of the dummy variables help us to measure the return of one strategy in isolation from the second one and in control of size and the bid-ask bounce. As mentioned above, overlapping portfolios are employed to examine a strategy's profitability. Consequently, as we examine the 52-week high and the momentum strategy for a holding period of six months, the winner and loser portfolios of both strategies in month t consist of six sub-portfolios formed in $t-j$ (with $j = 2, \ldots 7$) respectively.

Table 5: Comparison between the (6/1/6) Momentum and the 52-week High Strategy – Two-way Sort

(6/1/6) Momentum Strategy	52-week High Strategy H1	H2	H3	H1-H3	t-stat
	Panel A: Raw Returns				
M1	0.0033	0.0015	0.0001	0.0033	(1.10)
M2	0.0003	-0.0012	-0.0035	0.0039	(1.50)
M3	0.0001	-0.0012	-0.0042	0.0043	(1.26)
M1-M3	0.0032	0.0027	0.0043	-0.0011	
t-stat	(1.56)	(1.51)	(1.94)*		
	Panel B: Ex Dot-com Bubble				
M1	0.0042	0.0016	-0.0013	0.0055	(1.95)*
M2	0.0017	0.0000	-0.0032	0.0049	(1.84)*
M3	0.0012	-0.0001	-0.0041	0.0053	(1.49)
M1-M3	0.0030	0.0017	0.0028	0.0002	
t-stat	(1.27)	(0.91)	(1.28)		
	Panel C: Ex Jan				
M1	0.0027	0.0004	-0.0029	0.0055	(1.98)**
M2	0.0003	-0.0005	-0.0041	0.0045	(1.78)*
M3	0.0000	-0.0007	-0.0048	0.0048	(1.35)
M1-M3	0.0027	0.0011	0.0020	0.0007	
t-stat	(1.02)	(0.70)	(0.85)		
		Panel D: Ex. Jan and ex. Dot-com Bubble			
M1	0.0035	0.0006	-0.0034	0.0069	(2.45)**
M2	0.0015	0.0000	-0.0038	0.0053	(2.08)**
M3	0.0011	0.0000	-0.0055	0.0066	(1.82)*
M1-M3	0.0024	0.0006	0.0020	0.0004	
t-stat	(1.13)	(0.65)	(1.26)		

The table reports the average monthly returns of portfolios that are formed according to the (6/1/6) *momentum and the 52-week high strategy with a 6-month holding period from February 1981 through March 2008. Panel A reports the average monthly returns over the total sample period. Panel B documents average monthly returns when the dot-com bubble period is excluded, whereas Panel C reports average returns for non-January months. In Panel D, the average monthly non-January profits outside the dot-com bubble are documented. The t-statistics are in parentheses. *;**;*** are the significance levels on the 10%, 5% and 1% level.*

We estimate for each j the following regression in order to examine the relationship between the winner and loser portfolios formed in $t-j$ and the return in month t:

$$R_{i,t} = \alpha_{0t}^{j} + \alpha_{1t}^{j}\, size_{i,t-1} + \alpha_{2t}^{j}\, R_{i,t-1} + \alpha_{3t}^{j}\, mw_{i,t-j} + \alpha_{4t}^{j}\, ml_{i,t-j} + \alpha_{5t}^{j}\, hw_{i,t-j} + \alpha_{6t}^{j}\, hl_{i,t-j} + \epsilon_{it}, \quad (3)$$

where $R_{i,t}$ is the return and $size_{i,t}$ the market value of stock i in month t. The momentum strategy is considered in the regression by two dummy variables, $mw_{i,t-j}$ and $lw_{i,t-j}$. If in month $t-j$, stock i is ranked in the top (bottom) 30% based on the momentum ranking criterion, $mw_{i,t-j}$ ($lw_{i,t-j}$) is one and zero otherwise. The ranking criterion of momentum is stock i's buy-and-hold return between $t-j-6$ and $t-j$. The dummy variables $hw_{i,t-j}$ and $hl_{i,t-j}$ represent the 52-week high strategy: if in month $t-j$ stock i is among the top (bottom) 30% according to the 52-week high ranking measure, $hw_{i,t-j}$ ($hl_{i,t-j}$) takes one and zero otherwise. The ranking criterion of the 52-week high is the ratio of stock i's price in $t-1$ and its highest price between $t-j-12$ and $t-j$. The intercept α_{0t}^{j} can be interpreted as the monthly return of a portfolio that has hedged out the size effect, the bid-ask bounce, the momentum and the 52-week high effect (Fama (1976)). The dummy variable coefficients α_{3t}^{j} for example can be viewed as the return in excess of α_{0t}^{j} that is obtained by taking a long position in the (6/1/6) momentum winner portfolio in isolation of all other effects. In order to get the total monthly return of the pure winner or pure loser portfolios, the averages of the coefficients from the six independent regressions for each $j = 2, \ldots, 7$ are calculated: $1/6 \sum_{j=2}^{7} \alpha_3^j$, …, $1/6 \sum_{j=2}^{7} \alpha_6^j$.

Table 6: Comparison between the (6/1/6) Momentum and the 52-week High Strategy – Regression

	All Months	Ex Dot-com Bubble	Ex Jan
α_i	0.94 (3.65)***	0.81 (3.12)***	0.81 (3.05)***
$size_{i\,t-1}$	-0.02 (-0.80)	-0.05 (-0.76)	-0.04 (-0.94)
$R_{i,t-1}$	-1.03 (-3.96)***	-1.04 (-3.34)***	-1.03 (-3.74)***
$mw_{i,t-j}$	0.24 (2.49)***	0.25 (2.59)***	0.22 (2.30)**
$ml_{i,t-j}$	-0.13 (-1.67)*	-0.10 (-1.70)*	-0.13 (-1.69)*
$hw_{i,t-j}$	0.17 (1.82)*	0.24 (2.10)**	0.20 (2.15)**
$hl_{i,t-j}$	-0.24 (-1.70)*	-0.23 (-1.71)*	-0.34 (-2.05)**
$mw_{i,t-j} - ml_{i,t-j}$	0.37 (2.34)***	0.34 (2.28)**	0.35 (2.20)**
$hw_{i,t-j} - hl_{i,t-j}$	0.40 (2.16)**	0.48 (2.38)**	0.55 (2.30)**

The table reports the time-series average of the averaged coefficients obtained from six cross-sectional regressions (j=2, 7) which are estimated for each month between February 1981 and March 2008. The regressions for the (6/1/6) *momentum strategy and the 52-week high with a 6-month holding period are conducted as described in Equation (3). The time-series t-statistics are documented in parentheses. The first column reports the results for all months, the second column shows the findings for all months except for those during the dot-com bubble period from October 1998 to February 2000 and the last column reports the returns for non-January months. *;**;*** are the significance levels on the 10%, 5% and 1% level.*

Table 6 reports the time-series averages of the total monthly returns and the associated t-statistics. In the bottom of the table, the difference between the winner and loser dummies for the momentum (the 52-week high strategy) represents the average monthly return from a zero-cost portfolio that is long in the momentum (52-week high) winners and short in the momentum (52-week high) losers. The regression results support the general conclusions of the sorting approach. When the dot-com bubble period is excluded, the dominance of the 52-week high strategy is obvious. A self-financing 52-week high strategy yields 0.48%, which is much larger than the momentum return of 0.34%. A similar pattern is present when January returns are excluded. Using raw returns, the dominance is less clear and the difference in the 52-week high dummy variables is with 0.40% only weakly larger than the difference in the momentum dummy variables with 0.37%.

So far, the results indicate that the momentum and the 52-week high strategy generate similar returns, but that the 52-week high dominates momentum – at least when it is controlled for the dot-com bubble effect or the turn-of-the-year effect. Yet, this is not enough to reject the hypothesis that momentum is not driven by the anchoring phenomenon. The cause for the profitability of the 52-week high strategy (and hence of momentum) could also be a risk factor not yet detected or another behavioral heuristic than anchoring.

ANCHORING AS EXPLANATION FOR THE 52-WEEK HIGH PROFITS

Evidence for Anchoring

A potential explanation for the profitability of the 52-week high strategy is "anchoring" (George and Hwang, 2004). Anchoring refers to the method how people make estimations. Tversky and Kahneman (1974) argue that people form estimates by starting from an initial value and then adjusting to the final guess. Anchoring states that this adjustment is not sufficient and that subjects focus too much on the initial value (or reference point). Hence, anchoring can be defined as the insufficient adjustment of people's estimate from the starting value to the final guess. To examine this behavior, we carry out an

experimental analysis similar to one of Tversky and Kahneman (1974). We ask 105 undergraduate students to estimate the fraction of the area in Germany that is used for agriculture. We decide for this question based on two criteria: First, its answer should be unknown to the subjects so that they in fact have to guess the correct percentage and secondly it should be easily understandable for the participants in order to avoid misunderstandings. In the test, the participants have to answer two questions. In the first one, they are asked to estimate whether the fraction is smaller or larger than a specific number, which is given to them and which varies across the students. The specific number represents the initial value and is 20% for the first group, 50% for the second and 70% for the third group. In the second question, they have to estimate the percentage. In order to ensure that the results are not biased by a group dynamic, we make sure that a student's estimation is not influenced by her neighbor by first leaving enough space between the subjects and secondly by not giving the same initial value to students sitting next to each other. Furthermore, as the test is anonymous and as we do not offer payoffs for accuracy, the risk that decisions are made based on other criteria than the own estimate is quite small.

The core finding of the test is that the arbitrarily numbers have a substantial effect on the estimates. The median estimate for the group that obtains 20% as percentage number is 31% while it is 47% for the group with an initial value of 50%. Participants that have to evaluate whether the percentage is smaller or larger than 70% have a median estimate of 56%. When the estimates are compared pair wise between the groups, the differences are highly significant with a p-value below 0.01.

The Industry-52-week High Strategy

As documented, momentum strategies are profitable for individual stocks. There is also some evidence that the momentum effect is present at industry level (Moskowitz and Grinblatt, 1999, Nijman et al., 2004). Strategies that buy the top industries and sell the bottom industries based on the past returns over the ranking period generate significant monthly profits. Since momentum and the 52-week high strategies seem to be related, it is worth to examine whether the 52-week high strategy is also profitable at industry level. This test is that powerful as it tests both relationships, that between the momentum and the 52-week high strategy and that between the 52-week high strategy and anchoring. Evidence for both relationships is obtained by comparing the returns of the momentum and the 52-week high strategy at individual stock level and at industry level. Four potential findings with different interpretations are possible: First, the industry-52-week high strategy dominates and explains the profitability of the 52-week high strategy at individual stock level. This finding presents clear evidence against the anchoring hypothesis, which states that traders evaluate the impact on news based on a reference point. It implies that the reference point is a piece of information that is readily available to traders. This is true for the 52-week high of an individual stock as it is reported in nearly all newspapers publishing stock prices. However, this is not the case for the 52-week high of an industry. This piece of information is not available and needs to be calculated manually. Therefore, the 52-week high price of an industry cannot be considered as an easily obtainable piece of information. Consequently, the industry-52-week high strategy should not be substantially profitable or at least not dominate the 52-week high strategy of individual stocks if anchoring explains its profitability.

Secondly, the 52-week high strategy is not profitable at industry level. This could imply that the 52-week high is not able to explain momentum as it has not the capability to explain its profitability in industry portfolios. Yet, it could also indicate that momentum and industry momentum are independent phenomena with different drivers (due to their similar ranking criterion, this interpretation seems rather unrealistic). Furthermore, this second potential finding does not represent any evidence against anchoring being the driver of the 52-week high as the nearness to the 52-week high price of an industry is (at least) not a better predictor of future returns than the 52-week high price of individual stocks which is an easily available piece of information.

Third, the profits to the industry-52-week high strategy are not larger than those to the 52-week high but different in magnitude compared to the industry momentum returns. As above, since the industry-52-week high does not dominate the 52-week high, this finding does not present evidence against anchoring as the driver of the 52-week high. It also implies that there is a close link between the 52-week high and the momentum strategy, as the profits of the strategies are similar both at individual stock level and in industry portfolios.

Fourth, the profits to the industry-52-week high strategy are not larger than those of the 52-week high but similar to the industry momentum profits. As in the third potential finding, this does not contradict the anchoring idea. Concerning the link between momentum and the 52-week high, the finding points on a close relation between the two strategies as their profits are similar both at individual stock and at industry level.

Only the fourth potential finding presents support for the hypothesis that anchoring explains the stock price momentum. All other potential findings are either at odds with anchoring being the driver of the 52-week high or present evidence against a close relationship between the 52-week high and the momentum strategy. The construction of the industry-52-week high strategy resembles that of the 52-week high for individual stocks. Yet, since for an industry, neither a price nor a 52-week high exist, we calculate the price-52-week high ratio (PHR) for each industry. Therefore, the weighted price of all n_j stocks belonging to industry j at the beginning of month $t-1$ is divided by the weighted 52-week high of all n_j stocks (the highest price of a stock over one year ending at the beginning of month $t-1$). Within industry j, the n_j stocks are weighted based on the factor $\omega_{i,t-1}$. If stocks are value-weighted within the industries, it represents the fraction of stock i's market value in $t-1$ to the total market value of industry j in $t-1$. If however, stocks are equal-weighted within an industry, $\omega_{i,t-1}$ is equal to one divided by n_j:

$$PHR_{j,t-1}^{52} = \frac{\sum_{i=1}^{n_j} \omega_{i,t-1} P_{i,t-1}}{\sum_{i=1}^{n_j} \omega_{i,t-1} H_{i,t-1}^{52}} \tag{4}$$

By construction, the PHR measure can take positive values not larger than 1: if all stocks of industry j trade exactly on their 52-week high, PHR is one, if industry j's stocks have a price that is extremely far from their one year high, PHR takes a value close to zero. The strategy is long in stocks that belong to the 30% of industries with the highest PHR value and short in stocks that belong to 30% of industries with the lowest PHR measure. The portfolios are held over a holding period of six months. Between the ranking time and the holding period, a skip period of one month is included.

In order to examine the industry-52-week high strategy, we classify stocks into one of 20 industries according to the FTSE Economic and Industrial sector criterion of Datastream. We decide for this industry measure for three reasons. First, Moskowitz and Grinblatt (1999) also classify stocks into 20 industry categories when examining industry momentum. Secondly, dividing stocks into more than 20 industry groups would imply a smaller number of stocks per industry. This would increase the risk that results are driven by idiosyncratic effects due to lack of diversification. A broader measure in opposite would reduce the number of industries that is included in the winner and loser portfolios. To ensure that the industry portfolios are well diversified and have only negligible firm-specific risk, we reduce our sample period to the interval between March 1988 and March 2008. This is necessary since the industry-52-week high strategy has stricter requirements on data availability than the momentum and the 52-week high strategies as a sufficient number of stocks is necessary for *each* industry to ensure diversification. Since the number of stocks is small for some industries between 1980 and 1988, we ignore this period in the subsequent research. Additionally, each month, only industry that contain 15 stocks or more are

considered. Table 7 gives a description of the industry portfolios and a summary on them. There are some differences in the average monthly returns of industry portfolios when stocks are value- and equal-weighted within an industry. Therefore, the following tests are computed for both value-weighted and equal-weighted industry portfolios.

Table 7: Description of Industries, March 1988 – March 2008

Industry	Value-weighted		Equal-weighted		Avg. % of	Avg. No. of	Average
	Mean	St. Dev.	Mean	St. Dev.	Market Cap.	Stocks	PHR
Automobiles & Parts	0.15	3.15	0.12	2.66	3.98%	30.76	0.92
Banks	0.50	2.74	0.17	1.70	17.01%	83.16	0.90
Basic Resources	0.61	3.52	0.44	2.86	2.47%	52.47	0.94
Chemicals	0.21	2.41	0.33	1.91	3.37%	29.27	0.95
Construct. & Material	0.24	2.67	0.06	2.47	0.85%	35.25	0.95
Financial Services	0.64	3.44	0.21	2.62	5.87%	48.92	0.93
Food & Beverage	0.66	2.07	0.21	1.50	0.69%	38.74	0.94
Healthcare	0.73	2.63	0.67	2.74	8.80%	72.20	0.93
Ind. Goods & Services	0.50	3.11	0.17	2.43	8.09%	154.26	0.92
Insurance	0.23	2.99	0.06	2.48	5.36%	49.84	0.93
Media	0.18	3.79	0.17	4.01	4.19%	37.86	0.89
Oil & Gas	0.65	2.74	0.43	2.85	3.63%	30.69	0.89
Pers & Household Goods	0.34	2.42	0.03	2.07	4.51%	57.49	0.92
Real Estate	0.58	2.64	0.18	2.09	0.95%	34.12	0.95
Retail	0.27	2.67	0.11	2.64	3.25%	46.58	0.92
Technology	0.72	5.02	0.44	4.36	8.43%	139.70	0.89
Telecommunications	0.50	3.53	0.20	3.54	12.21%	33.75	0.90
Travel & Leisure	0.24	2.89	0.13	2.36	1.71%	28.10	0.91
Utilities	0.52	1.82	0.24	1.79	4.63%	31.57	0.95

The table represents summary statistics for 19 out of 20 industries. "Other" is excluded, as it does not contain more than two stocks in most months. The first columns represent the average returns in excess of the Datastream Germany Price Index and the standard deviations of value weighted industry portfolios, while the second ones show the mean and standard deviation of equally weighted industry portfolios. Also reported are the average percentages of total market capitalization, the average number of stocks assigned to each industry and the average PHR (value-weighted) for each industry over the sample period.

Table 8 reports the profits to the industry-52-week high and to the industry momentum strategy. Panel A documents the profits to the strategies if stocks are value-weighted within an industry and Panel B if stocks are equal-weighted within an industry. The industry-52-week high strategy generates significantly positive returns both when stocks are value-weighted and equal-weighted within an industry. The strategy remains profitable after the exclusion of the turn-of-the-year effect (line 4 in Panel A and B) and/or of the dot-com bubble (line 6 in Panel A and B). However, compared to the 52-week high strategy for individual stocks, the industry-52-week high is substantially less profitable. The 52-week high with a holding period of six months yields a monthly profit of 0.59% for the total sample, 0.75% for the period except the dot-com bubble and 0.80% for non-January returns between March 1 1988 and March 1 2008 (not reported in the tables). The industry-52-week high portfolios generate substantially lower returns with an average profit of 0.32% for the total sample, 0.44% for the non-dot-com bubble period and 0.44% for non-January months (when stocks are value-weighting within industries). To be very precise, we also compare the 52-week high strategy to the industry-52-week high strategy when stocks are equal-weighted within the total winner and loser portfolios (line 8). This ensures that only the ranking criteria of the respective strategies and not the employed portfolio weighting method are compared. But even by giving them the same weight within the winner and loser portfolios, the industry-52-week high strategy is still not as profitable as the 52-week high strategy. Furthermore, industry momentum does not outperfom the industry-52-week high strategy. Both yield similar profits during the total sample period. For equal-weighted industry portfolios, the difference is 0.03%, for value-weighted portfolios it is only 0.02%. The difference in the profitability is larger if the dot-com bubble period or the turn-of-the-year effect is excluded, but still below 0.10%.

Table 8: Profitability of Industry Strategies

	Wi	Lo	Wi-Lo	t-stat
		Panel A: Value-weighting		
Industry Momentum (6/1/6)	0.0058	0.0024	0.0034	(1.73)*
Industry-52-Week High	0.0051	0.0019	0.0032	(1.67)*
Industry Momentum (6/1/6) ex. Jan	0.0053	0.0016	0.0038	(1.83)*
Industry-52-Week High ex. Jan	0.0048	0.0004	0.0044	(2.17)**
Industry Momentum (6/1/6) ex. 10/98-2/00	0.0062	0.0028	0.0036	(1.81)*
Industry-52-Week High ex. 10/98-2/00	0.0058	0.0013	0.0044	(2.10)**
		Panel B: Equal-weighting		
Industry Momentum (6/1/6)	0.0039	-0.0004	0.0043	(2.27)**
Industry-52-Week High	0.0033	-0.0007	0.0040	(1.72)*
Industry Momentum (6/1/6) ex. Jan	0.003	-0.0024	0.0053	(2.51)**
Industry-52-Week High ex. Jan	0.0029	-0.0025	0.0054	(2.52)**
Industry Momentum (6/1/6) ex. 10/98-2/00	0.0032	-0.0011	0.0044	(2.17)**
Industry-52-Week High ex. 10/98-2/00	0.0030	-0.0025	0.0054	(2.57)***
Ind. Mom. (6/1/6) (Equal-weighted portfolios)	0.0038	0.0007	0.0033	(1.75)*
Ind. 52-week High (Equal-weighted portfolios)	0.0038	0.0005	0.0034	(1.72)*

*This table reports the average monthly portfolio returns from March 1 1988 to March 1 2008, for industry momentum and industry-52-week high strategies. In Panel A, stocks are value-weighted within an industry while stocks are equal-weighted within an industry in Panel B. For the ranking, all German stocks on Datastream with a price larger than 1 Euro and a market value above 50 Million Euro are considered; t-statistics (two-tailed) are reported in parentheses. *;**;*** are the significance levels on the 10%, 5% and 1% level.*

In summary, the momentum and the 52-week high strategy seem to be linked closely together. Both, at individual stock level and across industry portfolios, the returns to the strategies are of similar magnitude. Furthermore, since the industry-52-week high does not dominate the 52-week high strategy for individual stocks, we cannot reject the hypothesis that the 52-week high (and hence momentum) can be explained by anchoring. Moreover, we do not find any evidence that industry momentum can explain the profitability of individual momentum which is documented in Moskowitz and Grinblatt (1999) for the U.S. market. In Table 8, the industry momentum portfolios yield substantially lower returns than individual momentum portfolios. This finding is consistent with Nijman et al. (2004) documenting that industry momentum plays only a minor role in explaining the individual momentum effect for European stocks.

The x-month High Strategy

As a second test for anchoring as explanation for the 52-week high and hence for momentum profits, we examine whether the predictive power of the PHR_i^{52} ranking criterion is improved when we replace the 52-week High price by the x-month high price. We define the x-month high price as the highest price of a stock over the past x months. This test allows us to examine two implications of our core hypothesis. First, it is tested whether the 52-week high is indeed driven by the described behavioral phenomenon. While many newspapers publish the 52-week high price, this is not the case for most x-month high prices of a stock. As this information is not easily available to traders, they should not be able to use it as a reference point against which they evaluate the impact of news. Therefore, according to the anchoring hypothesis, strategies should not dominate the 52-week high strategy that rank stocks based on their nearness to an x-month high, which is not widely published. If however, an x-month high strategy dominates the 52-week high, anchoring would not be the right explanation for the 52-week high (and momentum) profits. Secondly, this test can also be used to examine whether the 52-week high price is the reference point used by traders that suffer from the anchoring bias. For example, some newspapers do also publish the 1-month high or the 3-month high of a stock. If the 1-month high strategy or the 3-month high strategy dominates the 52-week high, anchoring cannot be rejected although the 52-week high price might not be the correct reference point. The x-month high strategy is constructed similarly to the 52-week high strategy except for denominator. It is represented by $H_{i,t-1}^{x}$, the highest price of stock i over a period of x month length that ends at the beginning of month $t-1$:

$$PHR_i^x = \frac{P_{i,t-1}}{H_{i,t-1}^x}. \quad (5)$$

$H_{i,t-1}^x$ is constructed by using daily data and measuring the maximum intraday high price for stock i during the x-month period.

Table 9 documents the profitability of x-month high strategies during the total sample (column A), for all months except January (column B) and for all months except during the dot-com bubble. The 52-week high strategy dominates all x-month high strategies. This strongly supports the anchoring hypothesis since the biggest difference between most x-month high prices and the 52-week high price is the availability of the information. Therefore, the 52-week high qualifies as reference point while most x-month high measures do not. Beside the 52-week high, strategies that employ the highest price of a stock over a period close to one year yield the highest returns. Figure 2 illustrates this pattern and shows the monthly average returns of the x-month high strategies graphically. It documents that profits are inverted u-shaped. The closer (further) the length of the period over which the highest price of a stock is measured with respect to the one year high, the smaller (larger) is the difference between the monthly returns. This is not surprising, as with a high probability, the maximum price of a stock over a period close to one year is identical to the 52-week high price. For example, the 1-month high is only equal to the 52-week high if the highest price over the past year is reached within the previous month. In opposite, the chance that the 52-week high and the 9-month high are identical is larger as they have 9 months in common.

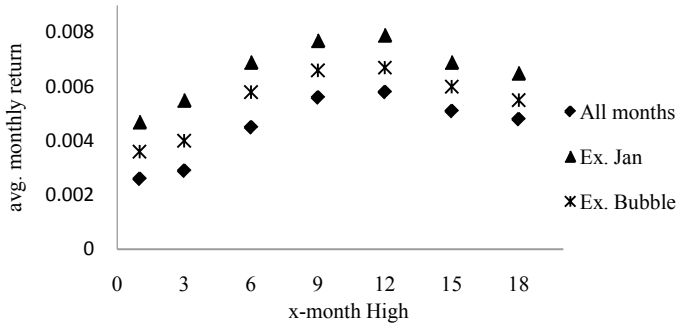
Table 9: Profitability of the x-month High Strategy

	All Months			**ex Jan.**			**ex Dot-com Bubble**		
	Wi	Lo	Wi-Lo	Wi	Lo	Wi-Lo	Wi	Lo	Wi-Lo
1-month High Strategy	0.001	-	0.0026	0.001	-	0.0047**	0.001	-	0.0036**
			(1.48)			(2.45)			(1.94)
3-month High Strategy	0.001	-	0.0029	0.001	-	0.0055**	0.001	-	0.0040
			(1.14)			(1.91)			(1.55)
6-month High Strategy	0.002	-	0.0045	0.002	-	0.0069**	0.002	-	0.0058**
			(1.58)			(2.44)			(1.95)
9-month High Strategy	0.003	-	0.0056**	0.003	-	0.0077***	0.002	-	0.0066**
			(2.07)			(2.91)			(2.43)
52-week High Strategy	0.003	-	0.0058**	0.002	-	0.0079***	0.004	-	0.0067**
			(2.24)			(3.08)			(2.50)
15-month High	0.002	-	0.0051*	0.001	-	0.0069***	0.002	-	0.0060**
			(1.94)			(2.70)			(2.24)
18-month High	0.002	-	0.0048*	0.002	-	0.0065***	0.002	-	0.0055**
			(1.90)			(2.64)			(1.82)

*This table reports the average monthly portfolio returns in excess of the Datastream Germany Price Index average return- The sample period is from February 1981 through March 2008 for all x-month high strategies except for the 15-month and 18-month high, which start in May 1980 and August 1980 respectively. For the ranking, all German stocks on Datastream with a price larger than one Euro and a market value above 50 Million Euro are considered; t-statistics (two-tailed) are reported in parentheses. *;**;*** are the significance levels on the 10%, 5% and 1% level.*

Furthermore, given that anchoring explains the 52-week high profits, other x-month high prices do not qualify as potential reference points used by traders. Beside the 52-week high prices, some newspapers do also publish the 1-month high prices or the 3-month high prices. However, strategies that use these pieces of information in their ranking criterion are less profitable than the 52-week high and they are not substantially more profitable than other x-month high strategies. In summary, these findings support anchoring as the explanation for the profits of the 52-week high (and the momentum) strategy and secondly present evidence for the 52-week high as the reference point used by investors.

Figure 2: Monthly Profits to the x-month High Strategy



The graph illustrates the average monthly returns of different x-month high strategies. On the x-axis, the number of months is shown over which the highest price for each stock is measured and on the y-axis, the average monthly return is documented. For each x-month high strategy, the average return for the total period, the average return for all months except January and for the total period except the dot-com bubble period is illustrated.

The Profitability of the 52-week High Strategy during the Dot-com Bubble

As a third test for anchoring being the driver of the 52-week high, we measure the profitability of the 52-week high strategy during the emergence of the dot-com bubble. There is a vast of literature, which documents that bubbles are caused by irrational behavior of subjects, for example herding - the tendency of subjects of being influenced by others (see, e.g. Hirshleifer and Hong Teoh (2003) for an overview) or overreaction (e.g. Scheinkman and Xiong, 2003, Hong et al., 2006). This argumentation implies that subjects change their behavior during a bubble. When herding or overreacting to private news, people form their estimates about future stock price based on other criteria than a reference point. This implies that the 52-week high strategy should not be profitable during the dot-com phase if anchoring is in fact its driver.

As mentioned above, we define October 1, 1998 as beginning and March 1, 2000 as ending date of the dot-com bubble. During that period, the 52-week high portfolios generate substantially negative returns for all examined holding periods (between -0.80% and -1.30% per month on average). Hence, while the 52-week high ranking criterion seems to work well in predicting future stock returns outside the dot-com bubble. This is not the case within this time period. The difference in the profitability of the 52-week high in and outside the dot-com bubble indicates that the driver of this strategy disappeared during the time. One explanation could be the behavior of investors: while they normally use the 52-week high as orientation in evaluating news and suffer from anchoring, they form their estimations about future stock prices based on other criteria during the bubble (e.g. herding). This might be viewed as evidence that the 52-week high is driven by people's non-rational behavior.

The 52-week Low Price – An Alternative Anchor?

Beside the 52-week high price, investors could also use the 52-week low price of a stock as a reference point as this information is also easily available. The 52-week low reports the lowest price of a stock within the past 52 weeks. Therefore, we also examine a strategy based on the 52-week low and examine a strategy that buys 30% of stocks of which the price is furthest away from their 52-week low and sells 30% of stocks with a price closest to the 52-week low. This strategy is substantially less profitable than the 52-week high. For a holding period of six months, the 52-week low portfolios generate an average monthly return of 0.39 (t-statistic: 2.46). The profitability of the strategy is not surprising as it partly

replicates the 52-week high strategy: The 52-week low portfolios are long in stocks with a price far from the 52-week low and short in stocks with a price close to the 52-week low. Stocks that are far from the 52-week low are often those that are close to their 52-week high and stocks that are close to their 52-week low are often those with a price far from the 52-week high. This can also be observed in the data. Over the total sample period, 46.7% (47.0%) of stocks in the winner (loser) portfolio based on the 52-week high criterion are also in the winner (loser) portfolio based on the 52-week low criterion. Hence, the 52-week low strategy is partially long in stocks that are close to the 52-week high and partially short in stocks with a price far from the 52-week high. This replication is incomplete as the 52-week high strategy generates a monthly return that is about 49% higher than the 52-week low strategy. If each strategy is only allowed to include stocks that are not considered in the same portfolio by the other strategy, the 52-week high strategy yields higher returns than the 52-week low. We come to this conclusion as the 52-week low strategy yields lower returns than the 52-week high although the number of stocks that are considered winners or losers commonly by both strategies is large. If we do not allow 52-week high winners and losers to be included into the winner and loser portfolios of the 52-week low strategy, the latter strategy loses its profitability and generates an insignificant average monthly return of 0.14% (t-stat 0.56). Hence, the 52-week low profits seem to be driven by the 52-week high criterion.

ROBUSTNESS TESTS

To ensure that our findings are not influenced by illiquid stocks, we recalculate momentum and 52-week high returns and only considers stocks for the ranking that are traded continuously in all six months before the ranking date. This approach goes back to Forner and Marhuenda (2003). Table 10 reports the results for the (6/1/6) momentum and the 52-week high strategy with a holding period of six months. It shows that the profits to the strategies are only slightly different under this assumption. Hence, our requirements for stocks to be included in the sample (stocks with a market value larger than 50 million Euro and a price above one Euro) seem to be sufficient.

To further limit the risk of obtaining biased results due to data mining, we follow August et al. (2000) and Göppl and Schütz (1992) and only include those stocks that are traded in at least 50 percent of all months of the sample period. This limitation also does not alter our results and conclusions (not reported in the tables).

Table 10: The Strategies' Profitability for Highly Liquid Stocks

	Stocks traded continuously			**All Stocks**		
	Wi	Lo	Wi-Lo	Wi	Lo	Wi-Lo
Mom (6/1/6)	0.0030	-0.0024	0.0053***	0.0034	-0.0022	0.0056***
			(2.89)			(2.75)
52-week High	0.0029	-0.0023	0.0052***	0.0033	-0.0025	0.0058**
			(3.63)			(2.24)
Mom (6/1/6) ex Jan.	0.0019	-0.0039	0.0058***	0.0023	-0.0039	0.0062***
			(3.28)			(3.13)
52-week High ex Jan.	0.0026	-0.0047	0.0073***	0.0025	-0.0046	0.0071***
			(3.95)			(2.91)
Mom (6/1/6) ex Dot-com Bubble	0.0040	-0.0015	0.0054***	0.0032	-0.0024	0.0057***
			(3.68)			(2.63)
52-week High ex Dot-com Bubble	0.0037	-0.0019	0.0056***	0.0040	-0.0028	0.0067**
			(3.87)			(2.50)

This table reports the average monthly portfolio returns in excess of the Datastream Germany Price Index average return from February 1981 through March 2008, for the (6/1/6) *momentum strategy and for the 52-week high strategy. In the left column, monthly returns for strategies are reported when only stocks are considered for ranking with a price larger than one Euro, a market value above 50 million Euro and which are traded continuously in all six months before the ranking date. In the right columns, stocks are considered with a price larger than one Euro and a market value above 50 Million Euro for the ranking. The data contains all German stocks on Datastream; t-statistics (two-tailed) are reported in parentheses. *;**;*** are the significance levels on the 10%, 5% and 1% level.*

In order to ensure that the dot-com bubble period does not heavily influence our results, we report monthly returns for all months except those during October 1998 and February 2000. Another way to control for this short episode in finance history is to measure profits of momentum and 52-week high strategies when technology and telecommunication stocks are excluded from the sample. These stocks are most heavily influenced by the emergence and the collapse of the dot-com bubble. Yet, the exclusion does not alter our findings: the (6/1/6) momentum strategy generates an average monthly return of 0.53%, which is only slightly smaller than 0.56% for all stocks; the profitability of the 52-week high strategy is (with 0.57%) almost identical compared to 0.58% for all stocks.

The last robustness check relates to stocks delisted during the holding period. As in Forner (2003), this study assumes that the proceeds of the delisted stocks are at once equally invested in the remaining stocks. To ensure that this does not influence the results we use the procedure of Agyei-Ampomah (2003) and assume a return of zero if a stock is delisted. Yet, as the percentage of stocks that are delisted during each ranking period is small (results available upon request), this assumption does not change our results.

SUMMARY AND CONCLUSIONS

This work relates to the behavioral finance literature and tests the hypothesis whether momentum can be explained by anchoring – a behavioral heuristic documented by Kahneman et al. (1982) which states that subjects focus too much on a reference point when forming estimates. We survey this behavior in an experimental study similar to that in Kahneman (1982) and ask 105 undergraduate students to estimate a quantity (e.g. the part of the area in Germany that is used for agriculture) in relation to a randomly chosen number. Subjects with a higher (lower) starting number have on average a higher (lower) estimate.

In order to test whether momentum can be explained by anchoring, we examine if momentum is dominated by George and Hwang (2004)'s 52-week high strategy and whether anchoring explains the 52-week high profits. Especially the second relationship is important. It decides whether both strategies represent a serious challenge to the Efficiency Market Hypothesis (EMH). If the impact of non-rational behavior on stock prices can be credibly documented, the assumption of full rationality is violated – a key assumption of the EMH. Up to our knowledge, we are the first to test empirically whether anchoring qualifies as the driver of the 52-week high strategy. With three different tests, we find support for the 52-week high price of a stock being used as a reference point by investors against which they evaluate the impact of news on the stock price.

Moreover, this work examines the link between momentum and the 52-week high and cannot reject the hypothesis that momentum is not dominated by the 52-week high. To show this, we use two sorting and one regression approach. This is important, as all tests face some weaknesses and a dominant method to compare the two strategies does not exist. Further evidence for a close relationship between the 52-week high and momentum is found as the two strategies yield similar returns on both individual stock level and in industry portfolios.

Beside our core findings, this paper also provides some interesting insights for non-U.S. stock data. Using German data, we show that the momentum effect is still present after 2001, which is doubted by some papers. Momentum is also profitable at industry level although, in opposite to the U.S market, the average monthly return of industry momentum is substantially smaller than the individual momentum profits. We also document that the 52-week high strategy is profitable in another market than the U.S. and largely dominates momentum.

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