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Systematic Risk and the Performance of Mutual Funds Pursuing Momentum and Contrarian Trades

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Abstract

We examine mutual fund trading activity to determine whether they rebalance their portfolios towards stocks that were recent superior performers (a momentum strategy) or towards stocks that recently underperformed (a contrarian strategy). Using 2,829 funds with 49,661 fund-periods between 1991 and 2005, we find that around 15% of the funds exhibit contrarian trading behavior with a similar percentage following a momentum strategy. We highlight the importance of a stock's risk to traders adopting momentum and contrarian strategies. Mutual funds that follow a momentum strategy and acquire high-risk stocks improve their performance, while those following a contrarian strategy in these stocks diminish their performance. Both contrarian and momentum trading behavior by funds persists.

JEL Classification: G2, G11, G14, G23

Keywords: Mutual fund, contrarian, momentum, risk

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Both momentum and contrarian trading strategies have been shown to earn excess returns. These trading strategies are associated with superior performance even though momentum trading requires the purchase of past superior performing stocks (winners) and the selling of past losers while contrarian trading is based on the purchase of past losers and selling of past winners. Researchers have focused on creating hypothetical portfolios, often in the form of deciles, which reflect these alternative strategies and have shown that these strategies generate abnormal returns. Little attention has been devoted to whether momentum and contrarian trading strategies are actually pursued by mutual funds. Furthermore, actual portfolios' trades change the mutual funds' risk, and as a consequence, their expected returns. A pertinent question is whether the performance of funds adopting either a momentum or contrarian strategy is differentially affected by risk changes. We use data on mutual fund holdings and their associated trading to empirically examine these issues.

Using a unique methodology which uses actual mutual fund trades we are able to identify managers which follow momentum and contrarian trading strategies. Consistent with previous qualitative research we find that managers follow both strategies. These strategies earn excess returns only when they are cognizant of the risk of the stocks they select. Mutual funds that follow a momentum strategy and acquire high-risk stocks improve their performance, while those following a contrarian strategy in these stocks diminish their performance. In contrast, funds which acquire winning, low-risk stocks adversely affect their performance while contrarians enhance their performance.

In Section I a brief review of the literature is presented. Section II describes the data and outlines our research procedure. We analyze the alignment of mutual fund trades with momentum and contrarian strategies and how this affects fund returns in Section III. The summary and conclusions of this research is presented in Section IV.

I. Literature Review

Two strands of literature examine trades which focus on purchasing stocks based on their past performance. We review this literature and then consider how momentum and contrarian strategies are employed by mutual fund managers.

A. Momentum Trading Strategies

Jegadeesh and Titman (1993) use decile portfolios created from performance ranked stocks and demonstrate that a strategy of purchasing winners will earn superior subsequent returns. This is consistent with investors who trade using the momentum strategy causing stock prices to over-react and deviate temporarily from their intrinsic values. According to Jegadeesh and Titman it is also possible that the market under-reacts (over-reacts) to short-term (long-term) firm prospects. A salient result is that the difference between the best and worst performance decile is greatest for the highest tercile when these are further subdivided on systematic risk. Moskowitz and Grinblatt (1999) show that momentum trading can be profitable, but attribute the success of this strategy principally to the industry momentum rather than the individual stocks. In fact, the purchasing of stocks from strongly performing industries and selling stocks from poorly performing industries subsumes stock momentum trading and is persistent. O'Neal (2000) examined the industry component of the momentum strategy over a quarterly and yearly basis and finds although this trading strategy yields returns that exceed the market

return its superiority significantly diminishes when risk is included. Chan, Jegadeesh and Lakonishok (1999) investigate momentum trading but consider the impact of earnings announcements and analysts' forecasts on return. They show that a firm's positive (negative) earnings announcements lead to optimistic (pessimistic) expectations, but that analysts are slow to adjust their forecast to this new information. Therefore, the market does not respond quickly to new information and this presents profitable short-term momentum strategies. Lee and Swaminathan (2000) consider the impact of trading volume in the valuation process. They contend that stocks alternate between high trading volume when the market overvalues the stock, to when the trading volume is low and the market undervalues the stock.

In an update of their previous research, Jegadeesh and Titman (2001) confirm the existence of profitable momentum trading and find support for a behavioral explanation. The prices of past winners (losers) continue to appreciate (depreciate) beyond their intrinsic value due to the delayed reaction of investors to new positive (negative) information.

More recent research has introduced the impact of trading costs to momentum strategies. According to Korajczyk and Sadka (2004) as the hypothetical portfolio size increases, trading costs reduce the potential to generate abnormal returns using a momentum trading strategy. Hvidkjaer (2006) suggests that the momentum strategy is partly attributable to small traders. In fact, large traders and large trades do not appear to drive future returns.

Sagi and Seasholes (2007) explore the underlying specific characteristics of firms exhibiting momentum. They show that the traditional momentum strategy can be enhanced by focusing only on firms that possess both high growth in revenue and investment opportunities, and also have a low cost structure. Baik, Farber and Petroni

(2009) also incorporate accounting information in the analysis of glamour firms. They report that analysts' adjustments to the earnings of glamour firms result in upwardly biased estimates relative to value stocks. This optimistic treatment of glamour stocks would promote momentum trading.

B. Contrarian Trading Strategies

Originally, the profitability of contrarian strategies was based on the notion of market overreaction. This implies that investors overreact and drive up (down) the prices of winners (losers), but eventually the winners (losers) became losers (winners). This implied market overreaction is consistent with negative serial correlation.

Lo and MacKinlay (1990) point out that while this explanation is plausible for individual stocks, an alternative explanation for successful contrarian strategies is the existence of positive cross-autocorrelation among stocks within portfolios. They suggest that over the long run stocks will move in the same direction but at different speeds. For example, one stock could move up while another stock moves down during a particular period. A contrarian would sell the stock that moved up and buy the one that moved down. If they both "revert to the mean", the contrarian will earn excess returns. Lo and MacKinlay (1990) report that individual security returns are generally negatively autocorrelated but that portfolios of stocks and market indexes exhibit positive autocorrelation. They point out that positive cross-autocorrelation among security returns are responsible for over half of the returns generated by contrarian strategy portfolios. They also report that in general returns of smaller stocks tend to lag those of the larger stocks.

Lakonishok, Shleifer and Vishny (1994) also provide evidence that contrarian strategies can outperform the market. However, unlike Lo and MacKinley (1990), they

argue that the strategy is successful because investors consistently overestimate the value of glamour stocks relative to value stocks, resulting in "suboptimal" investor behavior. They suggest that expectational errors occur because individual investors overweight recent information. Furthermore, Lakonishok, Shleifer and Vishny (1994) contend that institutional investors may invest in glamour stocks because they appear to be "prudent" investments, justifiable to shareholders, and because their time horizon is too short for the three to five years necessary for the value firms to rebound.

Schiereck, DeBondt and Weber (1999) study the efficacy of momentum and contrarian strategies in Germany. They report that both strategies outperform a strategy of buying and holding the market index and that the results are robust to differences in risk and firm size. Surprisingly, their results are strikingly similar to those found in the U.S. even with the marked differences between the German and U.S. institutional frameworks and trading characteristics.

Value firms have high book-to-market ratios for a variety of reasons. Some firms deserve high ratios because high financial distress results in low stock prices while other firms' do not deserve high ratios but their stock prices have been bid down due to overly pessimistic outlooks. Piotroski (2000) uses financial statement information to successfully differentiate between distressed firms and out-of-favor or neglected but financially strong firms. He reports that the high book-to-market firms which are healthy generate higher returns and are characterized as small, thinly traded firms with limited analyst following.

Chan and Lakonishok (2004) confirmed their earlier findings that value stocks outperform growth stocks, but report that during the late 1990s the relation deteriorated due to the technology bubble. They suggest that during that period investor over-optimism caused stock valuations in the technology industries to deviate from their intrinsic values.

C. Applied Trading Strategies

Both momentum and contrarian strategies have been the focus of numerous empirical studies and both appear to generate excess returns. Accordingly, it would seem reasonable for mutual fund managers to engage in these strategies.

Chen, Jegadeesh and Wermers (2000) examine the trades and stockholdings of mutual funds. They find that fund performance is driven by the extant portfolio holdings rather than the trades conducted by the fund managers. In addition, they report that the returns on the stocks purchased are greater than the returns on the stocks sold. They observe a momentum effect in that the past winners tend to outperform the past losers.

Menkhoff and Schmidt (2005) survey the trading strategies of a set of German fund managers, including mutual funds, pension funds, and specialized funds. They report that momentum, and contrarian and buy-and-hold strategies are all extensively used by these practitioners.

We use reported portfolio holdings to empirically identify equity mutual fund managers that employ momentum or contrarian trading strategies. Furthermore, after identification of the funds following the alternative strategies, their performance is analyzed and compared.

II. Data Description and Methodology

A. Data Description

We obtain the periodic stock holdings of all US equity mutual funds from Thomson Financial Services Ltd for the period January 1991 – December 2006. Since most holdings are reported on a quarterly basis, we infer transactions from the quarterly changes to the holdings while allowing for stock capitalization changes. Daily stock price

and return data are obtained from Center for Research in Security Prices (CRSP) and used to calculate quarterly excess returns for the individual stocks before we combine these with the holdings data. The CRSP database is also the source of mutual fund returns, and these returns are matched with the Thomson's holdings data using Mutual Fund Links.

To ensure that our data covers most of the changes to a mutual fund's portfolio, we restrict our sample to funds with average equity holdings exceeding 80% and average cash holdings of less than 10% of fund investments. In a further restriction to limit data errors and omissions, we must be able to replicate[1] the value of the fund's net tangible assets (NTA) by using the stock holdings data and assuming start-of-period prices for the stock to remain in our sample.

B. Method

Initially, for each stock held by a fund over the quarter prior to the start of each trading period that we examine, we calculate the excess return by subtracting the value weighted market return from the stock return. We rank these returns and assign each fund's stocks to "prior performance buckets". Regression analysis is used to identify the trading strategy for each fund in each period, and we can discriminate between funds trading using momentum and contrarian strategies.

Next, we calculate the change in each fund's systematic risk over the trading period by weighting the betas of the stocks held at the start and end of the period by their start and end of period proportionate values respectively. Finally, we regress various measures of a fund's performance following the trading period on trading strategy, change in risk, interaction terms and control variables.

[1] We allow a discrepancy of up to 10%, but exclude funds outside this range.

B.1. Assignment to Prior Performance Categories

To identify changes to a fund's asset portfolio that are consistent with momentum or contrarian trading, we rank stocks held by each fund by their excess return performance over the preceding quarter. We assemble these into equal value portfolios (prior performance buckets) each containing 5% of the fund's start-of-period holdings by value. This ensures that there is no relation between the value of the prior performance bucket and the bucket's prior performance. If trades are non-preferential with respect to prior performance, then this relation should persist.

We jointly rank the stocks acquired by a fund during a period with those held at the start of the period, such that they are also assigned to one of the 20 prior performance buckets. The value of the stocks traded during a period is determined for each prior performance bucket with buy (sell) trades assigned a positive (negative) value. The proportion that the value of each stock prior performance bucket comprises of the total value of stock traded by the fund during the period is then calculated. It is the relation between these proportions and prior performance that we examine statistically.[2]

B.2. Regression Analysis of Momentum Trading

The initial focus of our tests is to determine whether stocks' prior performances are incorporated into a fund's decision to trade stocks. We perform regression analysis to test the association between the proportion traded and stock prior performance. A significantly

[2] Ideally, the portfolio would be partitioned to assign exactly 5% of the value to each stock prior performance bucket. This rarely occurs because a particular stock holding straddles the desired partition. To address this issue, half the value of the holding and half the value of the stock traded are assigned to the prior performance bucket on either side of the partition. When it is not possible to assign the stocks to 20 equal value buckets (such as when a single stock comprises more than 5% of the value of the fund's asset portfolio), stocks are assigned to ten equal value prior performance buckets.

positive (negative) coefficient indicates the fund has made momentum (contrarian) trades while an insignificant regression coefficient indicates that the trades are neither momentum nor contrarian motivated.

We regress the proportion (by value) of stocks in a prior performance bucket traded (TradeProp) by a fund during a period on the value-weighted prior return of the bucket (BucketPR) determined by the stocks held at the start of the period:

$$\text{TradeProp}_j = \alpha + \beta\, \text{BucketPR}_j + \varepsilon_j \qquad (1)$$

where

$$\text{TradeProp}_j \equiv \frac{\text{Value stock prior performance bucket}_j \text{ traded}}{\sum_{i=1}^{n} \left|\text{Value of stock}_i \text{ traded}\right|};$$

$$\text{BucketPR}_j \equiv \sum_{i=1}^{n} (\text{Stock prior performance}_i \times \frac{\text{Value stock}_i \text{ held}}{\text{Value prior performance rank bucket}_j \text{ held}});$$

$$\text{Stock prior performance}_i = \text{Quarterly excess return of stock i; and}$$

$$\text{n} = \text{number of stocks in prior performance bucket j.}$$

These regressions are performed on 49,659 fund-periods between January 1991 and December 2006. The cumulative binomial distribution is used to determine whether the count of significant momentum (contrarian) betas could have occurred by chance.[3]

B.3. Changes in Systematic Risk

We calculate the systematic risk of each fund's equity portfolio at the start of each period, by weighting the betas of the stocks in the portfolio with the proportionate value that each stock comprises. These stock betas are determined from the stock returns over

[3] The number of regressions is used as the number of trials, the level of significance at which we find the coefficients to be positive (momentum) or negative (contrarian) is used as the probability of a success, and the critical number of successes corresponds to a cumulative binomial probability of 1%.

the previous 60 months[4] and the weighted market index over the same interval. The funds' betas at the end of each period are calculated by maintaining the same stock betas, while using end-of-period proportionate values.[5] The change in a fund's systematic risk that is attributed to the trades it conducts during a period, is obtained by subtracting the fund's start-of-period beta from its end-of-period beta.

B.4. Fund Returns

Annualized excess returns and are determined for the three- and six-month intervals preceding the interval of the trades, the period in which the trades occur, and the three- and six-month intervals following the trades. Annualized excess returns (AER) are calculated by subtracting the market return from the fund's return. The annualized cumulative residuals (ACR) are calculated in a two-step process. Residuals from the Fama and French (1995) model with Carhart's (1997) momentum factor, equation (2), are determined for each fund using monthly data for the period 1991–2006. Following Thompson (1978) and Cheng, Copeland, and O'Hanlon (1994) the residuals are summed and annualized to obtain the ACR for each fund for each interval.

$$R_{jt} - R_{Ft} = a_{j0} + b_{j1}(R_{Mt} - R_{Ft}) + b_{j2}SMB_t + b_{j3}HML_t + b_{j4}UMD_t + \varepsilon_{jt} \qquad (2)$$

where

[4] We eliminate stocks without a minimum of 6 months of returns. If greater than 10% of the stocks by value are eliminated, then we remove the fund-period from consideration.

[5] This procedure is analogous to that used by Chevalier and Ellison (1997) to calculate return variances. For completeness, we also calculate return variances but do not report these results.

R_{jt} = return on fund j at time t;
R_{Ft} = risk - free return (one - month treasury bill rate)
R_{Mt} = value - weighted NYSE/AMEX market return;
SMB_t = returns for small minus large stock portfolios;
HML_t = returns for high minus low book-to-market portfolios; and
UMD_t = high prior-year return minus low prior-year return.

We test whether statistically significant momentum (contrarian) trades generate superior performance. Funds are partitioned into positive (momentum) and negative (contrarian) coefficient groups. After removing return outliers exceeding three standard deviations from the universal mean, a t-test is used to determine whether a momentum strategy is statistically different from a contrarian strategy using both the mean AER and ACR return for each fund-period.

Future returns may be affected by fund managers altering the risk of their stock portfolios when they engage in tournament behavior as suggested by Brown, Harlow and Starks (1996). Accordingly, we control for such changes in risk while examining fund performance. We conjecture that momentum and contrarian trades lead to different return outcomes depending on whether the trades increase or decrease the risk of the portfolio, and to examine this issue, include multiplicative interaction terms.

Chen, Jegadeesh and Wermers (2000) point out that the holdings of funds are associated with future return performance as winning (losing) funds tend to win (lose). Hence, in addition to the momentum and contrarian dummy variables, we include previous excess return. Liquidity, turnover and size are included as control variables. Therefore, equation (3) is used to examine whether factors other than momentum and/or contrarian strategies affect subsequent performance.

$$R_{jt+1} = a_0 + b_1 MOM_{jt} + b_2 CON_{jt} + b_3 \Delta beta_{jt} + b_4 MOM_{jt} \times \Delta beta_{jt} + b_5 CON_{jt} \times \Delta beta_{jt} + b_6 TO_{jt} + b_7 Liq_{jt} + b_8 Size_{jt} + b_9 R_{jt} + \varepsilon_{jt} \quad (3)$$

R_{jt+1} = return on fund j in interval $t+1$;
MOM_{jt} = dummy variable for fund j with significant momentum trades in period t;
CON_{jt} = dummy variable for fund j with significant contrarian trades in period t;
$\Delta beta_{jt}$ = change in systematic risk from trades of fund j in period t;
TO_{jt} = standardized portfolio turnover of fund j in periodl t;
Liq_{jt} = standardized average portfolio liquidity of fund j at time t;
$Size_{jt}$ = standardized capitalization of fund j at time t; and
R_{jt} = return on fund j in period t.

Finally, we track whether a fund which has a significantly positive coefficient subsequently trades with a positive, negative or insignificant coefficient. Fund-periods with negative or insignificant coefficients are tracked in the same manner. These results provide insight into the stability of the trading behavior of mutual funds.

III. Momentum Betas and Returns

A. *Descriptive Statistics*

Our sample contains 2,829 distinct mutual funds, and 49,661 fund-periods that meet our selection and data quality criteria. Table I also shows the distribution of days in each period and number of stocks in each fund. These reflect the predominance of 90-day periods, and a small number of funds holding a large number of stocks.

[Insert Table I]

B. *Regression Analyses*

We perform 49,659 linear regressions to determine if there is a relation between stocks' prior performances and proportion of stocks traded by a fund during a period. Each regression is for one fund-period, and fund-periods with momentum betas

significant at the 10% level are identified. Table II, Panel A reports the pooled count over the sixteen-year period, while Panel B provides a breakdown by year. A positive momentum beta indicates that adjustments to a fund's portfolios during a period are consistent with a momentum trading strategy; recent superior performing stocks are purchased and underperforming stocks are sold. A negative momentum beta suggests funds are following a contrarian trading strategy.

[Insert Table II]

Momentum trading is represented by the significantly positive coefficients and account for 15.2% of the fund-periods. Significant negative coefficients represent 14.2% of the regressions and are indicative of contrarian trading. Using the binomial distribution, we are able to determine that the frequency of the significant betas, both positive and negative, exceeds that expected by random occurrence. Panel B reveals that while the counts of momentum and contrarian betas exhibit some variation over time, both are reasonably stable.

C. *Fund Returns*

The returns of the funds that are characterized by momentum trading are compared with those characterized by contrarian trading, for the periods in which we observe the funds' trades, and for the 3- and 6-month intervals preceding and following this period using both the AER and ACR measures. Our sample reduces to 26,631 fund-periods because we are unable to match return and holdings data, and because we eliminate fund-periods with return outliers. Table III documents the mean returns for each group, along with the difference between these means. First, considering the 3-month and 6-month periods following the trades we observe that the returns generated by the contrarian trading strategy statistically outperforms those of the momentum strategy. The contrarian

excess returns exceed the momentum returns by 2.2% and 2.5% over the three- and six-month intervals following the period of the trades. Notably, the superior performance of the funds following a contrarian trading strategy is also apparent in the intervals preceding the period of the trades.

[Insert Table III]

The possible explanations for the superior performance preceding the contrarian trades include:

i) contrarian and momentum trading strategies persist over time,

ii) profit-taking by funds which gives the appearance of contrarian trading, and

iii) the superior performance was due to the extant stock portfolio.

We examine persistence of trading strategy explicitly in Section E. By including the fund returns over the period of the trades we are able to control for profit taking and the quality of the extant portfolio.

D. *Multivariate Analysis of Trading Strategy and Fund Performance*

Tables IV and V present the results of the equation (3) regressions. The return measure in Table IV is annualized excess return, AER, for the three- and six-month intervals following the period in which we identify momentum and contrarian trading strategies, in Panels A and B respectively. Table V presents analogous results where annualized cumulative residuals, ACR, is the return measure. Model (1) in both tables includes only the momentum and contrarian dummy variables, and permits comparison with Table III.[6] The significantly positive coefficients associated with the contrarian dummy variable in Panels A and B of Table IV indicates that measured by AER, this

[6] For example, the sum of the intercept and coefficient on CON_{jt} in Panel A of Table IV gives the 6-month AER for the negative momentum beta (-0.007+0.022=0.015) in Panel A of Table III.

strategy outperforms the momentum strategy which exhibits an insignificant coefficient. However, the significance of this advantage almost disappears when performance is measured by ACR, with only the momentum coefficient in Panel A of Table V exhibiting weak (negative) significance.

Model (2) in both Tables IV and V indicates that changes to fund systematic risk ($\Delta beta_{jt}$) resulting from its trades during a period are positively related to fund performance when this is measured by both AER and ACR. However this relation is only statistically significant when return is measured over 6 months as seen in Panel A in each table. The significance of the coefficient on the contrarian dummy in Table IV remains, however the magnitude of the estimates are reduced from those in Model (1) to 0.019 and 0.016 in Panels A and B respectively. The finding that funds which increase (decrease) systematic risk through their trades, subsequently on average, increase (decrease) their return, is consistent with conventional finance theory and the motivation underlying the tournament behavior discussed by Brown, Harlow and Starks (1996).

The interaction terms $MOM_{jt}x\Delta beta_{jt}$ and $CON_{jt}x\Delta beta_{jt}$ in Tables IV and V are significant, and respectively, positive and negative for all return measures when Model (3) is estimated. The significance and magnitude of the coefficient on the contrarian dummy observed for Model (2) persists in Table IV and remains approximately the same in Table V. The relative magnitudes of the coefficients on the momentum and contrarian dummies compared to the coefficients on the interaction terms indicate that momentum or contrarian trades which change the fund's systematic risk have greater importance; particularly when performance is assessed using ACR. Panel A of Table IV shows that momentum trades which increase risk by one standard deviation of all systematic risk changes will increase AER returns over 6 months by 1.1% p.a.[7] In contrast, contrarian

[7] 0.080 x 0.139 = 0.011.

trades which increase risk by the same amount reduce 6-month AERs by 1.5% p.a.[8] A similar result is observed from Panel B, and both panels in Table V when ACR is used as the performance measure.

The results obtained for the interaction terms using Model (3) in Tables IV and V persist, and are even enhanced when the control variables are included in Model (4). Accordingly, we conclude that our results are not driven by fund turnover, the liquidity of the stocks in the fund portfolios, fund size, return persistence.

[Insert Table V]

E. *Persistence in Momentum Trading*

Table VI cross-tabulates current period trading by subsequent period trading. If in the current period, a fund exhibits contrarian trading, there is a 29.1% probability that it will continue to do so in the subsequent period, and a 6.2% probability that it will instead exhibit momentum trading. However, if a fund exhibits momentum trading in the current period, there is a 28.6% probability that in the following period that it will continue to exhibit momentum trading and a 6.0% probability that it will conduct contrarian trading. This indicates that trading behavior is persistent.

[Insert Table VI]

IV. Conclusions

We empirically confirm previous qualitative research and anecdotal reported behavior which indicates that mutual fund managers follow both momentum and contrarian trading strategies. Furthermore, we find that fund managers are persistent in

[8] -0.108 x 0.139 = 0.015

this behavior. Our unique methodology uses actual mutual fund trades to identify managers which follow these strategies, and allows us to examine their performance.

When we measure performance using simple excess returns, we find that on average contrarian traders outperform. The result is robust to previous fund return, fund turnover, fund size, liquidity of fund's portfolio and whether measured over 3- or 6-months. However, when we use the Carhart (1997) four factor model to measure return, this superior performance disappears. The apparent absence of an advantage from following either a momentum or contrarian strategy ignores managerial discretion on the attributes of the stocks in which the strategies are followed.

Fund managers may follow a momentum strategy by either trading in risky or safe stocks. Contrarian traders may do the same. We find that mutual funds that acquire (sell) high risk stocks that have been recent winners (losers) improve their performance while those following a contrarian strategy in these stocks diminish their performance. In contrast, funds which acquire (sell) winning (losing) low risk stocks adversely affect their performance while those that follow a contrarian strategy improve their performance.

This is consistent with momentum traders benefiting from buying higher risk stocks which exhibit positive autocorrelation of their returns, and avoiding low risk stocks which with negative autocorrelation over their investment horizon. Contrarian traders conversely may benefit from negative autocorrelation of stock returns from the opposite strategy of buying low risk stocks and selling high risk stocks. A possible theoretical explanation for the co-existence of momentum and contrarian trading strategies is that autocorrelation of stock returns may be related to risk. Low risk stocks are possibly more efficiently priced, and revert more quickly to intrinsic value than higher risk stocks which may be small, thinly traded and have limited analyst attention.

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Table I
Descriptive Statistics

Fund Descriptive Statistics 1991-2006			
	Mean	Median	Standard Deviation
Number of fund periods	49,661		
Number of Funds	2,829		
Days in Period	117	92	43
Number of Stocks in Portfolio	149	90	221

Table II

Significant Momentum Betas

The number of statistically significant (10%) momentum betas is generated from linear regressions of: $\text{TradeProp}_j = \alpha + \beta \text{BucketPR}_j + \varepsilon_j$ where:

$$\text{TradeProp}_j \equiv \frac{\text{Value stock prior performance bucket}_j \text{ traded}}{\sum_{i=1}^{n} |\text{Value of stock}_i \text{ traded}|};$$

$$\text{BucketPR}_j \equiv \sum_{i=1}^{n} (\text{Stock prior performance}_i \times \frac{\text{Value stock}_i \text{ held}}{\text{Value prior performance rank bucket}_j \text{ held}});$$

$\text{Stock prior performance}_i = \text{Quarterly excess return of stock i; and}$

$\text{n} = \text{number of stocks in prior performance bucket j.}$

			Momentum Beta			
Year	N	Binomial	Negative		Positive	
		Critical Value	Count	Percent	Count	Percent
Panel A.	Pooled Count	1991-2006				
	49,659	2,597	7,081	14.2%***	7,531	15.2%***
Panel B.	Annual Breakdown					
1991	1,159	76	132	11.4%	237	20.4%
1992	1,806	112	258	14.3%	285	15.8%
1993	1,982	122	237	12.0%	412	20.8%
1994	2,222	136	291	13.1%	347	15.6%
1995	2,579	155	379	14.7%	383	14.9%
1996	2,610	157	352	13.5%	402	15.4%
1997	3,519	207	508	14.4%	448	12.7%
1998	3,739	219	515	13.8%	566	15.1%
1999	3,525	207	514	14.6%	493	14.0%
2000	4,327	250	731	16.9%	623	14.4%
2001	3,848	224	596	15.5%	571	14.8%
2002	4,191	243	565	13.5%	704	16.8%
2003	4,059	236	546	13.5%	668	16.5%
2004	4,509	260	662	14.7%	642	14.2%
2005	4,371	252	648	14.8%	547	12.5%
2006	1,213	79	147	12.1%	203	16.7%

Cumulative binomial distribution critical values (Bin CV) reflect a 1% probability that a greater count occurs by chance.

***, ** and * indicate significance at the 1, 5 and 10 percent levels respectively.

Table III

Mean Returns for Funds with Significant Momentum Betas.

Mean returns and their differences for 26,631 fund-periods are accompanied by their standard errors in parentheses. Mean returns and their differences are accompanied by their standard errors in parentheses. The t-distribution is used to determine the significance of the difference between the negative and positive mean returns. We calculate annualized excess return by subtracting the market return from the fund's return. To obtain annualized cumulative residual return, we estimate:

$$R_{jt} - R_{ft} = a_{j0} + b_{j1}(R_{mt} - R_{ft}) + b_{j2}SMB_t + b_{j3}HML_t + b_{j4}UMD_t + \varepsilon_{jt}$$

for each fund using monthly returns and cumulate the residuals over their respective intervals, where R_{jt} is the return on fund j at time t, R_{ft} is the risk-free return, R_{mt} is the value weighted market return, SMB_t is the return for small minus large stock portfolios, HML_t is the returns for high minus low book-to-market portfolios and UMD_t is high prior-year return minus low prior-year return.

Interval	Negative betas	Positive betas	Difference
Panel A. Annualized Excess Return 1991–2006			
6-month prior	0.014	-0.028	0.042***
	(0.003)	(0.002)	(0.004)
3-month prior	0.031	-0.033	0.064***
	(0.004)	(0.003)	(0.005)
Period	0.018	-0.015	0.033***
	(0.003)	(0.003)	(0.004)
3-month after	0.015	-0.007	0.022***
	(0.003)	(0.003)	(0.005)
6-month after	0.015	-0.010	0.025***
	(0.003)	(0.003)	(0.004)
Panel B. Annualized Cumulative Residuals 1991–2006			
6-month prior	0.008	-0.007	0.015***
	(0.001)	(0.001)	(0.002)
3-month prior	0.015	-0.023	0.038***
	(0.002)	(0.002)	(0.003)
Period	0.001	-0.003	0.004
	(0.002)	(0.002)	(0.002)
3-month after	-0.002	0.001	-0.003
	(0.002)	(0.002)	(0.003)
6-month after	-0.001	-0.003	0.002
	(0.001)	(0.001)	(0.002)

***, ** and * indicate significance at the 1, 5 and 10 percent levels respectively.

Table IV

Excess Return Performance of Momentum and Contrarian Fund Trades

Annualized excess returns are calculated by subtracting the market return from the fund's return.

We estimate:

$$R_{jt+1} = a_0 + b_1 MOM_{jt} + b_2 CON_{jt} + b_3 \Delta beta_{jt} + b_4 MOM_{jt} \times \Delta beta_{jt} + b_5 CON_{jt} \times \Delta$$
$$+ b_6 TO_{jt} + b_7 Liq_{jt} + b_8 Size_{jt} + b_9 R_{jt} + \varepsilon_{jt}$$

	Model			
	(1)	(2)	(3)	(4)
Panel A. 6-Month annualized excess return 1991–2006				
Intercept	-0.007***	-0.007***	-0.007***	0.257***
	(-5.25)	(-4.85)	(-4.87)	(13.28)
MOM_{jt}	-0.004	-0.004	-0.003	0.002
	(-1.24)	(-1.08)	(-0.96)	(0.47)
CON_{jt}	0.022***	0.019***	0.019***	0.013***
	(7.20)	(5.64)	(5.68)	(3.81)
$\Delta beta_{jt}$		0.094***	0.088***	0.071***
		(10.93)	(8.04)	(6.60)
MOM_{jt} x $\Delta beta_{jt}$			0.080***	0.082***
			(3.94)	(4.13)
CON_{jt} x $\Delta beta_{jt}$			-0.108***	-0.111***
			(-4.19)	(-4.35)
TO_{jt}				0.003*
				(1.84)
Liq_{jt}				-0.228***
				(-13.51)
$Size_{jt}$				-0.045***
				(-3.39)
AER_{jt}				0.114***
				(18.31)
N	26,631	23,366	23,366	22,877
Adjusted R^2	0.002	0.007	0.008	0.035

Panel B. 3-Month annualized excess return 1991–2006				
Intercept	-0.004***	-0.005***	-0.005***	0.351***
	(-2.61)	(-2.84)	(-2.86)	(14.91)
MOM_{jt}	-0.003	-0.001	-0.000	0.003
	(-0.77)	(-0.31)	(-0.22)	(0.72)
CON_{jt}	0.019***	0.016***	0.016***	0.008**
	(5.29)	(3.99)	(4.01)	(2.11)
$\Delta beta_{jt}$		0.007	0.000	-0.008
		(0.67)	(-0.01)	(-0.62)
MOM_{jt} x $\Delta beta_{jt}$			0.056**	0.046*
			(2.28)	(1.91)
CON_{jt} x $\Delta beta_{jt}$			-0.053*	-0.67**
			(-1.70)	(-2.17)
TO_{jt}				0.003
				(1.51)
Liq_{jt}				-0.341***
				(-16.65)
$Size_{jt}$				-0.025
				(-1.54)
AER_{jt}				0.066***
				(8.69)
N	26,577	23,310	23,310	22,829
Adjusted R^2	0.001	0.001	0.001	0.019

***, ** and * indicate significance at the 1, 5 and 10 percent levels respectively.

Table V

Cumulative Residual Return Performance of Momentum and Contrarian Fund Trades

Annualized cumulative residual returns, are estimated by:

$$R_{jt} - R_{ft} = a_{j0} + b_{j1}(R_{mt} - R_{ft}) + b_{j2}SMB_t + b_{j3}HML_t + b_{j4}UMD_t + \varepsilon_{jt}$$

for each fund using monthly returns and cumulate the residuals over their respective intervals, where R_{jt} is the return on fund j at time t, R_{ft} is the risk-free return, R_{mt} is the value weighted market return, SMB_t is the return for small minus large stock portfolios, HML_t is the returns for high minus low book-to-market portfolios and UMD_t is high prior-year return minus low prior-year return.

We estimate:

$$R_{jt+1} = a_0 + b_1 MOM_{jt} + b_2 CON_{jt} + b_3 \Delta beta_{jt} + b_4 MOM_{jt} \times \Delta beta_{jt} + b_5 CON_{jt} \times \Delta$$
$$+ b_6 TO_{jt} + b_7 Liq_{jt} + b_8 Size_{jt} + b_9 R_{jt} + \varepsilon_{jt}$$

	Model			
	(1)	(2)	(3)	(4)
Panel A. 6-Month annualized cumulative residuals 1991–2006				
Intercept	-0.000	0.000	0.000	0.014
	(-0.88)	(-0.35)	(-0.37)	(1.50)
MOM_{jt}	-0.002*	-0.002	-0.002	-0.002
	(-1.72)	(-1.42)	(-1.28)	(-1.24)
CON_{jt}	0.000	0.000	0.000	0.000
	(-0.31)	(-0.52)	(-0.46)	(0.12)
$\Delta beta_{jt}$		0.026***	0.022***	0.023***
		(6.12)	(4.05)	(4.07)
MOM_{jt} x $\Delta beta_{jt}$			0.035***	0.031***
			(3.51)	(3.04)
CON_{jt} x $\Delta beta_{jt}$			-0.040***	-0.034***
			(-3.02)	(-2.57)
TO_{jt}				0.003***
				(3.31)
Liq_{jt}				0.013
				(1.55)
$Size_{jt}$				-0.030***
				(-4.64)
ACR_{jt}				-0.005
				(-0.98)
N	21,179	18,413	18,413	18,115
Adjusted R^2	0.000	0.002	0.003	0.005

Panel B. 3- Month annualized cumulative residuals 1991–2006				
Intercept	-0.002	-0.002	-0.002	0.012
	(-1.97)	(-1.61)	(-1.61)	(0.88)
MOM_{jt}	0.002	0.003	0.004	0.003
	(1.11)	(1.50)	(-1.59)	(1.31)
CON_{jt}	0.000	0.000	0.000	0.001
	(-0.25)	(-0.32)	(-0.24)	(0.28)
$\Delta beta_{jt}$		0.000	0.000	0.005
		(0.01)	(-0.03)	(0.59)
MOM_{jt} x $\Delta beta_{jt}$			0.038***	0.042***
			(2.74)	(2.93)
CON_{jt} x $\Delta beta_{jt}$			-0.082***	-0.084***
			(-4.37)	(-4.44)
TO_{jt}				0.003***
				(2.56)
Liq_{jt}				0.021
				(1.76)
$Size_{jt}$				-0.038***
				(-4.04)
ACR_{jt}				-0.032***
				(-3.99)
N	21,392	18,610	18,610	18,298
Adjusted R^2	0.000	0.000	0.002	0.004

***, ** and * indicate significance at the 1, 5 and 10 percent levels respectively.

Table VI

Persistence in Momentum Trading

Crosstabulation of funds' momentum trades in one period with their momentum trades in the following period.

		Subsequent period			
		Contrarian	Not Significant	Momentum	Total
Current Period	Contrarian	2028	4516	436	6980
		29.1%	64.7%	6.2%	100.0%
	Not Significant	4487	24507	4751	33745
		13.3%	72.6%	14.1%	100.0%
	Momentum	433	4730	2073	7236
		6.0%	65.4%	28.6%	100.0%
		6948	33753	7260	47961
		14.5%	70.4%	15.1%	100.0%