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# **Momentum Investment Strategy in Finnish Stock Market During Economic Boom and Recession**

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# 1 Introduction

A good investment opportunity always interests people. Nowadays more investment strategies are used in order to try to exceed the market rate of return that contradict the classical theories such as the Efficient Market Hypothesis. In order to explain these anomalies many researchers have started to include behavioral attributes to old theories. This field of finance is called behavioral finance. The momentum effect has attracted considerable attention because the application of momentum strategy is simple and its consistent profitability poses a strong challenge to the theory of asset pricing.

Several papers have studied momentum strategy. Fama and French (1996) used in their studies the method of buying short-term winners and short-selling short-term losers. Jegadeesh and Titman (2001) re-examine the momentum strategy, initially cited in their 1993 paper. Their P1-P10 momentum strategy appears to generate statistically significant abnormal return. Hong and Stein (1999) in their model to explain short-term momentum and long horizon return reversal, have two groups of investors. Noise traders base their decisions on past returns, while rational traders use “fundamentals news” about the cash flows. Grinblatt, Titman and Wermers (1995) showed in their study that 77% of mutual funds are momentum investors and that on average momentum funds realized significantly better performance than other funds. More recent studies by Balsara et al. (2006) indicate that volatility and the trading volume have an effect on the momentum strategy. They found that buying low volatility (or volume) past losers and short-selling low volume (or volatility) winners generates a positive net return. And also buying high volatility past winners and short-selling high volatility past losers generates a positive net return. Also Scowcroft and Sefton (2006) in their paper “Understanding Momentum”, state that price momentum is driven largely by industry momentum, not individual stock momentum.

This paper analyses the use of momentum strategy in Finnish stock market. Two stock portfolios of 10 stocks each are created based on the performance of the stocks over the previous month. The two portfolios are labeled Winner and Loser portfolio. Winner portfolio contains the 10 best performed stocks and Loser portfolio contains the 10 worst performed stocks. The holding period of the portfolios is six months. The construction of the Winner portfolio is funded by short-selling the Loser portfolio stocks. After the holding period the return of the Momentum portfolio is compared to the return of the market portfolio and the results are analyzed. The overall investment period is from the beginning of 2001 to the end of June 2006. This period includes both an economic recession and boom. One goal is to determine whether the economical conditions influence the use of momentum strategy in the Finnish stock market.

## **2 Theoretical background**

Structuring a stock portfolio can be done in various ways. When you rank a group of stocks based on the size of their returns over some time period you can use momentum strategy or contrarian strategy. Momentum investors seek out for purchase stocks that have recently risen significantly in price on the belief that they will continue to rise due to an upward shift in their demand curve. If stocks have recently fallen significantly in price, they are sold on the belief that their demand curves have shifted downward.

Contrarian investors do just the opposite of what most other investors are doing in the market. They buy stocks that others have shunned and think of as losers, and they sell stocks that others have feverishly pursued and think of as winners. They do so in the belief that investors tend to overreact to news. That is, stocks that have plunged in price because of some recent piece of bad news are thought to have fallen too far in price. Similarly, stocks that have risen rapidly in price due to some recent piece of good news are thought to have risen too far in price. Because of these overreactions investors tend to buy or sell these stocks and drive the price

towards the fundamental value of the stock (Sharpe et al., 1995). A crucial difference between these two strategies lies in the time period over which you decide to form your portfolio and the length of time you hold the portfolio. A “value-growth” investment scenario buys long-term losers and short-sells long-term winners – it is, therefore, a contrarian or reversal strategy and relies for its success on long horizon mean reversion in stock returns. The evidence for mean reversion could be based on univariate autoregressions or Fama-French’s long horizon returns or variance ratio statistics (Cuthbertson, 2004). Before continuing to implementing momentum strategies it is of great importance to understand the idea behind efficient market hypothesis.

## ***2.1 Efficient market hypothesis***

Beyond the normal utility maximizing agents, the efficient market hypothesis requires that agents have rational expectations; that on average the population is correct and whenever new relevant information appears, the agents update their expectations appropriately. Hence, individuals do not have different comparative advantages in the acquisition of information. It follows that in such a world there should be no opportunities for making a return on a stock that is in excess of a fair payment for the riskiness of that stock (Cuthbertson, 2004). In short, abnormal profits from trading should be zero. There are three common forms in which the efficient market hypothesis is commonly stated — weak-form efficiency, semi strong-form efficiency and strong-form efficiency, each of which have different implications for how markets work.

### **2.1.1 Weak-form efficiency**

In the weak-form efficiency no excess returns can be earned by using investment strategies based on historical share prices or other financial

data. Weak-form efficiency implies that Technical analysis techniques will not be able to consistently produce excess returns, though some forms of fundamental analysis may still provide excess returns. Fundamental analysis maintains that markets may misprice a security in the short run but that the "correct" price will eventually be reached. Profits can be made by trading the mispriced security and then waiting for the market to recognize its "mistake" and reprice the security. In a weak-form efficient market current share prices are the best, unbiased, estimate of the value of the security. Theoretical in nature, weak form efficiency advocates assert that fundamental analysis can be used to identify stocks that are undervalued and overvalued. Therefore, keen investors looking for profitable companies can earn profits by researching financial statements.

### **2.1.2 Semi strong-form efficiency**

In semi strong-form efficiency share prices adjust within an arbitrarily small but finite amount of time and in an unbiased fashion to publicly available new information, so that no excess returns can be earned by trading on that information. Semi strong-form efficiency implies that Fundamental analysis techniques will not be able to reliably produce excess returns.

### **2.1.3 Strong-form efficiency**

In strong-form efficiency the share prices reflect all information and no one can earn excess returns. If there are legal barriers to private information becoming public, as with insider trading laws, strong-form efficiency is impossible, except in the case where the laws are universally ignored.

Today the efficiency categories can be divided in such ways that the weak-form efficiency concerns the predictability of returns. The semi strong-form efficiency is understood as event studies and how the stock

prices react to new public information. The strong-form efficiency is about testing private information (Vaihekoski, 2004). By the start of the twenty-first century, the intellectual dominance of the efficient market hypothesis had become far less universal. Many financial economists and statisticians began to believe that stock prices are at least partially predictable. A new breed of economists emphasized psychological and behavioral elements of stock-price determination, and they came to believe that future stock prices are somewhat predictable on the basis of past stock price patterns as well as certain “fundamental” valuation metrics (Malkiel, 2005).

## ***2.2 Behavioral Finance***

Behavioral finance is the paradigm where financial markets are studied using models that are less narrow than those based on expected utility theory and arbitrage assumptions. Specifically, behavioral finance has two building blocks: cognitive psychology and the limits to arbitrage. Cognitive refers to how people think. There is a huge psychology literature documenting that people make systematic errors in the way that they think: they are overconfident, they put too much weight on recent experience, etc (Ritter, 2003). Their preferences may also create distortions. Behavioral finance uses this body of knowledge, rather than taking the arrogant approach that it should be ignored. Limits to arbitrage refer to predicting in what circumstances arbitrage forces will be effective, and when they won't be.

Behavioral finance uses models in which some agents are not fully rational, either because of preferences or because of mistaken beliefs. Mistaken beliefs arise because people are bad Bayesians. Modern finance has as a building block the Efficient Markets Hypothesis. The EMH argues that competition between investors seeking abnormal profits drives prices to their “correct” value. The EMH does not assume that all investors are rational, but it does assume that markets are rational. The EMH does not assume that markets can foresee the future, but it does assume that mar-

kets make unbiased forecasts of the future. In contrast, behavioral finance assumes that, in some circumstances, financial markets are informationally inefficient (Ritter, 2003).

If it is easy to take positions (shorting overvalued stocks or buying undervalued stocks) and these misvaluations are certain to be corrected over a short period, then “arbitrageurs” will take positions and eliminate these mispricings before they become large. But if it is difficult to take these positions, due to short sales constraints, for instance, or if there is no guarantee that the mispricing will be corrected within a reasonable timeframe, then arbitrage will fail to correct the mispricing. Indeed, arbitrageurs may even choose to avoid the markets where the mispricing is most severe, because the risks are too great.

### **2.2.1 Cognitive Biases**

Cognitive psychologists have documented many patterns regarding how people behave. Some of these patterns are as follows:

#### *Heuristics*

Heuristics, or rules of thumb, make decision-making easier. But they can sometimes lead to biases, especially when things change. These can lead to suboptimal investment decisions. When faced with  $N$  choices for how to invest retirement money, many people allocate using the  $1/N$  rule. If there are three funds, one-third goes into each. If two are stock funds, two-thirds goes into equities. If one of the three is a stock fund, one-third goes into equities (Ritter, 2003).

#### *Overconfidence*

People are overconfident about their abilities. Entrepreneurs are especially likely to be overconfident. Overconfidence manifests itself in a number of ways. One example is too little diversification, because of a tendency to invest too much in what one is familiar with. Men tend to be more overconfident than women. This manifests itself in many ways, including trading behavior (Barber & Odean, 2001).



### *Mental Accounting*

People sometimes separate decisions that should, in principle, be combined. For example, many people have a household budget for food, and a household budget for entertaining. At home, where the food budget is present, they will not eat lobster or shrimp because they are much more expensive than a fish casserole. But in a restaurant, they will order lobster and shrimp even though the cost is much higher than a simple fish dinner. If they instead ate lobster and shrimp at home, and the simple fish in a restaurant, they could save money. But because they are thinking separately about restaurant meals and food at home, they choose to limit their food at home (Barber & Odean 2001).

### *Framing*

Framing is the notion that how a concept is presented to individuals matters. For example, restaurants may advertise “early-bird” specials or “after-theatre” discounts, but they never use peak-period “surcharges.” They get more business if people feel they are getting a discount at off-peak times rather than paying a surcharge at peak periods, even if the prices are identical (Barber & Odean 2001).

### *Representativeness*

People underweight long-term averages. People tend to put too much weight on recent experience. This is sometimes known as the “law of small numbers.”

### *Conservatism*

When things change, people tend to be slow to pick up on the changes. In other words, they anchor on the ways things have normally been.

### *Disposition effect*

The disposition effect refers to the pattern that people avoid realizing losses and seek to realize gains. The disposition effect manifests itself in lots of small gains being realized, and few small losses.

One of the major criticisms of behavioral finance is that by choosing which bias to emphasize, one can predict either underreaction or overreaction. In other words, one can find a story to fit the facts to afterwards explain some puzzling phenomenon.

## 2.2.2 The limits to arbitrage

Misvaluations of financial assets are common, but it is not easy to reliably make abnormal profits off of these misvaluations. Misvaluations are of two types: those that are recurrent or arbitrageable, and those that are nonrepeating and long-term in nature (Shleifer & Vishny, 1997). For the recurrent misvaluations, trading strategies can reliably make money. For the long-term, nonrepeating misvaluations, it is impossible in real time to identify the peaks until they have passed.

## 3 Testing Momentum strategy

In this test is used daily Finnish stock market data from years 2000 – 2006. The market index is Hex all share index and risk free rate is 3 month euribor. Two portfolios are constructed and labelled Winner and Loser portfolio. The stocks are picked based on their one month performance prior to the time of constructing the portfolios. The weight of the stocks in the portfolios is equal. Winner portfolio contains the ten best performed stocks and Loser portfolio contains the bottom ten stocks. The holding period is six months, so the portfolios are updated twice a year. The construction of the Winner portfolio is funded by short-selling equal amount of Loser portfolio stocks. It follows that the return of this strategy is the Winner portfolio returns minus Loser portfolio returns.

### Equation 1

$$r_{mp} = r_{wp} - r_{lp},$$

where  $r_{mp}$  is the return of Momentum portfolio,  $r_{wp}$  is the return of Winner portfolio and  $r_{lp}$  is the return of Loser portfolio.

This implies that there are no transaction costs. In real life the transaction costs and construction costs would dilute the effective rate of return. Also possible restrictions on short-sales are ignored. All returns are continuously compounded. The time frame of this study consists of very extreme economical conditions such as the bursting of the IT-bubble and its after-

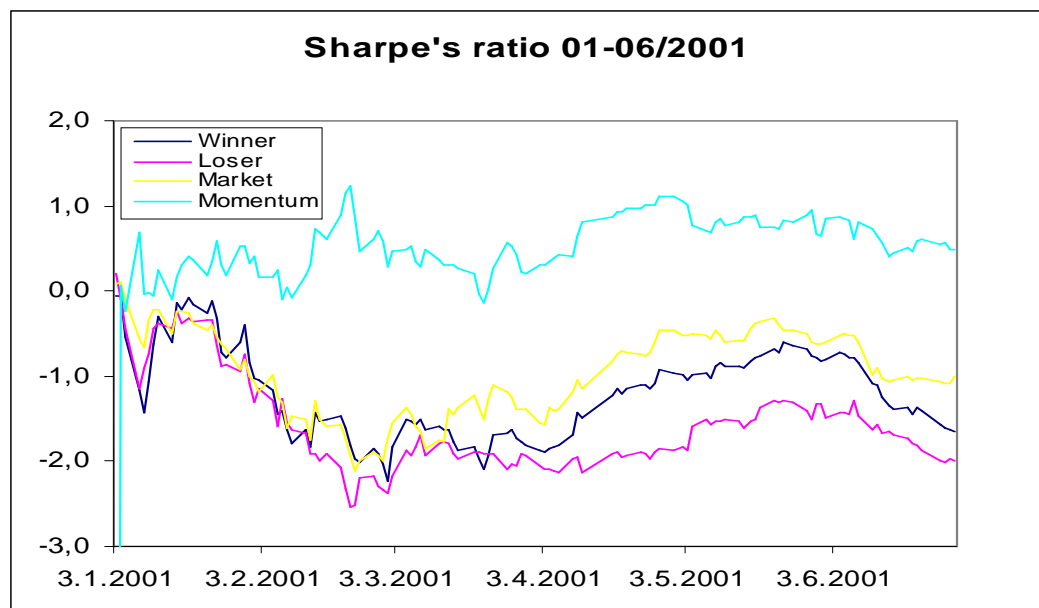
math and also a strong economic boom from mid 2003 until present. The portfolios are measured by their return and Sharpe's ratio. Sharpe's ratios are calculated from annualized figures. Also cumulative returns of the momentum portfolios are calculated and compared to the cumulative return of the market portfolio. It follows that we look at this study as an investment and we invest 100% to each portfolio at the beginning of the investment period in January 2001. Now let's take a look at the results:

### 3.1 Momentum during economic recession

The first portfolios are constructed in January 2001. On the holding period the market was plummeting heavily. During this period momentum strategy showed excellent results. As the market was crashing the Loser portfolio lost more than 50% of its value. Winner portfolios losses were more subtle so the strategy worked fine. The Sharpe's ratio measure which compares the return of an asset to its volatility (risk) is used to compare the portfolios. The following figure shows the development of the Sharpe's ratio of each portfolio.

**Figure 1**

Development of the portfolios' Sharpe's ratios in 01-06/2001.



As we can see from Figure 1, the relative performance of the momentum portfolio was way above market portfolio the entire period.

**Table 1**

Descriptive figures of the portfolios at the end of the period 01-06/2001.

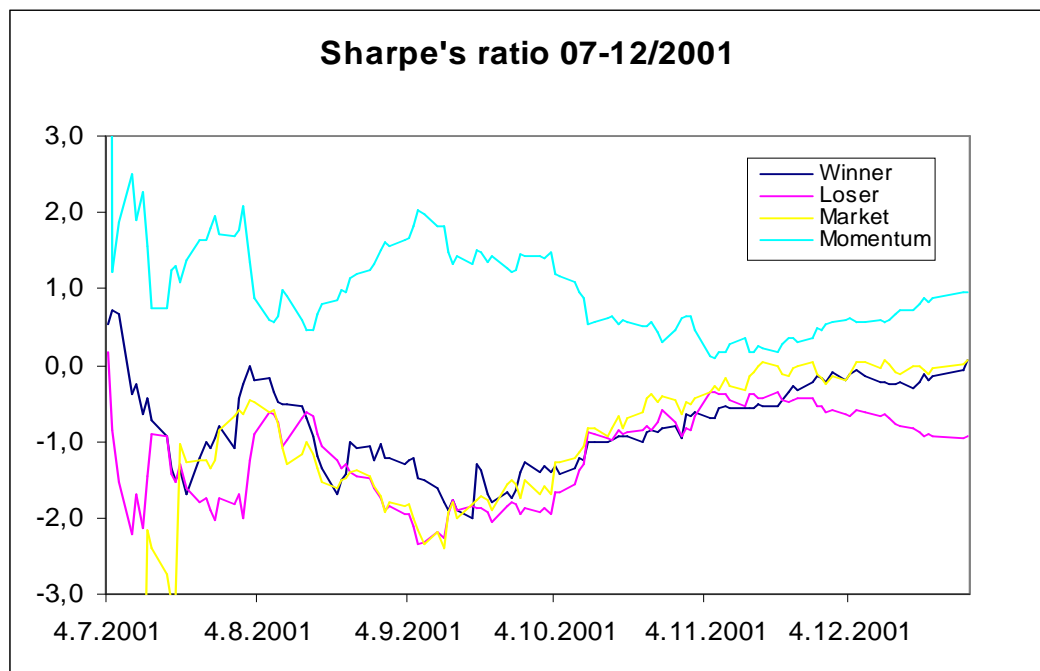
	<b>Momentum</b>	<b>Market</b>
<i>Return</i>	13,01 %	-38,47 %
<i>Sharpe's ratio</i>	0,48	-1,00
<i>Portfolio value</i>	113,89 %	68,07 %

Table 1 shows the facts of the first period. Where the market lost 38,47% of its value, momentum portfolio gained 13,01%. The difference is noticeable.

Portfolios are updated in July 2001 and new stocks are picked into the portfolios. It's still economic recession, but market seems to hold its value in this period. Following figure shows the development of Sharpe's ratios.

**Figure 2**

Development of the portfolios' Sharpe's ratios in 07-12/2001.



The relative performance of the momentum portfolio is again way better than the performance of the other portfolios the whole period.

**Table 2**

Descriptive figures of the portfolios at the end of the period 07-12/2001.

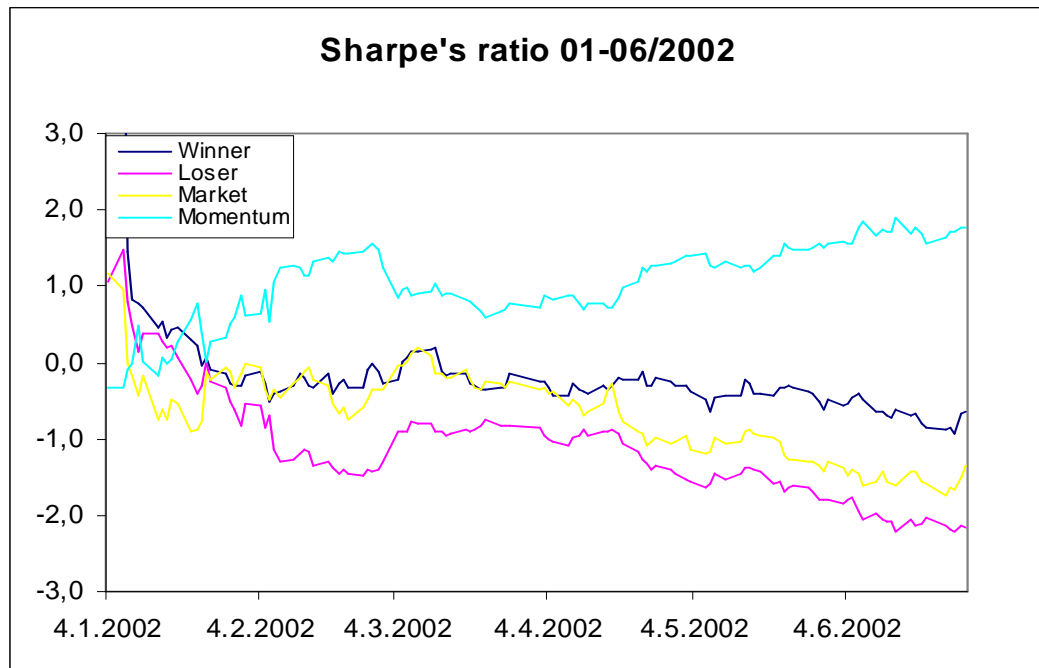
	<b>Momentum</b>	<b>Market</b>
<i>Return</i>	31,84 %	3,39 %
<i>Sharpe's ratio</i>	0,96	0,064
<i>Portfolio value</i>	156,59 %	70,41 %

Momentum portfolio outperformed market portfolio again with clear numbers thanks to the difference between Winner and Loser portfolios. Even though the rate of return is as high as 31,84%, the Sharpe's ratio is only 0,96. This implies high volatility of the momentum portfolio.

The third period begins in January 2002. Market is still declining. But thanks again to the bad performance of the Loser portfolio and rather good performance of the Winner portfolio; the Momentum portfolio had a very profitable period.

**Figure 3**

Development of the portfolios' Sharpe's ratios in 01-06/2002.



The trend is evident from Figure 3 that Momentum portfolio is performing also relatively much better than the other portfolios and that the difference between Winner and Loser portfolio is quite large.

**Table 3**

Descriptive figures of the portfolios at the end of the period 01-06/2002.

	<b>Momentum</b>	<b>Market</b>
<i>Return</i>	35,09 %	-32,74%
<i>Sharpe's ratio</i>	1,78	-1,34
<i>Portfolio value</i>	222,41 %	50,75 %

The table shows clearly that the difference between the portfolios in this period was substantial. Both the actual performance measured by return and the relative performance measured by Sharpe's ratio were in favor of Momentum portfolio. Noticeable is also that Momentum portfolio has now more than doubled its value where market portfolio holds only 51% of its initial value.

Portfolios were updated again in July 2002 and bear market was still the case. Market was declining in a more subtle manner and only showed -4,79% return. The huge gap between the returns of market and Momentum portfolio was now narrowing.

**Figure 4**

Development of the portfolios' Sharpe's ratios in 07-12/2002.

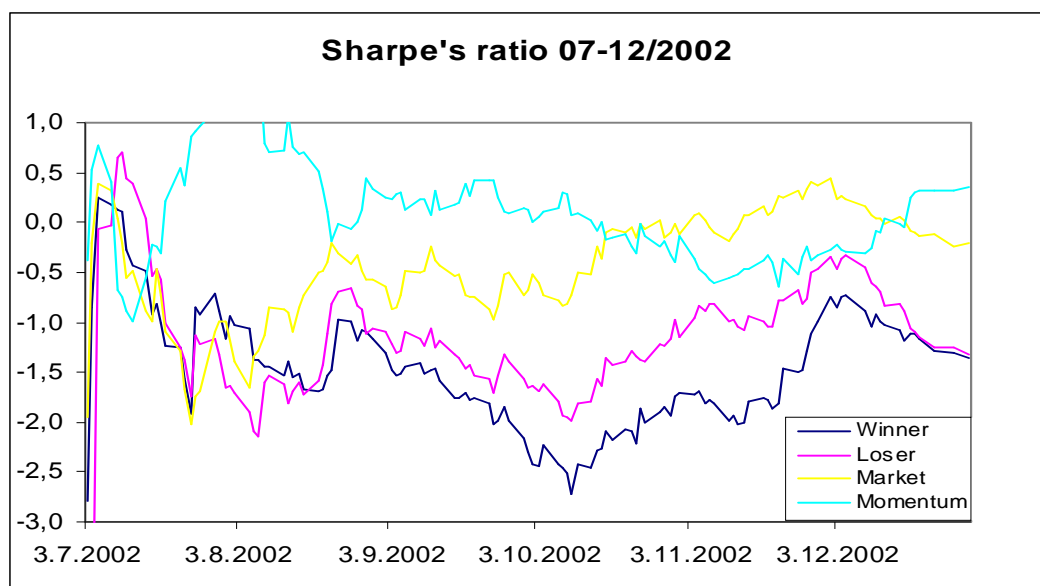


Figure 4 shows that there was not much difference in the risk relative performance of the portfolios. Momentum portfolio still ruled, but the difference was not so great.

**Table 4**

Descriptive figures of the portfolios at the end of the period 07-12/2002.

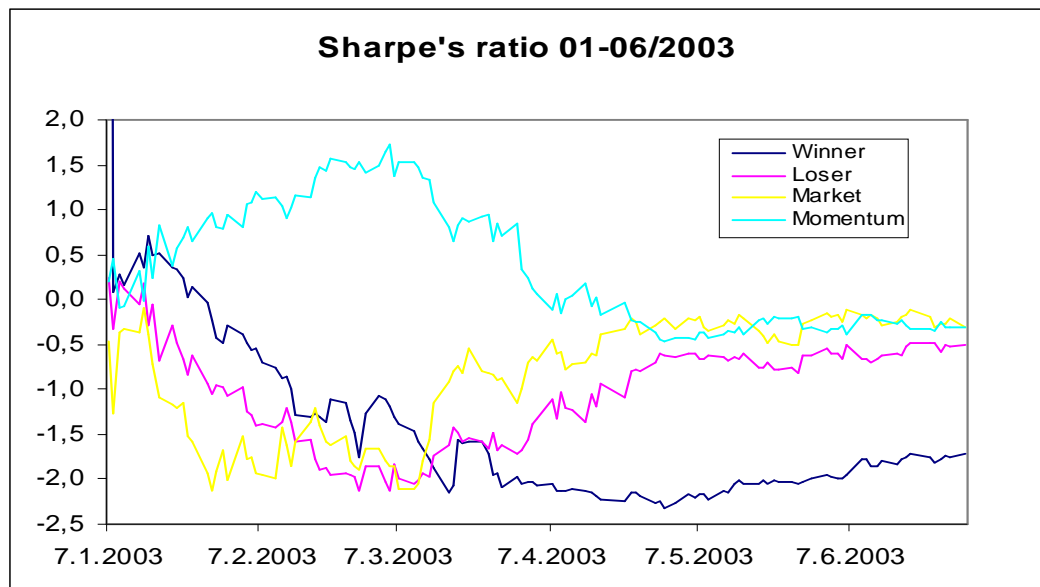
	<b>Momentum</b>	<b>Market</b>
<i>Return</i>	8,92 %	-4,79%
<i>Sharpe's ratio</i>	0,36	-0,20
<i>Portfolio value</i>	243,15 %	48,38 %

Table 4 shows that Momentum portfolio was still making positive returns even though the market was suffering from a downward trend. Cumulative portfolio returns show that at this point Momentum portfolio is about five times more valuable than market portfolio.

Fifth period begins in January 2003. The market trend is still moderately going down, but with a brighter future in sight.

**Figure 5**

Development of the portfolios' Sharpe's ratios in 01-06/2003.



In Figure 5 one can see that after an exploding start the Momentum portfolio started to make negative returns. This was due to the fact that Loser portfolio started to outperform Winner portfolio.

**Table 5**

Descriptive figures of the portfolios at the end of the period 01-06/2003.

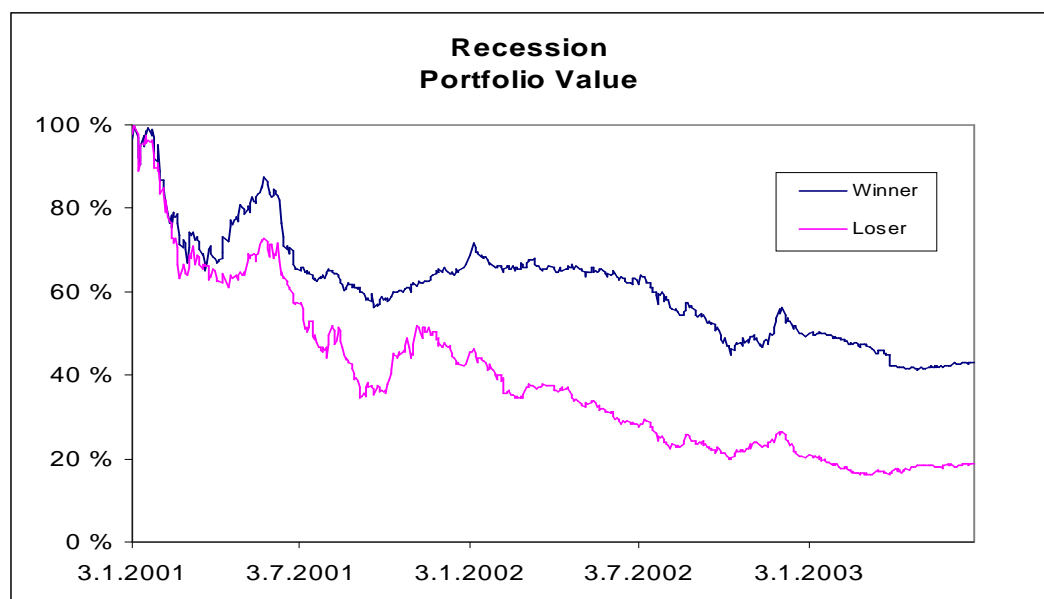
	<b>Momentum</b>	<b>Market</b>
<i>Return</i>	-5,36 %	-5,56%
<i>Sharpe's ratio</i>	-0,31	-0,30
<i>Portfolio value</i>	230,46 %	45,77 %

Table 5 is showing the reality that Momentum portfolio was on this period almost a replica of the market portfolio. Their performance has been very similar throughout the period. For the first time in this study the Momentum portfolio showed negative return. Could this be a change of season?

### **3.2 Results from recession period**

**Figure 6**

Cumulative performance of the portfolios in recession period.

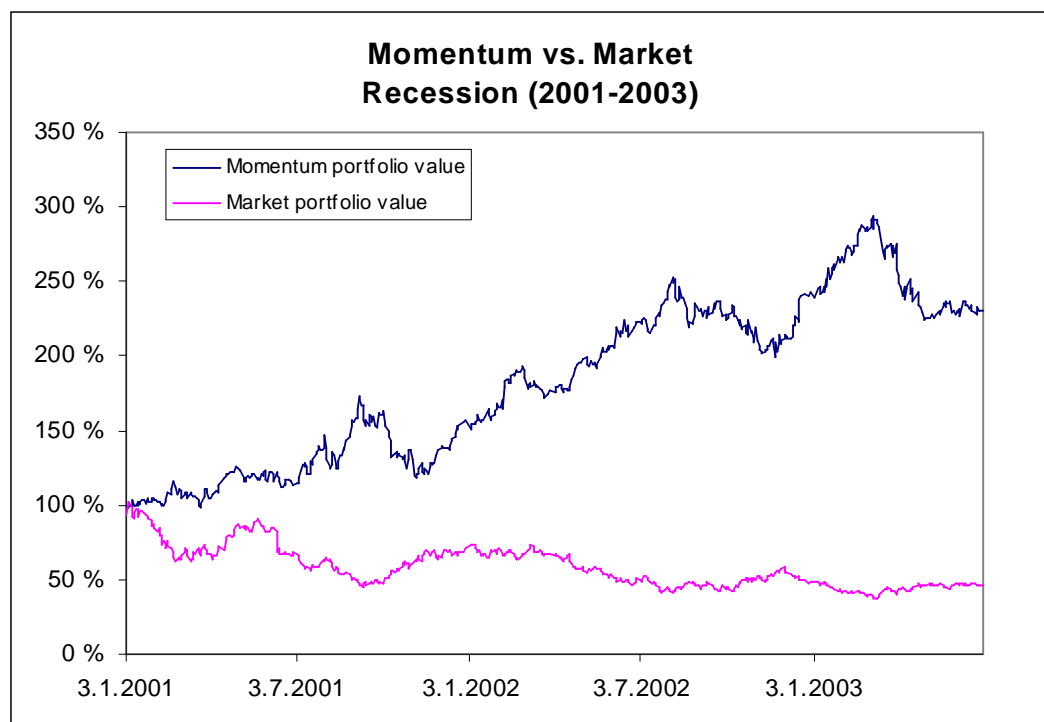




In Figure 6 we can see how the Winner and Loser portfolios have done compared to each other. Winner portfolio followed the movements of the market portfolio quite closely but Loser portfolio underperformed big time and lost about 80% of its value. This difference between Loser portfolio and Winner portfolio offers the explanation to the success of the Momentum portfolio during the period of economic recession.

**Figure 7**

Cumulative performance of the portfolios in recession period.



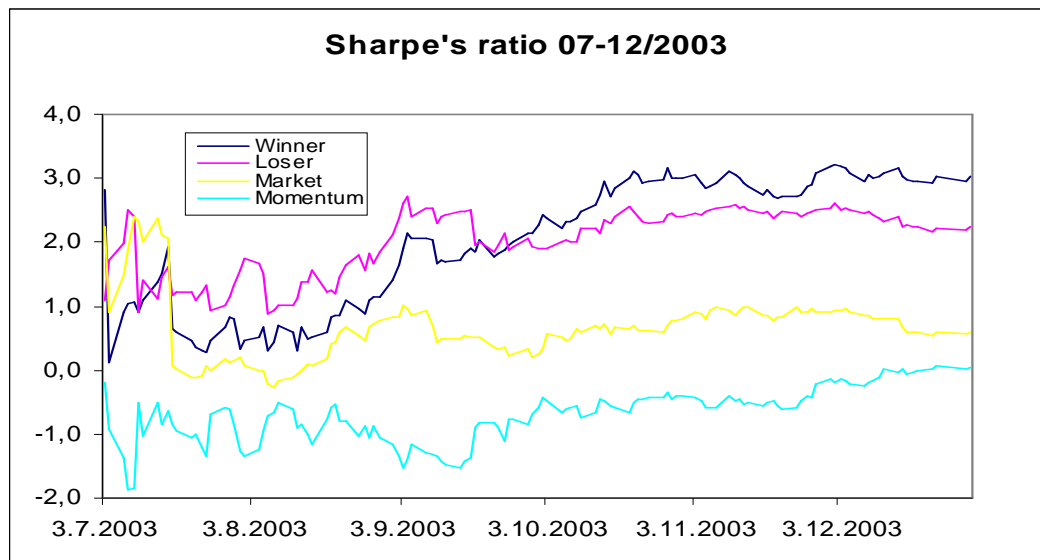
In deep recession this kind of momentum strategy seems to be a very good investment option. As one can see from Figure 7 the value of Momentum portfolio is about five times the value of the market portfolio. Also the predictions concerning the Winners and the Losers have been very accurate, which shouldn't be possible according to EMH. Annual rates of return in recession period were for the Momentum portfolio 33,40% c.c. and 39,65% p.a. and for the market portfolio -31,26% c.c. and -26,85% p.a.

### 3.3 Momentum during economic boom

In the middle of 2003 the economical environment changed for better. Long economic recession was in the past and market started to produce positive returns again. Portfolios were updated and the results were interesting.

**Figure 8**

Development of the portfolios' Sharpe's ratios in 07-12/2003.



When measured with Sharpe's ratio one can clearly see the table has turned. Market portfolio outperformed Momentum portfolio through out the whole period and Momentum portfolio only barely managed to stay on the positive side. Winner and Loser portfolios had an exceptional period; they both produced about 45% return. But since their difference was small, so was Momentum portfolio's return.

**Table 6**

Descriptive figures of the portfolios at the end of the period 07-12/2003.

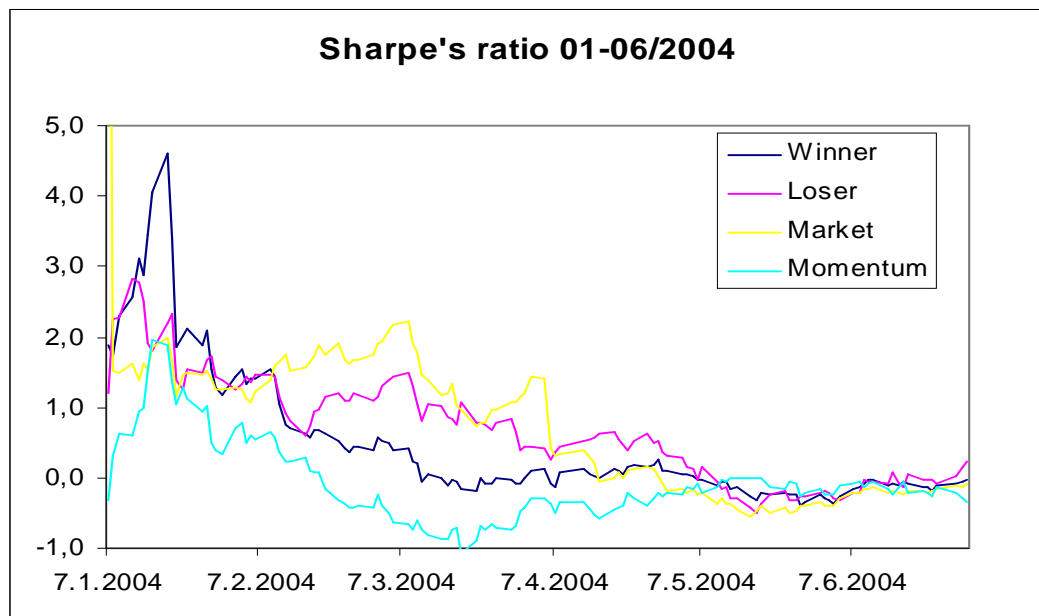
	<b>Momentum</b>	<b>Market</b>
<i>Return</i>	1,63 %	10,85%
<i>Sharpe's ratio</i>	0,05	0,59
<i>Portfolio value</i>	234,25 %	51,01 %

The first period of the new economic boom went badly for the momentum portfolio. The portfolio value pretty much stayed in a status quo. Market was clearly on an upward route again.

Seventh period began in January 2004. Market return curve stayed pretty much flat the whole period and ended a little bit below the initial value at the end of the period.

**Figure 9**

Development of the portfolios' Sharpe's ratios in 01-06/2004.



The Figure 9 shows that the performances of the portfolios were very even. The most level race so far.

**Table 7**

Descriptive figures of the portfolios at the end of the period 01-06/2004.

	<b>Momentum</b>	<b>Market</b>
<i>Return</i>	-3,91 %	-0,71%
<i>Sharpe's ratio</i>	-0,34	-0,08
<i>Portfolio value</i>	225,27 %	50,65 %

Table 7 shows that the race was indeed a very close-run. Both portfolios ended up on the negative side return and Sharpe's ratio wise. So far the economic boom has not been good for the momentum investor.

Next update was in July 2004. In this period the market gained some value and the difference in returns of Winner and Loser portfolio was larger again. Winner portfolio showed only a minor negative return but the Loser portfolio did very poorly.

**Figure 10**

Development of the portfolios' Sharpe's ratios in 07-12/2004.

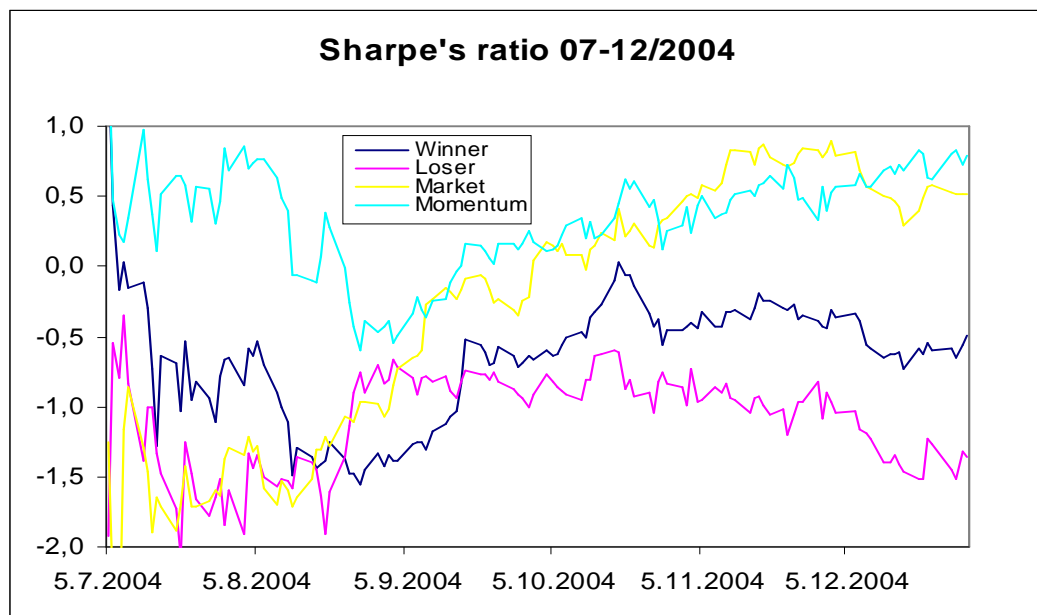


Figure 10 shows that risk relative performance of the portfolios was very similar with the market portfolio and Momentum portfolio. As we can see the Winner portfolio's curve is again clearly above Loser portfolios curve. This implies success for the Momentum portfolio.

**Table 8**

Descriptive figures of the portfolios at the end of the period 07-12/2004.

	<b>Momentum</b>	<b>Market</b>
<i>Return</i>	12,21 %	6,26%
<i>Sharpe's ratio</i>	0,80	0,51
<i>Portfolio value</i>	254,53 %	53,92 %

In the Table 8 one can see that this was the first period in the economic boom era when Momentum portfolio produced greater profit than market portfolio. Sharpe's ratio implies a bit more volatility in Momentum portfolio than in market portfolio.

Period nine began in the beginning of January 2005. New stocks were picked again based on their performance. Market had a good momentum and it was going up more rapidly than before.

**Figure 11**

Development of the portfolios' Sharpe's ratios in 01-06/2005.

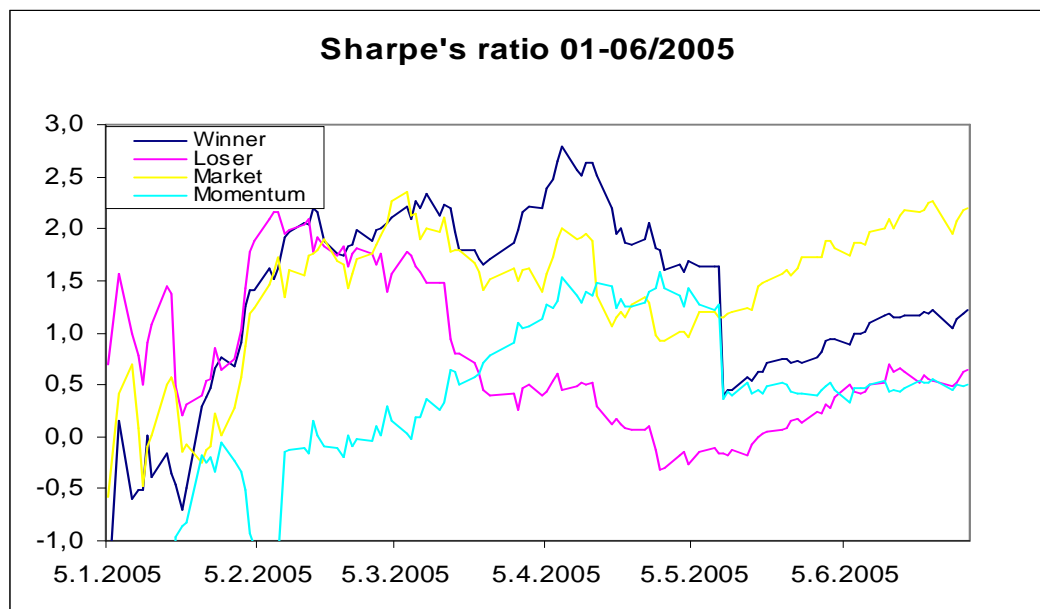


Figure 11 shows that this was a turbulent period indeed. The Sharpe's values changed considerably during the period. One thing is evident though, that market portfolio outperformed Momentum portfolio.

**Table 9**

Descriptive figures of the portfolios at the end of the period 01-06/2005.

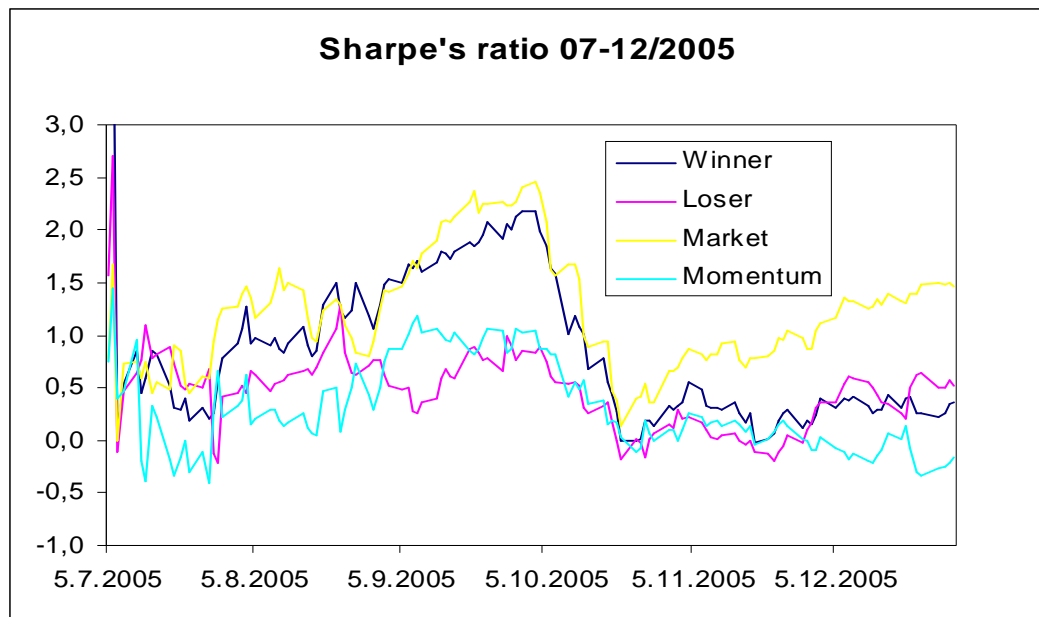
	<b>Momentum</b>	<b>Market</b>
<i>Return</i>	6,80 %	16,18%
<i>Sharpe's ratio</i>	0,50	2,20
<i>Portfolio value</i>	272,43 %	63,39 %

As Table 9 shows us the market portfolio had both better return and Sharpe's ratio as Momentum portfolio. A comforting fact is that at least the return on Momentum portfolio was positive.

Tenth period began in July 2005. The market was still doing great but Momentum portfolio seemed to have a little hiccup in its return curve.

**Figure 12**

Development of the portfolios' Sharpe's ratios in 07-12/2005.



As Figure 12 shows, the momentum portfolio did poorly because Loser portfolio outperformed Winner portfolio. Market portfolio had a good period.

**Table 10**

Descriptive figures of the portfolios at the end of the period 07-12/2005.

	<b>Momentum</b>	<b>Market</b>
<i>Return</i>	-1,32 %	12,30%
<i>Sharpe's ratio</i>	-0,16	1,47
<i>Portfolio value</i>	268,85 %	71,68 %

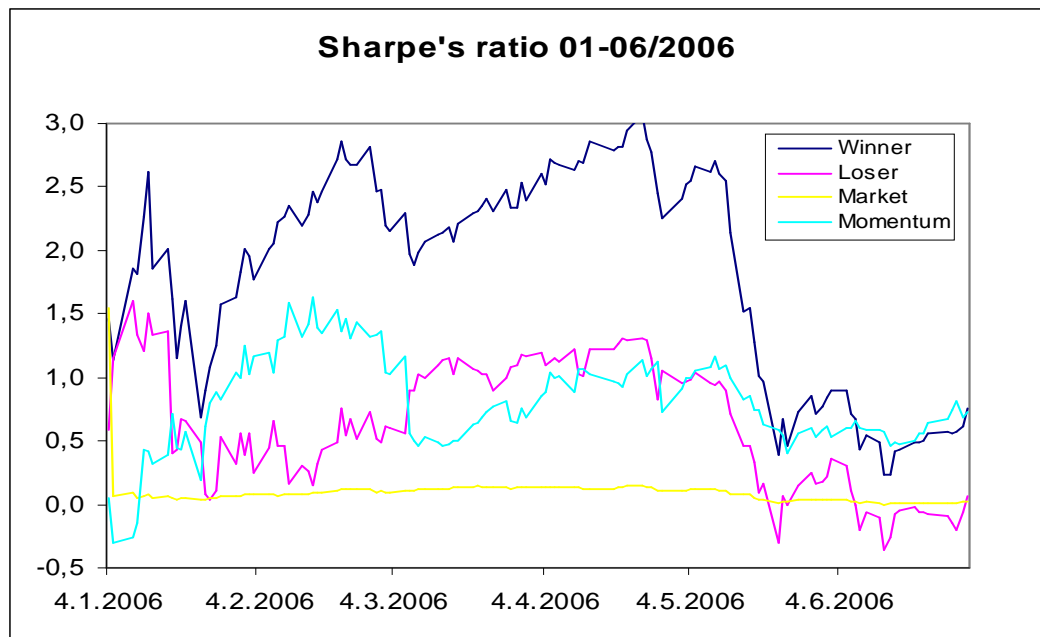
Market portfolio outperformed Momentum portfolio in every way. Return was higher and volatility was lower than Momentum portfolio's. Cumulative

portfolio performance shows that now the Momentum portfolio was now “only” almost four times the value of the market portfolio.

The final period of this study begins in January 2006. The market has an upward direction in its return curve. Momentum portfolio had a decent finish with an acceptable rate of return and a good Sharpe’s ratio.

**Figure 13**

Development of the portfolios’ Sharpe’s ratios in 01-06/2006.



As the Figure 13 shows, Momentum portfolio had a clear lead over market portfolio through out the period. Market portfolio had a very little variation in its value.

**Table 11**

Descriptive figures of the portfolios at the end of the period 01-06/2006.

	<b>Momentum</b>	<b>Market</b>
<i>Return</i>	11,35 %	9,12%
<i>Sharpe's ratio</i>	0,72	0,03
<i>Portfolio value</i>	311,89 %	78,53 %

Momentum portfolio produced 11,35% profit where market portfolio produced 9,12%. The difference was bigger when looking at the risk relative performance. Momentum portfolio performed better with a lower volatility.

### 3.4 Results from boom period

**Figure 14**

Cumulative performance of the portfolios in boom period.

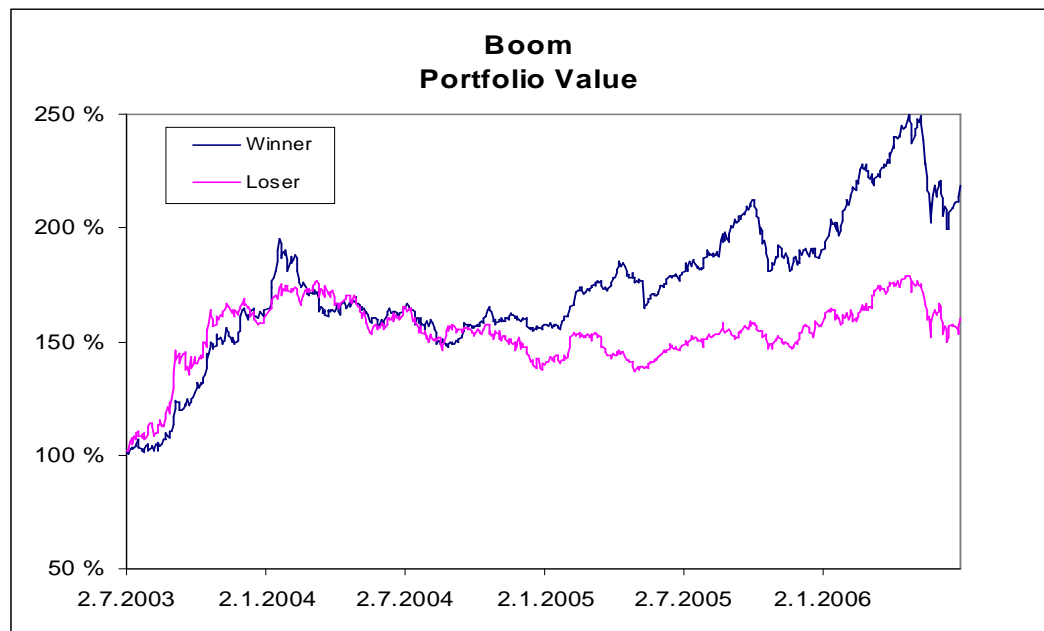


Figure 14 portrays the development of the portfolios' values in the boom period. As we can see both Winner and Loser portfolio started strong but were quite even most of the time. Half way through the period Loser portfolio began to lose value, while Winner portfolio still was steadily moving up. In the end Winner portfolio's value was about 220% of the initial value and Loser portfolio's value was 160%. The gap between Winner and Loser portfolio is much narrower than in the time of recession. Hence the lower rate of return of the Momentum portfolio.

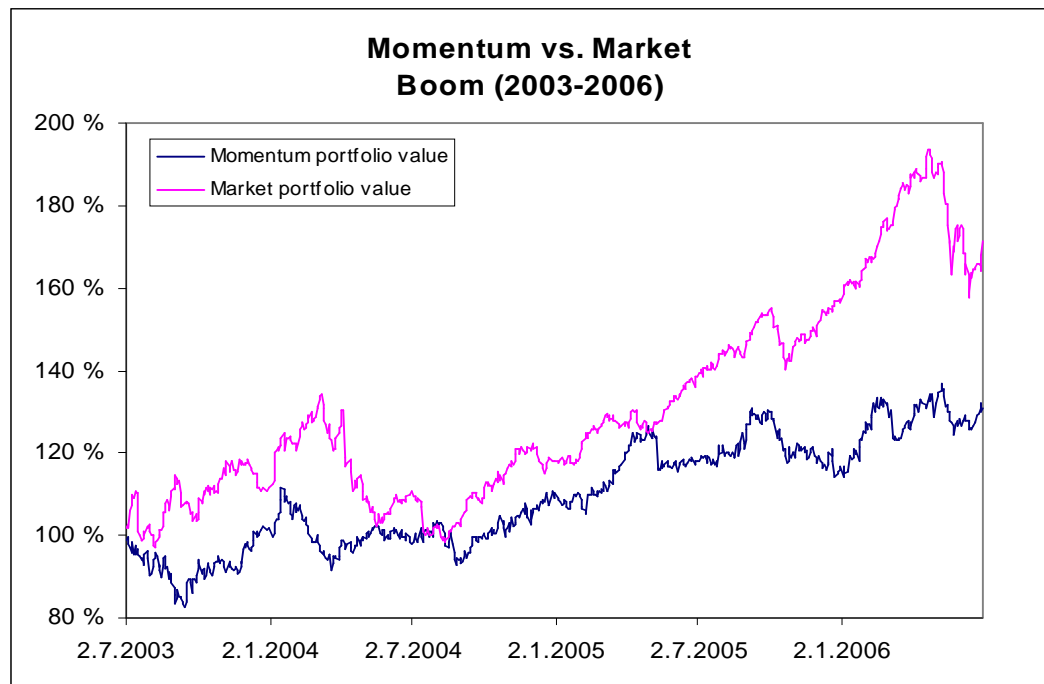
The Figure 15 shows the Momentum portfolio's performance compared to the Market portfolio's performance. It's clear that based on these results it would have been much more profitable to invest in the market portfolio than in the Momentum portfolio. With that said the real gold mines were



both Winner and Loser portfolio. They both realized a better return than market on average.

**Figure 15**

Cumulative performance of the portfolios in boom period.



## 4 Conclusion

Overall the kind of momentum investment strategy used in this study has proven to be able to select the stocks that either perform better than average or worse than the average. This is the cornerstone of the whole strategy. Also the key question of how the economical circumstances influence this strategy was answered. Evidence from this study suggests that in bear markets the strategy is very efficient but in bull markets it's quite easy to find more lucrative investment options. Nevertheless throughout the whole period 2001-2006 momentum strategy realized almost constantly a positive net return. During boom it was outperformed by the other portfolios, that's why the curves do not look as good.

**Figure 16**

Cumulative performance of the portfolios in the entire investment period.

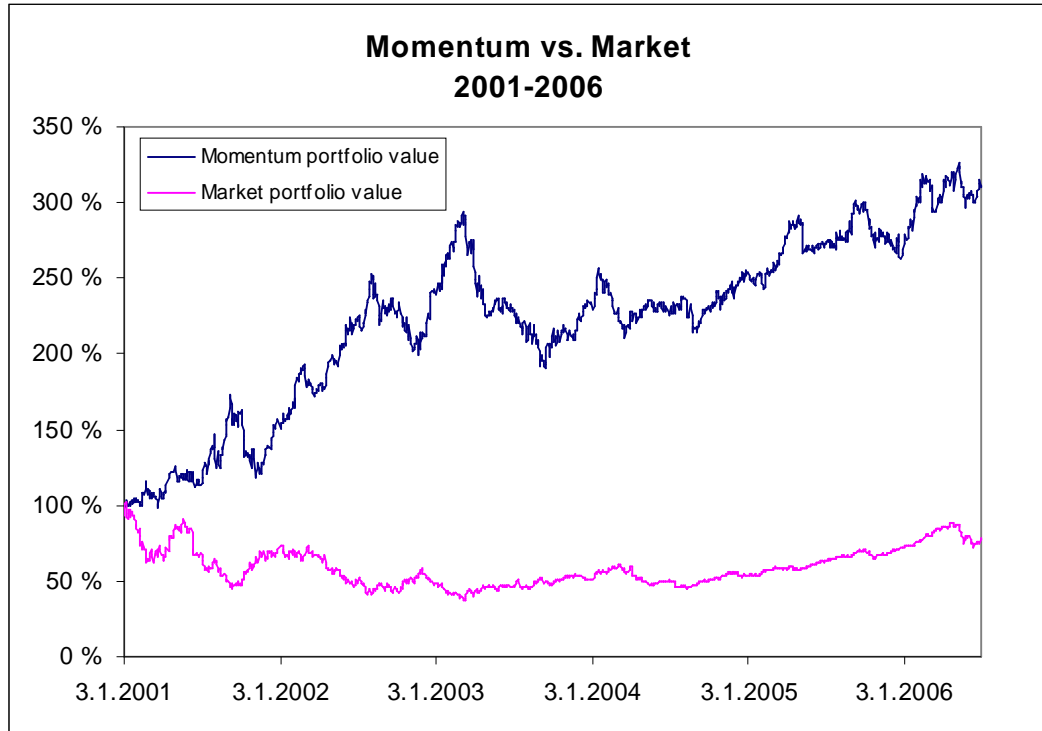


Figure 16 shows the development of the portfolio values throughout the investment period. There's no doubt that momentum strategy wasn't the better alternative of these two. Momentum investor would have about 310% of the initial value of the investment where market portfolio investor would have only about 80% left of his portfolio value. That's a 20,68% c.c. or 22,98% p.a. return per year for the Momentum portfolio and a -4,39% c.c. or -4,30% p.a. return for the market portfolio. Of course we must remember that no transaction costs or costs of any kind or short-sale constraints were included in this study. That would have diluted the effective rate of return. Nevertheless, the evidence is there and momentum strategy has shown great potential.

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