Market Timing with Moving Averages[1]

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November 9, 2012

[1]I would like to thank Syed Zamin Ali, Jean Canil, Sudipto Dasgupta, Bruce Rosser, Takeshi Yamada, Alfred Yawson as well as seminar participants at the University of Adelaide. Any remaining errors are my own responsibility.

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Abstract

I present evidence that a moving average (MA) trading strategy third order stochastically dominates buying and holding the underlying asset in a mean-variance-skewness sense using monthly returns of value-weighted decile portfolios sorted by market size, book-to-market cash-flow-to-price, earnings-to-price, dividend-price, short-term reversal, medium-term momentum, long-term reversal and industry. The abnormal returns are largely insensitive to the four Carhart (1997) factors and produce economically and statistically significant alphas of between 10% and 15% per year after transaction costs. This performance is robust to different lags of the moving average and in subperiods while investor sentiment, liquidity risks, business cycles, up and down markets, and the default spread cannot fully account for its performance. The MA strategy works just as well with randomly generated returns and bootstrapped returns. I also report evidence regarding the profitability of the MA strategy in seven international stock markets. The performance of the MA strategies also holds for more than 18,000 individual stocks from the CRSP database. The substantial market timing ability of the MA strategy appears to be the main driver of the abnormal returns. The returns to the MA strategy resemble the returns of an imperfect at-the-money protective put strategy relative to the underlying portfolio. Furthermore, combining several MA strategies into a value/equal-weighted portfolio of MA strategies performs even better and represents a unified framework for security selection *and* market timing.

Key Words: Market timing, security selection, moving average, technical analysis, conditional models.
JEL Classification: G11, G12, G14.

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1 Introduction

Technical analysis involves the use of past and current market price, trading volume and, potentially, other publicly available information to try and predict future market prices. It is highly popular in practice with plentiful financial trading advice that is based largely, if not exclusively, on technical indicators. In a perhaps belated testament to this fact consider the following quote from the *New York Times*'s issue dated March 11, 1988: *"Starting today the New York Times will publish a comprehensive three-column market chart every Saturday... History has shown that when the S&P index rises decisively above its (moving) average the market is likely to continue on an upward trend. When it is below the average that is a bearish signal.* More formally, Brock, Lakonishok and LeBaron (1992) find evidence that some technical indicators do have a significant predictive ability. Blume, Easley and O'Hara (1994) present a theoretical framework using trading volume and price data leading to technical analysis being a part of a trader's learning process. A more thorough study of a large set of technical indicators by Lo, Mamaysky and Wang (2000) also found some predictive ability especially when moving averages are concerned. Zhu and Zhou (2009) provide a solid theoretical reason why technical indicators could be a potentially useful state variable in an environment where investors need to learn over time the fundamental value of the risky asset they invest in. More recently, Neely, Rapach, Tu and Zhou (2010,2011) find that technical analysis has as much forecasting power over the equity risk premium as the information provided by economic fundamentals. The practitioners literature also includes Faber (2007) and Kilgallen (2012) who thoroughly document the risk-adjusted returns to the moving average strategy using various portfolios, commodities and currencies.

The main contributions of this study are as follows. First, I present evidence that the returns to a simple moving average switching strategy dominate in a mean-variance sense the returns to a buy-and-hold strategy of the underlying portfolio. Second, I demonstrate that there is relatively infrequent trading with relatively long periods when the moving average strategy is also holding the underlying assets and the break-even transaction costs are on the order of 5% to 7% per transaction. Thirdly, even though there is overwhelming evidence of market timing ability of the moving average switching strategy, cross-sectional differences remain between the portfolio abnormal returns. These differences persist when controlling for the four-factor Carhart (1997) model for portfolios formed on past price returns. Fourthly, conditional models explain to a certain degree the moving average abnormal returns but do not completely eliminate the significant alphas. Fifth, I document the performance of the moving average strategy using more than 18,000 individual stocks from the Center for Research in Security Prices. Sixth, I present evidence of the robustness of the performance of the moving average strategy in seven international stock markets. Last but not least, the strategy is robust to randomly generated stock returns and boostrapped historical returns.

This paper is similar in spirit to Han, Yang and Zhou (2012). However, a few important differences need to be pointed out. First, I use monthly value-weighted returns of decile portfolios constructed by various characteristics like size, book-to-market, cash-flow-to-price, earnings-to-price, dividend-price, past return, and industry. Value-weighted portfolios at a monthly frequency should have a much smaller amount of

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trading going on inside the portfolio compared to the daily equal-weighted portfolios investigated by Han, Yang and Zhou (2012). Secondly, the cross-sectional results in this study are just an artefact of the decile portfolios and not the main focus of this paper while Han, Yang and Zhou (2012) make a case in point regarding a new cross-sectional anomaly they claim to have discovered. The highlights of this study are the extremely good performance of the moving average portfolios relative to buying and holding the underlying portfolios, the infrequency of trading and the very large break-even transaction costs.

This paper proceeds as follows. Section 2 presents the moving average investment strategy. Section 3 presents evidence regarding the profitability of the moving average switching strategy. Section 4 investigates the robustness of the results in a number of ways. Section 5 discusses the potential drivers of the performance of the moving average strategy over the business cycle and controls for sensitivity to up or down markets, investor sentiment, the default premium, and an aggregate liquidity factor. Section 7 offers a few concluding remarks and discusses potential areas of future research.

2 Moving Average Market Timing Strategies

I use monthly value-weighted[1] returns of sets of ten portfolios sorted by market value, book-to-market, cash-flow-to-price, earnings-to-price, dividend-price, short-term and long-term price reversal, medium-term momentum, and industry classification. The data is readily available from Ken French Data Library. The sample period starts in January 1960 and ends in December 2011.

The following exposition of the moving average strategy follows closely the presentation in Han, Yang, and Zhou (2012). Let R_{jt} be the return on portfolio j at the end of month t and let P_{jt} be the respective price level of that portfolio. Define the moving average of portfolio j $A_{jt,L}$ at time t with length L periods as follows:

$$A_{jt,L} = \frac{P_{jt-L+1} + P_{jt-L+2} + \cdots + P_{jt-1} + P_{jt}}{L}, \tag{1}$$

Throughout most of the paper, I use a moving average of length $L = 24$ months. Later on, in the robustness checks I also present results for all sets of portfolios with lags of 6-months, 12-months, 36-months, 48-months, and 60-months. According to Brock, Lakonishok and LeBaron (1992), the moving average in its various implementations, is the most popular strategy followed by investors who use technical analysis. The way I implement the moving average strategy in this paper is to compare the closing price P_{jt} at the end of every month to the running moving average $A_{jt,L}$. If the price is above the moving average this triggers a signal to invest (or stay invested if already invested at $t-1$) in the portfolio in the next month $t+1$. If the price is below the moving average this triggers a signal to leave the risky portfolio (or stay invested in cash if not invested at $t-1$) in the following month $t+1$. As a proxy for the risk-free rate, I use the returns on

[1] I use value-weighted portfolio returns to limit the amount of trading inside the various portfolios. The empirical results in this paper are unaffected and are strengthened when equal-weighted portfolios are used. However, this may understate the break-even transaction costs as equal weighted portfolios require a lot of trading to be replicated. Similarly, I use monthly returns in order to have a trading strategy which trades less frequently. The results with daily portfolio returns are similar and lead to higher abnormal returns without a disproportionately more frequent trading.

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the 30-day US Treasury Bill.

More formally, the returns of the moving average switching strategy can be expressed as follows:

$$\tilde{R}_{jt,L} = \begin{cases} R_{jt}, & \text{if } P_{jt-1} > A_{jt-1,L} \\ r_{ft}, & \text{otherwise,} \end{cases} \tag{2}$$

in the absence of any transaction costs imposed on the switches. For the rest of the paper and in all of the empirical results quoted I consider returns after the imposition of a one-way transaction cost of τ. Mathematically, this leads to the following four cases in the post-transaction cost returns:

$$\tilde{R}_{jt,L} = \begin{cases} R_{jt}, & \text{if } P_{jt-1} > A_{jt-1,L} \text{ and } P_{jt-2} > A_{jt-2,L}, \\ R_{jt} - \tau, & \text{if } P_{jt-1} > A_{jt-1,L} \text{ and } P_{jt-2} < A_{jt-2,L}, \\ r_{ft}, & \text{if } P_{jt-1} < A_{jt-1,L} \text{ and } P_{jt-2} < A_{jt-2,L}, \\ r_{ft} - \tau, & \text{if } P_{jt-1} < A_{jt-1,L} \text{ and } P_{jt-2} > A_{jt-2,L}. \end{cases} \tag{3}$$

depending on whether the investor switches or not. Note that this imposes a cost on selling and buying the risky portfolio but no cost is imposed on buying and selling the Treasury bill. This is consistent with prior studies like Balduzzi and Lynch (1999), Lynch and Balduzzi (2000), and Han (2006), among others. Regarding the appropriate size of the transaction cost, Balduzi and Lynch (1999) propose using a value between 1 and 50 basis points. Lynch and Balduzi (2000) use a mid-point value of 25 basis point. In order to err on the side of caution, I use a value of 50 basis points in all the empirical results presented in the next section or $\tau = 0.005$.

Once I obtain the returns of the moving average switching strategy, I construct excess returns as zero-cost portfolios that are long the MASS and short the underlying portfolio. Denote the resulting excess return for portfolio j at at the end of month t as follows:

$$\text{MAP}_{jt,L} = \tilde{R}_{jt,L} - R_{jt}, \quad j = 1, \ldots, N. \tag{4}$$

The presence of significant abnormal returns can be interpreted as evidence in favor of superiority of the moving average switching strategy over the buy-and-hold strategy of the underlying portfolio. Naturally, the moving average switching strategy is a dynamic trading strategy so it is perhaps unfair to compare its returns to the buy-and-hold returns of being long the underlying portfolio. Nevertheless, I impose conservatively large transaction costs and later report much larger break-even transaction costs.

3 Profitability of Moving Average Portfolios

In this section, I present summary statistics for the underlying portfolios performance, the performance of the moving average switching strategy, and the excess MAP returns for nine sets of ten portfolios sorted by

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market value, book-to-market ratios, cash-flow-to-price ratios, earnings yields, dividend yields, short-term and long-term price reversal, medium-term momentum, and industry classification. Next, I present single-factor CAPM of Sharpe (1964), three-factor Fama-French (1992), and four-factor Carhart (1997) regression results for the MAP returns of each set of portfolios. Finally, I discuss the result in light of the potential reasons for the profitability of the moving average switching strategy.

A Performance

Table 1 reports the first three moments and the Sharpe ratios of the underlying portfolios, the moving average (MA) switching strategy applied to each portfolio, and the excess return (MAP) of the MA switching strategy over the buying and holding (BH) of the underlying portfolio. The results are most intriguing. First, the average annualized returns of the MA strategy are substantially higher than the average annualized returns of the underlying portfolios. Second, this average return difference come with a lower return standard deviation and, hence, the MA switching strategy appears to dominate the underlying BH portfolio strategy in a mean-variance sense[2]. Third, for the vast majority of portfolios, the underlying BH has a negative return skewness while the MA strategy in most cases exhibits positive skewness. This feature will make the MA switching strategy very attractive to investors who have a preference for skewness. Fourth, the risk-return trade-off is improved tremendously as witnessed by the much higher Sharpe ratios of the MA returns when compared to the Sharpe ratios of the BH returns. Fifth, these results hold for almost all portfolio across all sorting variables. Furthermore, there appear to be some substantial cross-sectional differences related to the size effect (Panel A), the value premium (Panels B through E) as well as reversal and momentum premia (Panels F, G, and H). While not directly the focus of this work, there also appear to be some cross-sectional difference between different industry portfolios.

Insert Table 1 here.

The MA strategy clearly performs very well compared to the BH strategy. However, this only raises questions as to the reasons why it is so much more successful than a traditional buy-and-hold strategy. This leads to the factor attribution and abnormal return analysis in the next subsection.

B Abnormal Returns

The first asset pricing model I consider is the CAPM of Sharpe (1964):

$$\text{MAP}_{jt,L} = \alpha_j + \beta_{j,m} r_{mkt,t} + \epsilon_{jt}, \quad j = 1, \ldots, N, \tag{5}$$

where $r_{mkt,t}$ is the excess return on the market portfolio at the end of month t. The panel on the left in Table 2 presents the annualized alphas in percent and the market betas of the MAP excess returns for

[2]Issues related to the statistical significance of the mean return improvement and the return standard deviation reduction are explored in the next section.

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several sets of portfolios as well as the High minus Low cross-sectional difference.[3] The CAPM alphas of portfolios sorted by market size range between 5.41% for the largest and 7.15% per year for the smallest size, respectively. The alphas of book-to-market portfolios range between 4.17% for decile 8 and 7.76% for the Low decile, respectively. The High minus Low alpha is not statistically significant in either of these two portfolio sets. Next, the cash-flow-to-price sorted portfolios have risk-adjusted returns going from 3.83% for decile 9 to 9.25% for the Low decile. The cross-section High minus Low alpha is highly statistically significant, indicating the the moving average strategy generates much higher abnormal returns for value stocks rather than growth stocks, when value is defined by the cash-flow-to-price ratio. Similar results obtain for the deciles sorted by earnings yield (annualized alphas from as low as 4.12% for decile 8 to as high as 9.26% for the Low decile with a highly statistically significant High minus Low alpha of 4.01%) and dividend yield (annualized alphas range from 3.85% for decile 9 to 9.34% for the Low decile with a statistically significant High minus Low alpha of 4.3%). Portfolios sorted on short-term price reversal have CAPM alphas that go from 5.54% for decile 7 to 10.11% for the Low decile with an insignificant cross-sectional High minus Low CAPM alpha. In contrast, portfolio sorted on past momentum deliver an even wider range of CAPM alphas (4.27% for decile 8 to 15.91% for the Low decile) and a highly significant and positive cross-sectional High minus Low alpha (9.98%) as well. The industry-sorted portfolios have CAPM alphas ranging between 3.06% for the NoDur industry to 10.06% for the HiTec industry.

The next asset pricing model I use to adjust for the risk of the MAP returns is the Fama and French (1992) three-factor model:

$$\text{MAP}_{jt,L} = \alpha_j + \beta_{j,m} r_{mkt,t} + \beta_{j,s} r_{smb,t} + \beta_{j,h} r_{hml,t} + \epsilon_{jt}, \quad j = 1, \ldots, N, \tag{6}$$

where $r_{mkt,t}$ is the excess market return at the end of month t, $r_{smb,t}$ is the return on the SMB factor at the end of month t and $r_{hml,t}$ is the return on the HML factor at the end of month t. The middle panel of Table 2 reports the empirical results. The Fama-French alphas are largely similar to the CAPM alphas with some of the previous results for the High minus Low portfolio becoming statistically significant (size deciles in Panel A), some becoming statistically insignificant (value deciles by earnings and dividend yield in Panels D and E) with the rest unchanged qualitatively. The sign and magnitude of the Fama-French market betas is largely the same as the CAPM market betas, namely, significantly negative though low in absolute value suggesting that the MAP returns can be used to hedge exposure to the underlying portfolios. The SMB betas are either negative and significant (with the exception of a few dividend yield deciles) or insignificant. Similarly, the HML betas are mostly negative and significant though of smaller absolute values than the market betas. In terms of factor attribution, these results suggest that the MAP returns have negative exposure to the market factor, a somewhat positive exposure on larger stocks with an emphasis on growth stocks over value stocks.

[3] With the exception of industry-sorted portfolios. However, other types of cross-sectional difference portfolios are possible in this case. I leave the investigation into these potential cross-industry differences for future work.

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The final asset pricing model I consider in this section is the four-factor Carhart (1997) model:

$$\text{MAP}_{jt,L} = \alpha_j + \beta_{j,m} r_{mkt,t} + \beta_{j,s} r_{smb,t} + \beta_{j,h} r_{hml,t} + \beta_{j,u} r_{umd,t} + \epsilon_{jt}, \quad j = 1, \ldots, N, \tag{7}$$

where all variables are as defined before and $r_{umd,t}$ is the return of the UMD factor at the end of month t. The panel on the right in Table 2 presents the results for the four-factor model adjustment to the MAP returns. First, note that the vast majority of the risk-adjusted alphas are lower than the CAPM and the Fama-French alphas. However, they are all still quite substantial economically and are still highly statistically significant. The factor loadings on the market portfolio, SMB, and HML are largely unchanged while the loadings on the UMD factor are mostly negative and statistically significant (with the exception of decile 1 in a few panels). This is in line with the CAPM factor loadings reported previously and further demonstrates the contrarian nature of the MAP returns.

Insert Table 2 here.

Reading Table 2 across, we notice that the adjusted R^2 improves when we consider in turn the Fama-French three factor model and the four-factor Carhart model. This improvement is uniform across the different sets of portfolios I consider and suggests that all four factors have a role to play in driving the performance of the MAP returns. Nevertheless, the average adjusted R^2 values suggest that only around half of the return variation can be explained and accounted for by market, size, value and momentum. This leaves a large portion of return variation that cannot be accounted for.

C Discussion

The large values of the risk-adjusted abnormal returns presented in the previous subsection demonstrate the profitability of the MA switching strategy. This raises the question as to what are the drivers of the performance of the MA strategy. So far the evidence points towards a strategy that is contrarian, with a focus on large-cap growth stocks and short the market. However, the goodness-of-fit statistics so far indicate this is at most only half the story. A more fundamental question that arises is how can this strategy survive in competitive financial markets. A few potential reasons seem plausible.

First, there is ample evidence that stock returns are predictable at various frequencies at least to a certain degree. This level of predictability is not perfect but is sufficient to improve forecasts of future stock returns when stock return predictability is ignored. Some of the early evidence presented in Fama and Schwert (1977) and Campbell (1987) as well as more recent work by Cochrane (2008) clearly demonstrates that stock return predictability is an important feature that investors should ignore at their own peril.

Evidence regarding the performance of the moving average technical indicator is present in Brock, Lakonishok and LeBaron (1992) in the context of predicting future moments of the Dow Jones Industrial Average. Lo, Mamaysky and Wang (2000) provide further evidence using a wide range of technical indicators with

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wide popularity among traders showing that this adds value even at the individual stock level over and above the performance of a stock index. More recently, Neely, Rapach, Tu, and Zhou (2010) provide evidence in favor of the usefulness of technical analysis in forecasting the stock market risk premium.

Second, early work on the performance of filter rules by Fama and Blume (1966), Jensen and Benington (1970) concluded that such rules were dominated by buy and hold strategies especially after transaction costs. Malkiel (1996) makes a forceful and memorable point against technical indicators: *"Obviously, I'm biased against the chartist. This is not only a personal predilection but a professional one as well. Technical analysis is anathema to the academic world. We love to pick on it. Our bullying tactics are prompted by two considerations: (1) after paying transaction costs, the method does not do better than a buy-and-hold strategy for investors, and (2) it's easy to pick on. And while it may seem a bit unfair to pick on such a sorry target, just remember: It's your money we are trying to save."* In a follow up on Brock et al (1992), Bessembinder and Chan (1998) attribute the forecasting power of technical analysis to measurement errors arising from non-synchronous trading. Ready (2002) goes even further and claims the results in Brock et al (1992) are spurious and due to data snooping. Formal tests using White's Reality Check are conducted in Sullivan, Timmerman and White (1999) confirm that Brock et al (1992) results are robust to data snooping and perform even better out of sample though there is evidence of time variation in performance across subperiods. A more recent study using White's Reality Check and Hansen's SPA test is Hsu and Kuan (2005) who find evidence of profitability of technical analysis using relatively "young" markets like the NASDAQ Composite index and the Russell 2000 both in-sample and out-of-sample.

Furthermore, Treynor and Ferguson (1985) make a strong case in favor of investor's learning and Bayesian updating conditional on new information received rationally combining past prices can result in abnormal profitability. Sweeney (1988) revisits Fama and Blume (1966) and finds that fulter rules can be profitable to floor traders in the 1970–1982 time period. Neftci (1991) presents a formal analysis of Wiener-Kolmogorov prediction theory which provides optimal linear forecasts. He concludes that if the underlying price processes are non-linear in nature then technical analysis rules might capture some useful information that is ignored by the linear prediction rules. More involved and inherently non-linear rules are investigated in the context of foreign currency exchange rates by Neely, Weller and Dittmar (1997) using a genetic programming approach. Gencay (1998) goes even further in using non-linear predictors based on simple moving average rules on the Dow Jones Industrial Average over a long time period between 1897 and 1988. In a similar vein, Allen and Karjalainen (1999) use genetic algorithm to search for functions of past prices find that can outperform a simple buy-and-hold strategy and report negative excess returns for most of the strategies they consider.

Thirdly, it is entirely possible that market prices of financial assets can persistently deviate from fundamental values. Those fundamental values themselves are subject to incomplete information and, perhaps, imperfect understanding of valuation tools as well as dispersion of beliefs and objective and behavioral biases across the pool of traders and investors who regularly interact in financial markets. When investors' information is incomplete and they learn continuously over time the true fundamental value, Zhu and Zhou

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(2009) show theoretically that the moving average price is a useful state variable that aids in investors' learning and improves their well-being and utility.

Behavioral and cognitive biases have been proposed in Daniel, Hirshleifer and Subrahmanyam (1998) and Hong and Stein (1999), among others, as a potential driver of both price under- and over-reaction in conjunction with the observed price continuation of stock prices. An alternative explanation for price continuation was proposed in Zhang (2006). He argues that investors sub-optimally underweight newly arriving public information leading to a persistent deviation of the market price from the fundamental intrinsic value.

Note also that despite the apparent similarity of the MA switching strategy to the momentum strategy, the four-factor alphas presented in the previous subsection are still mostly significant and of high magnitudes. More appropriately, the payoff of the MA strategy is similar to the payoffs of an average-price Asian call option that is continuously reloading as the moving average window moves forward in time. Hence, perhaps it should be less surprising that it reduces volatility compared to the buy-and-hold portfolio and improves the mean return (due to the call option's convexity). Further investigation of this possibility is left for future work.

D Explanation

Before making an attempt at explaining the reasons for the profitability of the MA strategies performance, it is useful to inspect a scatter plot of the MA strategy returns versus the underlying BH strategy returns for the same portfolio. For ease of exposition I provide a plot for a single portfolio only.[4] Figure 1 presents the scatter plot for the first decile of the market-capitalization sorted deciles.

Insert Figure 1 about here.

The strategy is obviously triggering false positive signals where we are told to be long the underlying asset and then its value declines (negative quadrant of returns in the figure) as well as false negative signals where we switch into the risk-free assets while the risky underlying delivers a negative return in the following period. Nevertheless, when the signal is right, the scatter plot resembles the payoff of an at-the-money put option combined with a long position in the underlying risky asset.

In order to develop this idea further, I introduce some additional notation. Suppose that the price of the underlying risky asset is S_0 which follows a geometric Brownian motion process. Black and Scholes (1973) then show that a European put option with a strike price of $X = S_0$ and T periods to maturity has the following value:

$$P_0 = e^{-rT} S_0 N(-d_2) - S_0 N(-d_2), \tag{8}$$

[4]The scatter plots for the other portfolios sorted on the various characteristics are available from the author upon request.

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where

$$d_{1,2} = \frac{(r \pm \frac{\sigma^2}{2})T}{\sigma\sqrt{T}},$$

and $N(d)$ is the cumulative distribution of a standard Gaussian random variable. Now consider the value V_0 of an at-the-money protective put option combined with a long position in the underlying S_0:

$$V_0 = S_0 \left[N(d_1) + e^{-rT}(1 - N(d_2)) \right]. \tag{9}$$

Considering the replicating portfolio involved in this protective put strategy as if we had \$1 to invest at time 0 we need to invest a fraction w_S in the risky underlying security and a fraction w_B in the risk-free security:

$$\begin{aligned} w_S &= \frac{N(d_1)}{N(d_1) + e^{-rT}(1 - N(d_2))}, \\ w_B &= \frac{e^{-rT}(1 - N(d_2))}{N(d_1) + e^{-rT}(1 - N(d_2))}. \end{aligned}$$

Note that this strategy is always partially invested in the risky underlying and partially lends money at the risk-free rate of interest. If we believed completely the assumption regarding the data-generating process for the stock price then this would be a superior strategy to follow compared to the MA strategy. However, in light of the evidence against the log-normality of stock returns and volatility clustering, the MA strategy appears to provide a risky heuristic alternative where the switch is complete. We are always either fully 100% invested in the risky underlying or fully 100% invested in the risk-free security. In the absence of a strong belief regarding the data generating process this is perhaps a suitable strategy to follow. Furthermore, if one is prepared to supply a more suitable process for the stock price and price the protective put, then the replicating portfolio in this case will provide a better alternative to the MA strategy.

E Cumulative Returns

The cumulative return performance of the MA strategies relative to the underlying BH strategies is uncanny. The MA strategies over all ten ME-sorted decile portfolios manage to avoid most sharp down-turns over the past half century. Figure 2 presents the time series plot of the cumulative returns of value-weighted 10 decile portfolio returns relative to the cumulative returns of the underlying BH portfolio returns.

Insert Figure 2 about here.

F Individual Stocks

In this subsection I report results on the performance of moving average strategies with individual stocks in the CRSP database starting in January 1960 until December 2011. This results in 28,685 individual stocks.

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I retain only the stocks for which a contiguous block of non-missing 48 monthly returns is available.[5] This leaves a total of 18,397 stocks. Instead of reporting the results in tabular form, I report the key attributes in Figure 3.

Insert Figure 3 about here.

The performance of the MA strategy with individual stocks is largely consistent with the performance of the MA strategy with portfolios. The risk of the MA strategy is uniformly always smaller than the risk of the underlying stock. The difference in average returns between the MA and BH strategies is positive for 18,078 or more than 98% of all individual stocks I investigate. The superior performance of the MA strategy over the BH strategy does not come at the cost of a large number of trades. The MA strategies of almost 10,000 stocks have between 1 and 10 switches during the sample period under consideration. The break-even transaction costs of 15,000 stocks are between 0 and 100 basis points. Bear in mind that the break-even transaction costs are in excess of the 50 basis point one-way transaction cost imposed in calculating the MA returns. Finally and, most importantly, for the vast majority of individual stocks, the probability of being on the right side of the market, p_1, is well above 50% with an average value of 72.4%.

Insert Figure 4 about here.

Figure 4 presents histograms of the annualized Treynor-Mazuy (TM) and Henriksson-Merton (HM) alphas of the respective market timing regressions of the MA strategies returns performed on individual stocks and the associated t-statistics. The positive skew of the TM alphas is very pronounced with 84.6% positive alphas (40.9% statistically significant at 95% confidence level). This leaves only 13.7% of the TM alphas have negative point estimate with barely 1.2% statistically significant at 95% confidence level. Turning to the HM market timing alphas we observe a slightly less pronounced positive skew of the histogram. Of all the HM alphas only 71.1% have positive point estimates (24.8% are statistically significant at 95% confidence level) while 27.3% have negative point estimates (with almost 4% statistically significant at the 95% confidence level).

Bearing in mind that the Henriksson-Merton market timing regression is based on the market factor and at-the-money put option return on the market explains why the results are evidence of abnormal MA returns is weaker in the HM alphas compared to the TM abnormal returns. Nevertheless, a quarter of all stocks under consideration have statistically significant positive abnormal returns of magnitudes that are highly economically significant.

[5] As a robustness check, I also consider requiring a longer series on non-missing monthly returns of 72 months and 84 returns. This results in a smaller number of stocks but does not materially change the results presented for the larger set of stocks with only 48 consecutive non-missing monthly returns. The additional results are available from the author upon request.

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4 Robustness Checks

In this section, I report the results of several robustness check performed on the previously reported empirical findings. First, I show evidence of the MA strategy performance in two subperiods of equal length. Second, I show how the MA strategy performs when various lag length are used. Third, I report the intensity of trading, the break-even transaction costs, the probability of being on the right side of the market, and the statistical significance of the mean return and standard deviation improvement. Finally, I also report how the number of trades and the break-even transaction costs vary with alternative lengths of the moving average.[6]

A Subperiods

In this subsection, I split the sample in two when the first half-period starts in January 1960 and ends in December 1986 while the second half-period starts in January 1987 and ends in December 2011. Table 3 presents the results for the risk-adjusted abnormal MAP returns using the single-factor CAPM model, the three-factor Fama-French model, as well as the four-factor Carhart model. In the interest of preserving space and the focus the reader's attention on the important results, only the alphas and the adjusted R^2 is reported in Table 2.[7] Overall, the results in previous section are robust with respect to the two sub-periods. The results are a little weaker with respect to the alphas of size deciles (Panel A) and momentum deciles (Panel G) where half of the decile portfolios' alphas are insignificant in the first half-period while all ten deciles' alphas are highly significant in the second half-period.

Insert Table 3 here.

B Alternative Lag Lengths

Next, I investigate the effect of moving average windows of various lengths on the size of the average MAP returns for all the sets of portfolios under investigation. Table 4 reports the annualized average returns of the MAP for moving average windows of 6 months, 12 months, 36 months, 48 months, and 60 months in length. The average returns are economically and statistically significant with fewer as well as more than 24 months, the baseline window used previously. These results persist with up to 36 months in the moving average length and appear to be much weaker at longer windows of 48 and 60 months. Importantly, significant cross-sectional variation persists for all sets of portfolios with the exception of book-to-market, and both short-term and long-term reversal portfolios. The range of annual MAP returns with a moving average window of 6 months is between roughly 8% and 21%. The range of annual MAP returns with the length of the moving average is 12 months is between approximately 5% and 15%. When I increase the moving

[6]The robustness checks presented here are only a small portion of the total number of robustness checks performed in preparing this article. Results for equal-weighted portfolio, both daily and monthly returns, double-sorted portfolio sets along size/book-to-market and size/past performance show the profitability of the MA switching strategy is robust with respect the frequency of the data, the portfolio construction and the portfolio composition. Additional results are available from the author upon request.

[7]The full regression results along with the factor loadings is available from the author upon request.

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average window length to 36 months the range of average annualized MAP returns drops considerably to between 1% and 9%, depending on which sets of deciles I consider.

Insert Table 4 here.

C Statistical Significance, Trading Intensity and Break-Even Transaction Costs

Table 5 reports the annualized change in the average return between the MA and BH portfolio, the change in the annualized standard deviation, the proportion of times when the signal is on, p_A, the number of one-way transactions, NT, the break-even transaction costs (BETC) that would eliminate the return improvement based on the number of transactions NT, and two success probabilities, p_1 and p_2. The first probability reports the fraction of times when a signal resulted in a action that led to a positive return, while the second probability reports the fraction of times when the return was in excess of the risk-free rate.

Table 5 reports the statistical significance in the improvement of the average return $\Delta\mu$ of the MA portfolio over the BH portfolio as well as the reduction in the return standard deviation $\Delta\sigma$. The evidence points towards a substantial improvement in a mean-variance sense for all sets of portfolios under consideration. The annualized improvement in the average return ranges from 2% to 10% while the reduction in the standard deviation is between approximately 3% to 14%. The MA strategy is active more often than not ranging between 52% to 87% of the sample. Yet, the number of transactions, NT, is never above 60 and can be as little as 26 for decile 9 of the dividend-yield sorted portfolios. In a sample of 600 months this translates into average holding periods of between 10 and 25 months where the MA strategy is continuously invested either in the risky asset or the risk-free asset. Next, I calculate break-even transaction costs, BETC, calculated as the level of one-way proportional transaction cost in percent that would eliminate completely the average MAP portfolio return. The values of the BETC for the various sets of portfolio range between almost 3% to as high as 9%. This is a very large level of transaction costs which should more than compensate for the rebalancing costs associated with implementing the value-weighted portfolio scheme used to construct the portfolio returns. Finally, the last two columns report the fraction of months that the MA strategy generates a positive return (π_1) as well as a return that is in excess of the risk-free rate (π_2). I report the statistical significance of the null hypothesis that the true fraction of times is above 50%. With the exception of three momentum deciles and two industry portfolios, all the observed fractions are highly statistically significant and range from 55% to 65% success rate of the MA strategy being on the right side of the market. These are considerably favorable odds and in line with the evidence reported previously about the superior performance of the MA switching strategy.

Insert Table 5 here.

Table 6 reports the number of transactions and the break-even transaction costs for alternative lag lengths of the moving average strategy. As would be expected, the trading intensity declines as I implement the MA strategy at longer window lengths of up to 60 months. Vice versa, at shorter moving average window length

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of 6 and 12 months the number of transaction increases but it is never excessive with a maximum of 140 transaction for MAP(6) and 93 for MAP(12). In a similar fashion, the BETC decline at shorter MA window lengths compared to the baseline MAP(24) results while they increase at longer MA window lengths.

Insert Table 6 here.

The large values of BETC and the relatively small number of transactions NT suggest that this MA switching strategy is quite successful at improving the returns over a buy-and-hold investment strategy. The superior performance is robust with respect to two subperiods, various lag lengths of the moving average window and persists for between 6 and 60 months with very reasonable intensity of trading and substantial break-even transaction costs. This suggests that the MA switching strategy will be of use to not only large institutional investors but will also be attractive and within reach of small individual investors. These results are perhaps suggestive as to the wide popularity of the MA as a technical indicator in practice.

5 Drivers of Abnormal Returns

In this section, I investigate whether the superior returns of the MAP portfolios are due to their ability to time the market. Furthermore, I control the MAP performance for economic expansions and contractions as well as other state contingencies like the sign of the lagged market return. Finally, I investigate the conditional performance of the MAP returns while controlling for two instrumental variables with documented predictive power over stock returns and an additional risk factor to control of the possible presence of liquidity risks.

A Market Timing

The first approach towards testing for market timing ability is the quadratic regression of Treynor and Mazuy (1966):

$$\text{MAP}_{jt,L} = \alpha_j + \beta_{j,m} r_{mkt,t} + \beta_{j,m^2} r^2_{mkt,t} + \epsilon_{jt}, \quad j = 1, \ldots, N, \tag{10}$$

where statistically significant evidence of a positive β_{j,m^2} can be interpreted as evidence in favor of market timing ability. The second approach is to allow for a state-contingent $\beta_{j,m}$ based on the direction of move of the market return as in Henriksson and Merton (1981):

$$\text{MAP}_{jt,L} = \alpha_j + \beta_{j,m} r_{mkt,t} + \gamma_{j,m} r_{mkt,t} I_{\{r_{mkt,t}>0\}} + \epsilon_{jt}, \quad j = 1, \ldots, N, \tag{11}$$

where $I_{\{r_{mkt,t}>0\}}$ is an indicator function of the event of a positive market return. A statistically significant value of $\gamma_{j,m}$ is usually interpreted as evidence of successful market timing ability.

Table 7 presents the results of the two market timing regressions for various sets of value-weighted decile portfolios. Panel TM presents the empirical results from the Treynor and Mazuy (1966) quadratic regression while Panel HM presents the results for the state-contingent beta regression of Henriksson and Merton (1981).

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In both regressions, both β_{j,m^2} and $\gamma_{j,m}$ are highly statistically significant, indicating there is strong evidence of market timing ability of the switching moving average strategy. Nevertheless, the alphas of quite a few decile portfolios are also statistically significant at conventional levels. This suggests that market timing alone is not the sole driver of the abnormal returns generated by the switching moving average strategy.

Insert Table 7 here.

B Business Cycles and Market States

Following Han, Yang and Zhou (2012), I investigate the performance of the MAP portfolio returns in economic expansions and contractions as well as in up and down markets as defined by the sign of the market return. Table 8 presents the results for the various sets of portfolio deciles. The evidence overwhelmingly indicates that MAP abnormal returns are higher during economic contractions and following positive market factor returns. For portfolios constructed by sorting on past performance (short-term/long-term reversal and medium-term momentum) there is also evidence of a significant cross-sectional differences between the High and Low MAP abnormal returns which cannot be accounted for by the four Carhart (1997) factors and the recession dummy and up market dummy variables. This effect is smaller in magnitude than the one found by Han, Yang and Zhou (2012). Note, however, that they use daily equal-weighted returns which could potentially explain the difference in the cross-sectional results between this study and their study.

Insert Table 8 here.

C Conditional Models with Macroeconomic Variables

Ferson and Schadt (1996) make a strong case for using predetermined variables in controlling for changes in economic conditions while evaluating investment performance. I augment the four-factor Carhart (1997) model with an intercept that is a linear function of a set of instruments as well as cross-products of the instrumental variables with the market return to allow for state-dependent betas with the market factor. I use investor sentiment due to Baker and Wurgler (2006), the aggregate liquidity factor of Pastor and Stambaugh (2003), and the default spread of Moody's BAA corporate bond yield over the AAA corporate bond yield as the instrumental variables Z_t in the following regression:

$$\text{MAP}_{jt,L} = \alpha_j + \beta_{j,m} r_{mkt,t} + \beta_{j,s} r_{smb,t} + \beta_{j,h} r_{hml,t} + \beta_{j,u} r_{umd,t} + \beta_{j,Z} Z_{t-1} + \gamma_{j,Z} Z_{t-1} r_{mkt,t} + \epsilon_{jt}, \quad j = 1, \ldots, N, \tag{12}$$

Baker and Wurgler (2006) provide evidence that investor sentiment is associated with expected returns and risks of the market. When investor sentiment is low, undervalued stocks are likely to be undervalued more strongly than when investor sentiment is high. Similarly, overvalued stocks are likely to be less overvalued when investor sentiment is low and more overvalued when investor sentiment is high. Next, I present evidence regarding the exposure of the MAP returns to changes in investor sentiment.

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Table 9 presents the results of the conditional model estimation. Changes in investor sentiment are important both in increasing conditional alphas but also lead to higher betas with the market factor as evidenced by the positive coefficient estimate of the cross-product variable $\Delta S \times r_m$. Increases in the default spread result in higher conditional alphas but lower conditional betas with the market. The evidence for the aggregate liquidity factor is a little mixed and there appear to be some cross-sectional differences between the various decile portfolio returns. However, all the unconditional alphas for all sets of portfolios are highly statistically and economically significant. This suggests that investor sentiment, liquidity and the default premium cannot account for the MAP abnormal returns, at least using this particular conditional specification.

Insert Table 9 here.

Finally, I put all the instrumental variables along with an NBER recession dummy variable in the same regression with the four Carhart (1997) factors as well as interactions between the instrumental variables and the market return. Table 10 presents the results from this conditional model specification. The previous results vis-a-vis investor sentiment, the default spread, and liquidity largely hold with the same signs albeit with a smaller degree of statistical significant. The recession indicator emerges as an important driver of conditional market betas where for all sets of portfolios the interaction term $RI \times r_m$ is always negative and highly statistically significant. This suggests that for almost all portfolios betas with the market tend to be significantly lower during economic recessions compared to their value during economic expansions.

Insert Table 10 here.

D Portfolios of MA Strategies

It is of further interest to investigate the combined performance of security selection as well as market timing. To this effect, I construct value-weighted (VW) and equal-weighted (EW) portfolios based on each set of ten portfolios under consideration. As a benchmark, I construct VW and EW buy-and-hold (BH) portfolios of the respective portfolios sets. Table 11 reports the annualized first three moments of the portfolio of MA strategies returns, the BH benchmarks as well as the spread of the portfolio of MAs over the portfolios of BH benchmarks. The results are quite striking. First, the portfolios of MA strategies significantly outperform the portfolios of BH strategies. Second, the risk of the portfolios of MA strategies is considerably lower than the risk of portfolios of BH strategies. Thirdly, the skewness of the portfolios of MA strategies is positive while the skewness of the portfolios of BH strategies is negative. Hence, it appears that the portfolios of MA strategies third-order stochastically dominate the portfolios of BH strategies. Fourthly, the Sharpe ratios of the portfolios of MA strategies is substantially larger than the Sharpe ratios of the portfolios of BH strategies. Furthermore, the performance of the portfolio spreads MA$-$BH shows a further reduction in risk and an increase in skewness with similar or better risk-return trade-off. However, the average return of the portfolio

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spreads is of the same order of magnitude as the break-even transaction costs reported previously. This is an indication that most of the additional return is due to market timing rather than security selection.

Insert Table 11 here.

E Simulations

In this subsection, I report the results from two sets of simulations. First, I draw 1000 random samples designed to match the average historical return and the historical variance-covariance matrix of returns for each set of portfolios under consideration. Then, I compare the MA versus BH performance for every random sample and report the averages across all the simulations. Second, I draw randomly and without replacement 1000 samples from the historical returns. Again, I compare the performance of the MA strategy over the BH strategy for every bootstrapped sample and report the averages across all the simulations.

E.1 Randomly Generated Returns

Table 12 reports the average improvement in mean return and risk as well as the number of switches, percentage of months the MA strategy is invested in the underlying portfolio, break-even transaction costs, percentage of months the MA strategy return exceeds zero and the Treynor-Merton and Henriksson-Merton market timing alphas across 1000 Monte Carlo simulations designed to match the first two moments of the portfolio returns. Overall, the results are consistent with the results reported in previous sections regarding the various sets of portfolios. There is a significant improvement in both risk and return when comparing the moving average strategy over the buy-and-hold strategy. This improvement does not come at the cost of a lot of trading as the number of switches is between 42 (EP decile 7) and 67 (Momentum decile Low) from a total of 600 months in the entire sample period. The average break-even transaction costs are of similar order of magnitude as reported previously and indicate that the MA strategy is superior to the BH strategy for typical levels of proportional transaction costs available to both institutional and retail investors. Fully up to 2 out of 3 months the MA strategy delivers a positive return as indicated by the average value of p_1's reported in the table. Interestingly, virtually all of the market timing alphas are statistically significant. This is an indicator that the simulated returns produce MA returns that are not entirely explained by market timing.

Insert Table 12 here.

E.2 Bootstrapped Returns

Table 13 reports averages across 1000 bootstrapped samples from the historical set of portfolio returns during the same period under consideration used in previous sections. As a starting point, I do draw without replacement one monthly return at random from the same sample for every single month and decile between 1960:01 and 2011:12. I run the moving average strategy and the buy-and-hold strategy for every simulated

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sample and report the average improvement in mean return and standard deviation of return as well as the average number of switches, the average break-even transaction costs, percentage of positive returns and the average market timing alphas. The results are broadly consistent with the Monte Carlo simulation results reported previously as well as the decile portfolio results in Tables 5 and 7.

Insert Table 13 here.

6 International Evidence

In this section, I investigate further the performance of the moving average strategy relative to the buy-and-hold strategy using stock returns from Australia, Canada, France, Germany, Italy, Japan and UK. In order to avoid the effects of exchange rate changes, I use local currency monthly returns for the entire stock market of each of the countries I consider as well as portfolio returns sorted on book-to-market, earnings yield, dividend yield and cash earnings to price ratio.

Table 14 reports the international evidence in favor of the moving strategy. The evidence is broadly similar to the evidence reported previously using US portfolio returns. The MA strategy largely outperforms the BH strategy and this outperformance is achieved with less risk. The MA strategy has a very low intensity of trading with between 14 (UK Low DP and Low CEP portfolios) and 48 (Australia Low EP portfolio) number of switches in a sample of 432 months. Furthermore, the break-even transaction costs are very large and well above realistic one-way transaction costs encountered in practice. Additionally, a few of the market timing alphas are statistically different from zero. Note, that we cannot attach any meaningful economic significance to these market timing alphas over and above the fact that any superior performance is not entirely due to the market timing ability of the MA strategy. Finally, note that the outperformance is clearly much larger for growth portfolios than for value portfolios. This is consistent with the protective put option explanation suggested previously since growth stocks tend to be more volatile than value stocks.

Insert Table 14 here.

7 Conclusion

In this paper, I report results for a simple moving average switching strategy applied to decile portfolios sorted by size, book-to-market, cash-flow-ro-price, earnings-to-price, dividend-price, past returns and industry. There is overwhelming evidence that the switching moving average strategy dominates in a mean-variance sense buying and holding any of the decile portfolios. The excess returns of the switching moving average returns over buying and holding the underlying portfolios are relatively insensitive to the four Carhart (1997) factors and generate highly statistically and economically significant alphas. In addition, abnormal returns for most deciles survive after controlling for investor sentiment, default, liquidity risks, recessions and up/down markets. This switching strategy does not involve any heavy trading when implemented with

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monthly returns and has very high break-even transaction costs, suggesting that it will be actionable even for small investors. The results are robust with respect to portfolio construction, various lag lengths of the moving average, alternative sets of portfolios, international stock markets, individual stocks, randomly generated stock returns and boostrapped historical returns.

Further work would be necessary to investigate the potential link between the returns of the MA switching strategy and the payoffs of protective put options on the underlying asset. A more aggressive implementation will involve selling short the underlying asset in response to a signal to switch instead of shifting the funds into cash. I conjecture that the payoff of this version of the MA strategy resembles an imperfect at-the-money straddle. It would also be of use to test more formally whether higher moments like skewness and kurtosis are improved by the MA strategy over the BH strategy. One potential alternative is to combine all first four moments using a utility function over them and convert the gains into certainty equivalent utility gains. Comparing those gain to the break-even transaction costs will provide further evidence into the superiority of the MA switching strategy.

Considering the vast literature on technical analysis and the numerous technical indicators following by some traders in practice, this study is just a first step towards investigating the performance and implementation of one common technical indicator. Future work will determine which other technical indicators perform well and whether they produce significant abnormal returns over and above the relevant transaction costs.

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Table 1. Summary Statistics.

This table reports summary statistics for the respective buy and hold (BH) portfolio returns, the moving average (MA) switching strategy portfolio returns and the excess return of MA over BH (MAP) using sets of 10 portfolios sorted by several variables. The sample period covers 1960:01 until 2011:12 with value-weighted portfolio returns. μ is the annualized average return, σ is annualized standard deviation of returns, s is the annualized skewness, and SR is the annualized Sharpe ratio. The length of the moving average window is 24 months. A one-way transaction cost of 0.5% has been imposed in the computation of the MA and MAP returns.

Panel A: Size sorted portfolios.

Portfolio	μ	σ	s	SR	μ	σ	s	SR	μ	σ	s	SR
	BH Portfolios				MA Portfolios				MAP Portfolios			
Low	13.57	22.44	-0.14	0.38	17.94	17.04	0.35	0.75	4.37	14.09	0.71	0.31
2	12.92	22.28	-0.22	0.35	17.92	16.84	0.27	0.76	5.00	13.99	0.90	0.36
3	13.62	21.29	-0.41	0.40	17.62	16.25	0.03	0.77	4.00	13.24	1.21	0.30
4	13.01	20.52	-0.46	0.38	17.70	15.17	0.07	0.83	4.69	13.24	1.30	0.35
5	13.30	19.80	-0.48	0.41	17.48	14.66	-0.08	0.84	4.18	12.76	1.07	0.33
6	12.47	18.58	-0.49	0.40	16.59	13.73	0.08	0.84	4.11	11.99	1.38	0.34
7	12.50	18.26	-0.45	0.40	16.41	13.49	0.17	0.84	3.91	11.83	1.32	0.33
8	11.90	17.79	-0.43	0.38	15.91	13.24	0.14	0.82	4.01	11.36	1.34	0.35
9	11.19	16.35	-0.40	0.37	15.17	12.04	0.21	0.84	3.98	10.54	1.30	0.38
High	9.47	14.99	-0.31	0.29	13.11	11.70	-0.19	0.68	3.64	8.92	0.76	0.41
High−Low	-4.10	16.95	-0.74	-0.54	-4.83	16.35	-0.71	-0.61	-0.73	12.24	-0.66	-0.06

Panel B: Book-to-market sorted portfolios.

Portfolio	μ	σ	s	SR	μ	σ	s	SR	μ	σ	s	SR
	BH Portfolios				MA Portfolios				MAP Portfolios			
Low	9.13	18.13	-0.19	0.22	14.36	13.28	0.27	0.70	5.23	11.88	0.83	0.44
2	10.21	16.63	-0.43	0.31	14.38	12.67	0.12	0.73	4.17	10.28	1.65	0.41
3	10.95	16.26	-0.45	0.36	15.29	12.39	0.07	0.82	4.34	9.92	1.73	0.44
4	10.89	16.66	-0.46	0.35	14.80	12.14	0.37	0.80	3.91	10.93	1.58	0.36
5	10.76	15.66	-0.39	0.36	14.39	11.84	0.26	0.78	3.63	9.77	1.55	0.37
6	11.68	15.94	-0.40	0.41	15.26	12.17	0.31	0.83	3.58	9.77	1.71	0.37
7	12.31	15.53	-0.08	0.46	15.81	12.76	0.30	0.84	3.50	8.27	1.27	0.42
8	12.97	16.02	-0.44	0.49	15.47	12.42	0.14	0.83	2.50	9.70	1.43	0.26
9	13.93	16.90	-0.29	0.52	17.99	13.02	0.21	0.99	4.06	10.06	1.06	0.40
High	15.29	20.56	0.08	0.49	19.33	16.03	0.55	0.89	4.04	12.29	0.18	0.33
High−Low	6.16	16.17	0.54	0.06	4.97	15.13	0.72	-0.01	-1.19	11.45	-0.58	-0.10

Panel C: Cash-flow-to-price sorted portfolios.

Portfolio	μ	σ	s	SR	μ	σ	s	SR	μ	σ	s	SR
	BH Portfolios				MA Portfolios				MAP Portfolios			
Low	8.98	19.63	-0.31	0.20	15.85	13.98	0.16	0.77	6.87	13.38	0.93	0.51
2	9.81	16.74	-0.07	0.28	14.39	12.96	0.36	0.72	4.58	10.32	0.86	0.44
3	10.03	16.10	-0.30	0.31	14.50	12.79	-0.09	0.73	4.47	9.47	1.14	0.47
4	10.65	16.19	-0.39	0.34	14.90	12.40	0.16	0.79	4.25	10.08	1.54	0.42
5	11.29	16.14	-0.58	0.38	15.18	11.85	0.16	0.85	3.89	10.68	1.70	0.36
6	10.53	15.88	-0.43	0.34	14.88	12.11	0.26	0.81	4.35	9.95	1.86	0.44
7	11.85	15.24	-0.38	0.44	15.70	12.10	0.20	0.87	3.85	8.94	2.03	0.43
8	12.49	15.61	-0.05	0.47	16.06	12.42	0.29	0.88	3.57	9.13	0.49	0.39
9	14.09	15.78	-0.04	0.57	16.94	13.48	0.52	0.88	2.85	7.85	2.32	0.36
High	15.44	18.24	-0.39	0.57	18.83	14.90	-0.26	0.92	3.39	10.16	0.84	0.33
High−Low	6.46	14.61	0.01	0.09	2.98	13.33	0.06	-0.16	-3.48	11.20	-0.01	-0.31

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Table 1 Continued.

Panel D: Earnings-price sorted portfolios.

Portfolio	μ	σ	s	SR	μ	σ	s	SR	μ	σ	s	SR
	BH Portfolios				MA Portfolios				MAP Portfolios			
Low	9.18	20.18	-0.18	0.20	15.45	14.31	0.29	0.72	6.27	13.68	0.67	0.46
2	9.08	16.89	-0.23	0.23	13.60	12.65	0.23	0.67	4.52	10.68	1.04	0.42
3	10.38	16.11	-0.20	0.33	13.94	12.58	0.28	0.70	3.56	9.59	1.22	0.37
4	9.73	15.51	-0.36	0.30	13.11	11.75	0.20	0.68	3.38	9.71	1.42	0.35
5	10.39	15.80	-0.33	0.33	14.13	12.29	0.12	0.73	3.74	9.42	1.42	0.40
6	12.19	15.39	-0.32	0.46	14.88	11.98	0.01	0.82	2.70	9.26	0.85	0.29
7	13.20	15.42	-0.31	0.52	16.33	13.04	-0.15	0.86	3.14	7.60	1.46	0.41
8	13.13	15.96	-0.19	0.50	15.72	12.75	0.19	0.83	2.59	9.17	0.84	0.28
9	14.09	16.93	-0.15	0.53	17.27	13.22	0.19	0.92	3.18	10.03	0.43	0.32
High	14.84	18.51	-0.31	0.53	18.13	14.76	-0.04	0.88	3.29	10.65	0.85	0.31
High−Low	5.67	14.89	-0.02	0.04	2.68	13.30	0.18	-0.18	-2.99	11.75	0.14	-0.25

Panel E: Dividend-price sorted portfolios.

Portfolio	μ	σ	s	SR	μ	σ	s	SR	μ	σ	s	SR
	BH Portfolios				MA Portfolios				MAP Portfolios			
Low	9.68	20.30	-0.39	0.23	16.00	14.37	0.12	0.76	6.32	13.71	1.06	0.46
2	9.74	18.03	-0.40	0.26	13.96	13.35	-0.11	0.66	4.22	11.67	0.97	0.36
3	10.56	17.47	-0.19	0.31	14.65	13.61	0.20	0.70	4.09	10.41	1.05	0.39
4	11.19	16.41	-0.32	0.37	14.87	12.97	0.22	0.75	3.68	9.55	1.82	0.38
5	9.56	16.77	-0.33	0.27	13.77	12.64	0.32	0.68	4.21	10.52	1.54	0.40
6	11.16	15.41	-0.31	0.39	15.38	11.94	0.29	0.86	4.21	9.08	1.72	0.46
7	11.22	15.57	-0.49	0.39	14.32	12.48	-0.38	0.74	3.11	8.87	1.17	0.35
8	12.82	14.91	-0.25	0.52	15.63	11.84	0.41	0.89	2.81	8.55	1.76	0.33
9	12.37	14.53	-0.20	0.50	15.05	11.80	0.37	0.84	2.68	7.99	1.74	0.33
High	11.23	15.94	-0.30	0.38	14.73	10.87	0.62	0.88	3.50	11.20	0.77	0.31
High−Low	1.54	18.60	0.02	-0.19	-1.27	14.68	0.37	-0.43	-2.81	13.40	-0.43	-0.21

Panel F: Short-term reversal sorted portfolios.

Portfolio	μ	σ	s	SR	μ	σ	s	SR	μ	σ	s	SR
	BH Portfolios				MA Portfolios				MAP Portfolios			
Low	11.49	25.68	-0.23	0.25	17.73	16.86	0.79	0.75	6.25	18.85	0.72	0.33
2	13.63	20.34	-0.22	0.42	19.12	14.96	0.72	0.94	5.49	13.03	1.33	0.42
3	13.16	18.09	-0.26	0.44	16.82	12.99	0.40	0.90	3.67	12.09	0.71	0.30
4	11.67	16.73	-0.27	0.39	15.70	13.09	0.23	0.81	4.03	9.84	1.45	0.41
5	11.12	15.93	-0.31	0.38	14.58	12.08	0.25	0.78	3.46	9.96	1.24	0.35
6	10.00	15.28	-0.40	0.32	13.72	11.89	0.10	0.72	3.72	9.09	1.83	0.41
7	10.08	15.23	-0.33	0.33	13.63	11.50	0.06	0.74	3.55	9.55	1.00	0.37
8	9.99	15.70	-0.42	0.31	13.90	11.62	0.07	0.76	3.91	10.12	1.17	0.39
9	8.05	16.78	-0.43	0.18	13.35	12.32	0.16	0.67	5.30	10.87	1.50	0.49
High	6.62	19.44	-0.22	0.08	12.32	14.11	0.36	0.51	5.70	12.95	1.04	0.44
High−Low	-4.87	18.60	-0.23	-0.54	-5.42	14.96	-1.02	-0.70	-0.55	14.98	-0.05	-0.04

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Table 1 Continued.

Panel G: Medium-term momentum sorted portfolios.

Portfolio	μ	σ	s	SR	μ	σ	s	SR	μ	σ	s	SR
	BH Portfolios				MA Portfolios				MAP Portfolios			
Low	1.23	28.02	0.67	-0.14	11.90	13.53	1.10	0.50	10.68	24.14	-1.00	0.44
2	7.82	21.88	0.24	0.12	13.39	14.19	0.62	0.58	5.57	16.26	-0.43	0.34
3	9.30	18.80	0.33	0.22	13.94	12.33	0.59	0.72	4.64	13.82	-0.79	0.34
4	9.97	16.93	-0.11	0.29	13.77	11.62	0.53	0.74	3.80	11.92	0.34	0.32
5	8.96	15.69	-0.25	0.25	12.89	10.99	0.42	0.71	3.93	10.72	0.83	0.37
6	10.14	15.92	-0.36	0.32	14.27	11.64	0.55	0.79	4.13	10.38	1.62	0.40
7	10.41	15.42	-0.48	0.34	14.23	12.00	0.12	0.76	3.82	9.17	2.14	0.42
8	12.60	15.77	-0.29	0.47	15.25	13.12	-0.08	0.77	2.65	8.31	1.11	0.32
9	13.21	17.05	-0.52	0.47	16.40	14.32	-0.10	0.79	3.19	8.72	2.90	0.37
High	17.62	21.78	-0.39	0.57	21.58	18.69	-0.07	0.88	3.96	10.46	2.57	0.38
High−Low	16.39	24.17	-1.52	0.47	9.68	17.97	-0.41	0.25	-6.72	20.90	1.90	-0.32

Panel H: Long-term reversal sorted portfolios.

Portfolio	μ	σ	s	SR	μ	σ	s	SR	μ	σ	s	SR
	BH Portfolios				MA Portfolios				MAP Portfolios			
Low	14.97	23.00	0.30	0.43	19.48	17.49	0.66	0.82	4.51	14.36	-0.61	0.31
2	13.21	18.35	-0.06	0.44	17.77	14.69	0.79	0.86	4.56	10.26	2.26	0.44
3	13.28	16.91	-0.31	0.48	17.07	13.77	0.53	0.87	3.79	9.14	3.29	0.41
4	11.94	15.88	-0.26	0.43	15.26	11.95	0.26	0.85	3.31	9.95	0.90	0.33
5	11.97	15.72	-0.25	0.44	15.01	12.01	0.18	0.82	3.04	9.73	0.75	0.31
6	11.63	15.18	-0.47	0.43	14.57	12.07	0.15	0.78	2.94	8.74	2.26	0.34
7	11.52	15.44	-0.18	0.41	14.39	12.35	0.12	0.75	2.87	8.84	0.83	0.32
8	10.81	15.57	-0.31	0.37	14.59	11.86	0.12	0.80	3.78	9.57	1.10	0.39
9	9.44	16.83	-0.50	0.26	14.15	12.43	0.04	0.73	4.71	10.86	1.60	0.43
High	9.48	21.08	-0.32	0.21	16.05	14.72	0.17	0.74	6.58	14.53	0.87	0.45
High−Low	-5.49	17.49	-1.00	-0.61	-3.43	16.05	-0.78	-0.53	2.06	14.95	0.97	0.14

Panel I: Industry sorted portfolios.

Portfolio	μ	σ	s	SR	μ	σ	s	SR	μ	σ	s	SR
	BH Portfolios				MA Portfolios				MAP Portfolios			
NoDur	12.23	15.30	-0.26	0.47	14.43	12.40	-0.19	0.75	2.20	8.61	0.34	0.26
Durbl	9.94	21.94	0.15	0.22	15.32	14.59	0.40	0.70	5.39	15.92	-0.51	0.34
Manuf	11.05	17.49	-0.44	0.34	14.90	12.98	0.25	0.75	3.85	11.25	1.56	0.34
Enrgy	13.15	18.70	0.04	0.43	17.20	15.85	0.33	0.76	4.05	9.23	1.25	0.44
HiTec	10.90	23.08	-0.20	0.25	17.82	16.58	0.47	0.77	6.92	15.40	0.91	0.45
Telcm	9.46	16.37	-0.15	0.27	13.42	12.59	0.04	0.66	3.96	10.03	0.34	0.39
Shops	11.60	18.37	-0.24	0.35	15.06	13.97	0.28	0.71	3.46	11.51	1.05	0.30
Hlth	11.85	17.50	0.07	0.39	15.18	13.83	-0.03	0.73	3.33	10.24	-0.88	0.33
Utils	9.87	14.15	-0.09	0.34	12.66	11.06	0.17	0.68	2.79	8.39	0.50	0.33
Other	10.51	18.71	-0.41	0.29	15.39	13.15	0.18	0.78	4.87	12.79	1.02	0.38

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Table 2. Factor Regressions Results.

This table reports alphas, betas, and adjusted R^2 of the regressions of the MAP excess returns on the market factor, the Fama-French three-factors and the Carhart four-factors using portfolios sorted by several variables. The alphas are annualized and in percent. The sample period covers 1960:01 until 2011:12 with value-weighted portfolio returns. The length of the moving average window is 24 months. A one-way transaction cost of 0.5% has been imposed in constructing the switching moving average strategy excess returns. Newey and West (1987) standard errors with 24 lags are used in reporting statistical significance of a two-sided null hypothesis at the 1%, 5%, and 10% level is given by a ***, a **, and a *, respectively.

Panel A: Size sorted portfolios.

Portfolio	α	β_m	$\bar{R}^2$	α	β_m	β_s	β_h	$\bar{R}^2$	α	β_m	β_s	β_h	β_u	$\bar{R}^2$
	CAPM			Fama-French					Carhart					
Low	7.15***	-0.55***	37.86	9.02***	-0.51***	-0.36***	-0.22***	45.55	6.04***	-0.46***	-0.36***	-0.13***	0.27***	53.01
2	7.79***	-0.55***	38.69	9.94***	-0.53***	-0.33***	-0.27***	46.59	6.94***	-0.48***	-0.33***	-0.19***	0.27***	54.23
3	6.65***	-0.52***	38.94	8.19***	-0.50***	-0.26***	-0.19***	43.98	5.41***	-0.46***	-0.27***	-0.11***	0.25***	51.32
4	7.41***	-0.54***	41.03	8.99***	-0.52***	-0.27***	-0.19***	46.23	6.36***	-0.47***	-0.27***	-0.12***	0.24***	52.80
5	6.84***	-0.53***	42.19	7.98***	-0.51***	-0.21***	-0.14***	45.34	4.99***	-0.46***	-0.21***	-0.05	0.27***	54.53
6	6.66***	-0.50***	43.90	7.52***	-0.49***	-0.17***	-0.10***	46.08	5.10***	-0.44***	-0.17***	-0.03	0.22***	52.86
7	6.38***	-0.49***	42.40	7.49***	-0.49***	-0.14***	-0.15***	44.72	5.22***	-0.45***	-0.14***	-0.09***	0.20***	50.85
8	6.40***	-0.47***	43.03	7.41***	-0.48***	-0.09***	-0.15***	44.79	5.20***	-0.44***	-0.10***	-0.08***	0.20***	51.11
9	6.23***	-0.45***	44.38	7.02***	-0.46***	-0.05**	-0.12***	45.50	5.17***	-0.43***	-0.05**	-0.07**	0.17***	50.58
High	5.41***	-0.35***	38.33	5.23***	-0.36***	0.07***	0.01	38.85	3.35***	-0.33***	0.07***	0.06***	0.17***	46.29
High−Low	1.74	-0.20***	6.49	3.79***	-0.15***	-0.43***	-0.22***	20.62	2.69***	-0.13***	-0.43***	-0.19***	0.10***	21.83

Panel B: Book-to-market sorted portfolios.

Portfolio	α	β_m	$\bar{R}^2$	α	β_m	β_s	β_h	$\bar{R}^2$	α	β_m	β_s	β_h	β_u	$\bar{R}^2$
	CAPM			Fama-French					Carhart					
Low	7.76***	-0.50***	44.34	6.80***	-0.49***	0.08***	0.14***	45.70	4.49***	-0.45***	0.07***	0.21***	0.21***	51.97
2	6.23***	-0.41***	39.13	6.44***	-0.41***	-0.03	-0.03	39.07	4.88***	-0.38***	-0.03	0.02	0.14***	42.86
3	6.43***	-0.41***	43.08	6.86***	-0.41***	-0.05***	-0.06***	43.45	5.52***	-0.39***	-0.06***	-0.02	0.12***	46.44
4	6.20***	-0.45***	42.97	7.45***	-0.48***	-0.05**	-0.20***	45.90	5.87***	-0.45***	-0.05**	-0.16***	0.14***	49.35
5	5.57***	-0.38***	38.47	6.63***	-0.41***	-0.02	-0.18***	41.20	5.22***	-0.39***	-0.03	-0.14***	0.13***	44.62
6	5.52***	-0.38***	38.34	6.70***	-0.41***	-0.06***	-0.19***	41.56	5.13***	-0.38***	-0.06**	-0.14***	0.14***	45.83
7	4.90***	-0.28***	27.83	5.85***	-0.32***	0.03	-0.18***	32.17	4.41***	-0.29***	0.03	-0.13***	0.13***	37.14
8	4.17***	-0.33***	28.73	6.09***	-0.38***	-0.06***	-0.32***	38.09	4.59***	-0.35***	-0.06**	-0.27***	0.14***	42.04
9	5.95***	-0.37***	34.36	7.58***	-0.41***	-0.08***	-0.26***	40.33	5.75***	-0.37***	-0.08***	-0.21***	0.17***	45.86
High	6.18***	-0.42***	29.54	8.10***	-0.45***	-0.12***	-0.30***	34.96	5.83***	-0.42***	-0.12***	-0.23***	0.20***	40.56
High−Low	1.58	-0.08***	0.98	-1.30	-0.04	0.19***	0.44***	15.36	-1.34	-0.04	0.19***	0.44***	0.00	15.23

Panel C: Cash-flow-to-price sorted portfolios.

Portfolio	α	β_m	$\bar{R}^2$	α	β_m	β_s	β_h	$\bar{R}^2$	α	β_m	β_s	β_h	β_u	$\bar{R}^2$
	CAPM			Fama-French					Carhart					
Low	9.25***	-0.57***	46.31	8.31***	-0.55***	0.05**	0.15***	47.29	5.57***	-0.51***	0.05	0.22***	0.25***	54.41
2	6.19***	-0.42***	41.57	6.11***	-0.42***	0.03	0.00	41.48	4.59***	-0.40***	0.03	0.05*	0.14***	45.11
3	5.85***	-0.36***	37.81	6.39***	-0.37***	-0.03	-0.08***	38.37	4.76***	-0.35***	-0.03	-0.04	0.15***	43.42
4	5.77***	-0.39***	37.49	6.81***	-0.41***	-0.04**	-0.17***	39.90	5.28***	-0.38***	-0.04*	-0.12***	0.14***	43.77
5	5.66***	-0.41***	38.16	7.08***	-0.44***	-0.06***	-0.23***	42.23	5.38***	-0.42***	-0.06**	-0.18***	0.15***	46.50
6	5.93***	-0.38***	37.58	7.10***	-0.42***	0.01	-0.21***	41.58	5.64***	-0.40***	0.01	-0.17***	0.13***	45.17
7	5.09***	-0.32***	32.28	6.02***	-0.34***	-0.02	-0.15***	34.85	5.11***	-0.33***	-0.02	-0.13***	0.08***	36.52
8	4.76***	-0.32***	31.46	6.05***	-0.36***	-0.03	-0.22***	36.40	4.56***	-0.33***	-0.03	-0.17***	0.13***	40.90
9	3.83***	-0.24***	24.48	4.64***	-0.27***	0.02	-0.15***	27.68	3.37***	-0.25***	0.02	-0.11***	0.11***	32.08
High	4.85***	-0.35***	29.66	6.52***	-0.38***	-0.08***	-0.26***	35.88	4.49***	-0.35***	-0.08***	-0.21***	0.18***	42.63
High−Low	4.40***	-0.22***	10.19	1.80**	-0.17***	0.13***	0.41***	22.90	1.08	-0.16***	0.13***	0.43***	0.06***	23.48

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Table 2 Continued.

Panel D: Earnings-price sorted portfolios.

Portfolio	α	β_m	$\bar{R}^2$	α	β_m	β_s	β_h	$\bar{R}^2$	α	β_m	β_s	β_h	β_u	$\bar{R}^2$
	CAPM			Fama-French					Carhart					
Low	9.26***	-0.59***	46.41	8.30***	-0.57***	0.05*	0.15***	47.39	5.14***	-0.52***	0.05	0.24***	0.28***	56.29
2	6.77***	-0.45***	43.29	6.86***	-0.45***	0.02	-0.02	43.19	5.40***	-0.43***	0.02	0.02	0.13***	46.23
3	5.45***	-0.37***	37.71	5.78***	-0.38***	-0.03	-0.05**	37.80	4.40***	-0.35***	-0.03	-0.01	0.12***	41.21
4	5.28***	-0.38***	37.09	6.05***	-0.41***	0.05***	-0.15***	39.64	4.31***	-0.39***	0.05**	-0.10***	0.16***	44.96
5	5.63***	-0.37***	39.30	6.70***	-0.39***	-0.06***	-0.17***	42.09	5.58***	-0.37***	-0.06***	-0.13***	0.10***	44.39
6	4.36***	-0.33***	31.39	5.53***	-0.37***	-0.00	-0.20***	35.51	4.19***	-0.34***	-0.00	-0.16***	0.12***	38.96
7	4.37***	-0.24***	25.42	5.18***	-0.28***	0.03	-0.15***	29.24	3.69***	-0.25***	0.03	-0.11***	0.13***	35.63
8	4.12***	-0.30***	27.27	5.61***	-0.35***	-0.02	-0.25***	33.80	4.21***	-0.32***	-0.02	-0.21***	0.13***	37.64
9	4.90***	-0.34***	28.67	6.57***	-0.38***	-0.05**	-0.27***	35.10	4.47***	-0.35***	-0.05**	-0.21***	0.19***	42.37
High	5.25***	-0.39***	33.10	7.25***	-0.41***	-0.15***	-0.30***	41.22	5.33***	-0.38***	-0.15***	-0.25***	0.17***	46.61
High−Low	4.01***	-0.20***	7.23	1.04	-0.16***	0.20***	0.45***	21.79	-0.19	-0.14***	0.20***	0.49***	0.11***	23.53

Panel E: Dividend-price sorted portfolios.

Portfolio	α	β_m	$\bar{R}^2$	α	β_m	β_s	β_h	$\bar{R}^2$	α	β_m	β_s	β_h	β_u	$\bar{R}^2$
	CAPM			Fama-French					Carhart					
Low	9.34***	-0.60***	47.34	9.11***	-0.59***	0.01	0.04	47.22	6.88***	-0.56***	0.01	0.10***	0.20***	51.61
2	6.64***	-0.48***	42.01	6.83***	-0.49***	0.02	-0.04*	41.99	5.18***	-0.46***	0.02	0.01	0.15***	45.24
3	6.23***	-0.42***	41.22	6.40***	-0.45***	0.06**	-0.05**	41.60	4.89***	-0.42***	0.06**	-0.00	0.14***	45.07
4	5.59***	-0.38***	39.16	6.18***	-0.39***	-0.03	-0.09***	39.85	5.07***	-0.37***	-0.03	-0.06**	0.10***	42.03
5	6.20***	-0.39***	34.78	7.29***	-0.45***	0.08***	-0.22***	39.57	5.72***	-0.43***	0.08***	-0.17***	0.14***	43.25
6	5.91***	-0.34***	34.05	6.62***	-0.37***	0.03	-0.13***	36.17	5.74***	-0.35***	0.03	-0.11***	0.08***	37.67
7	4.58***	-0.29***	26.83	5.27***	-0.35***	0.14***	-0.16***	33.24	3.61***	-0.32***	0.14***	-0.12***	0.15***	39.01
8	4.13***	-0.26***	23.16	5.26***	-0.33***	0.12***	-0.23***	32.76	4.07***	-0.31***	0.12***	-0.20***	0.11***	35.93
9	3.85***	-0.23***	20.85	5.02***	-0.28***	0.05***	-0.22***	28.56	3.43***	-0.26***	0.05**	-0.17***	0.14***	35.12
High	5.04***	-0.30***	18.26	7.87***	-0.39***	-0.03	-0.48***	34.82	5.97***	-0.36***	-0.03	-0.43***	0.17***	39.55
High−Low	4.30***	-0.29***	11.83	1.24	-0.20***	0.04	0.52***	25.09	0.90	-0.20***	0.04	0.53***	0.03	25.07

Panel F: Short-term reversal sorted portfolios.

Portfolio	α	β_m	$\bar{R}^2$	α	β_m	β_s	β_h	$\bar{R}^2$	α	β_m	β_s	β_h	β_u	$\bar{R}^2$
	CAPM			Fama-French					Carhart					
Low	10.11***	-0.76***	40.93	10.53***	-0.73***	-0.16***	-0.02	41.50	6.02***	-0.66***	-0.17***	0.11**	0.41***	51.02
2	8.10***	-0.52***	39.23	8.69***	-0.52***	-0.06**	-0.08***	39.55	6.89***	-0.49***	-0.06**	-0.03	0.16***	42.68
3	6.12***	-0.49***	40.10	6.78***	-0.50***	-0.02	-0.11***	40.61	4.95***	-0.47***	-0.02	-0.06*	0.16***	44.38
4	5.98***	-0.39***	38.20	6.66***	-0.39***	-0.07***	-0.10***	39.17	4.94***	-0.36***	-0.07***	-0.05*	0.15***	44.20
5	5.49***	-0.40***	40.55	5.95***	-0.41***	-0.04**	-0.07***	40.88	4.14***	-0.37***	-0.04**	-0.01	0.16***	46.33
6	5.57***	-0.37***	40.49	5.91***	-0.38***	-0.00	-0.06***	40.64	4.71***	-0.36***	-0.00	-0.02	0.11***	43.44
7	5.54***	-0.39***	42.38	5.78***	-0.40***	0.01	-0.04**	42.41	3.82***	-0.37***	0.01	0.01	0.18***	49.43
8	5.99***	-0.41***	41.25	6.53***	-0.43***	-0.01	-0.09***	41.78	4.53***	-0.39***	-0.01	-0.03	0.18***	48.24
9	7.53***	-0.44***	41.10	7.77***	-0.45***	-0.01	-0.04	41.01	5.72***	-0.41***	-0.01	0.02	0.18***	46.92
High	8.40***	-0.53***	42.27	8.84***	-0.54***	-0.04	-0.07*	42.36	6.00***	-0.49***	-0.04	0.02	0.26***	50.37
High−Low	1.71	-0.23***	5.75	1.69	-0.20***	-0.13***	0.04	6.33	0.03	-0.17***	-0.13***	0.09*	0.15***	8.24

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Table 2 Continued.

Panel G: Medium-term momentum sorted portfolios.

Portfolio	α	β_m	$\bar{R}^2$	α	β_m	β_s	β_h	$\bar{R}^2$	α	β_m	β_s	β_h	β_u	$\bar{R}^2$
	CAPM			Fama-French					Carhart					
Low	15.91***	-1.04***	45.85	16.73***	-0.99***	-0.26***	-0.06	46.88	7.44***	-0.84***	-0.26***	0.20***	0.84***	71.75
2	8.78***	-0.64***	37.93	10.37***	-0.66***	-0.11***	-0.24***	39.97	4.75***	-0.56***	-0.11***	-0.08*	0.51***	60.02
3	7.20***	-0.51***	33.49	8.14***	-0.54***	0.01	-0.16***	34.58	3.13**	-0.45***	0.00	-0.02	0.45***	56.64
4	6.18***	-0.47***	38.92	7.14***	-0.50***	0.00	-0.17***	40.53	4.18***	-0.45***	-0.00	-0.08***	0.27***	50.88
5	6.10***	-0.43***	40.18	7.10***	-0.46***	-0.00	-0.17***	42.33	5.09***	-0.43***	-0.00	-0.11***	0.18***	48.14
6	6.33***	-0.44***	43.89	6.93***	-0.45***	-0.02	-0.10***	44.50	5.25***	-0.42***	-0.02	-0.05*	0.15***	48.84
7	5.65***	-0.36***	38.45	6.00***	-0.37***	0.01	-0.06***	38.72	5.19***	-0.36***	0.01	-0.04*	0.07***	39.95
8	4.27***	-0.32***	36.98	4.76***	-0.34***	0.00	-0.09***	37.75	4.01***	-0.32***	0.00	-0.06***	0.07***	39.01
9	4.82***	-0.32***	34.16	5.23***	-0.34***	0.01	-0.07***	34.66	5.28***	-0.34***	0.01	-0.08***	-0.00	34.56
High	5.93***	-0.39***	34.60	6.01***	-0.39***	-0.01	-0.01	34.40	5.95***	-0.39***	-0.01	-0.01	0.01	34.30
High−Low	9.98***	-0.65***	23.71	10.72***	-0.60***	-0.25***	-0.05	24.96	1.49	-0.45***	-0.26***	0.21***	0.83***	57.68

Panel H: Long-term reversal sorted portfolios.

Portfolio	α	β_m	$\bar{R}^2$	α	β_m	β_s	β_h	$\bar{R}^2$	α	β_m	β_s	β_h	β_u	$\bar{R}^2$
	CAPM			Fama-French					Carhart					
Low	7.09***	-0.51***	31.36	9.37***	-0.51***	-0.26***	-0.32***	37.85	6.30***	-0.46***	-0.26***	-0.23***	0.28***	45.47
2	6.41***	-0.37***	31.66	7.53***	-0.38***	-0.09***	-0.17***	34.27	6.37***	-0.36***	-0.09***	-0.13***	0.10***	36.28
3	5.39***	-0.32***	29.96	6.38***	-0.33***	-0.08***	-0.15***	32.50	5.71***	-0.32***	-0.08***	-0.13***	0.06***	33.30
4	5.20***	-0.37***	35.18	6.42***	-0.40***	-0.07***	-0.19***	38.43	4.84***	-0.37***	-0.07***	-0.14***	0.14***	42.54
5	4.93***	-0.37***	36.63	6.16***	-0.40***	-0.06***	-0.20***	40.18	4.73***	-0.37***	-0.06***	-0.16***	0.13***	43.75
6	4.57***	-0.32***	33.93	5.54***	-0.35***	-0.03	-0.16***	36.66	4.54***	-0.33***	-0.03	-0.13***	0.09***	38.76
7	4.54***	-0.33***	34.77	5.26***	-0.35***	0.00	-0.12***	36.39	3.98***	-0.33***	0.00	-0.09***	0.12***	39.82
8	5.73***	-0.39***	40.59	6.23***	-0.41***	0.03	-0.09***	41.47	4.91***	-0.39***	0.03	-0.06**	0.12***	44.57
9	6.98***	-0.45***	42.54	7.37***	-0.46***	0.00	-0.07**	42.72	6.30***	-0.45***	0.00	-0.04	0.10***	44.26
High	9.75***	-0.63***	46.49	9.01***	-0.60***	-0.00	0.13***	47.05	6.19***	-0.56***	-0.00	0.21***	0.25***	53.28
High−Low	-2.66	0.12***	1.38	0.37	0.09***	-0.26***	-0.45***	10.87	0.11	0.09***	-0.26***	-0.44***	0.02	10.77

Panel I: Industry sorted portfolios.

Portfolio	α	β_m	$\bar{R}^2$	α	β_m	β_s	β_h	$\bar{R}^2$	α	β_m	β_s	β_h	β_u	$\bar{R}^2$
	CAPM			Fama-French					Carhart					
NoDur	3.61***	-0.28***	26.15	4.19***	-0.31***	0.03	-0.11***	27.71	2.76***	-0.28***	0.03	-0.07***	0.13***	32.20
Durbl	8.44***	-0.60***	35.79	11.06***	-0.65***	-0.15***	-0.41***	41.86	7.52***	-0.59***	-0.16***	-0.31***	0.32***	50.09
Manuf	6.21***	-0.47***	42.68	7.16***	-0.48***	-0.05**	-0.15***	44.13	5.42***	-0.45***	-0.05**	-0.10***	0.16***	48.07
Enrgy	5.51***	-0.29***	24.06	5.84***	-0.31***	0.05*	-0.07**	24.85	5.21***	-0.30***	0.05	-0.06*	0.06***	25.52
HiTec	10.06***	-0.62***	40.46	8.94***	-0.58***	-0.03	0.20***	41.94	4.97***	-0.51***	-0.03	0.32***	0.36***	53.00
Telcm	5.51***	-0.31***	23.27	5.30***	-0.33***	0.09***	0.01	23.94	3.05**	-0.29***	0.09***	0.07*	0.20***	32.30
Shops	5.67***	-0.44***	35.86	6.74***	-0.42***	-0.17***	-0.13***	38.79	4.92***	-0.39***	-0.17***	-0.08***	0.16***	42.94
Hlth	4.83***	-0.30***	20.80	3.99***	-0.31***	0.14***	0.10***	23.01	2.81***	-0.29***	0.14***	0.14***	0.11***	25.15
Utils	4.01***	-0.24***	20.41	5.16***	-0.29***	0.03	-0.21***	26.12	4.46***	-0.27***	0.03	-0.19***	0.06***	27.19
Other	7.56***	-0.53***	42.78	9.17***	-0.57***	-0.05*	-0.26***	46.45	6.80***	-0.53***	-0.05*	-0.20***	0.21***	52.16

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Table 3. Factor Regressions Results in Subperiods.

This table reports alphas and adjusted R^2 of the regressions of the MAP excess returns on the market factor, the Fama-French three-factors and the Carhart four-factors in two subperiods using portfolios sorted by several variables. The alphas are annualized and in percent. The sample period covers 1960:01 until 2011:12 with value-weighted portfolio returns. The length of the moving average window is 24 months. A one-way transaction cost of 0.5% has been imposed in constructing the switching moving average strategy excess returns. Newey and West (1987) standard errors with 24 lags are used in reporting statistical significance of a two-sided null hypothesis at the 1%, 5%, and 10% level is given by a ***, a **, and a *, respectively.

Panel A: Size sorted portfolios.

Portfolio	α	$\bar{R}^2$	α	$\bar{R}^2$	α	$\bar{R}^2$	α	$\bar{R}^2$	α	$\bar{R}^2$	α	$\bar{R}^2$
	1960:01−1985:12						1986:01−2011:12					
	CAPM		Fama-French		Carhart		CAPM		Fama-French		Carhart	
Low	6.22^{***}	31.80	8.15^{***}	43.32	1.10	63.10	6.75^{***}	41.45	8.28^{***}	49.25	6.74^{***}	52.61
2	6.31^{***}	33.20	8.08^{***}	40.82	1.71	59.42	8.31^{***}	40.64	10.31^{***}	52.56	8.37^{***}	57.48
3	5.78^{***}	33.66	6.93^{***}	38.65	1.24	55.26	6.59^{***}	40.67	8.07^{***}	47.98	6.15^{***}	53.32
4	6.09^{***}	33.40	7.44^{***}	39.87	2.51	53.12	7.99^{***}	45.40	9.44^{***}	52.12	7.47^{***}	57.59
5	5.13^{***}	34.22	6.28^{***}	37.83	1.51	52.06	7.91^{***}	47.10	8.87^{***}	50.20	6.29^{***}	59.77
6	6.00^{***}	38.16	7.12^{***}	41.23	2.92^{**}	52.27	6.68^{***}	46.98	7.27^{***}	48.23	5.27^{***}	55.36
7	5.48^{***}	38.26	6.13^{***}	40.21	2.01	50.67	6.54^{***}	43.60	7.66^{***}	48.48	5.79^{***}	55.27
8	5.63^{***}	39.68	6.14^{***}	39.90	2.45^{*}	49.80	6.48^{***}	43.07	7.54^{***}	47.33	5.60^{***}	54.56
9	5.50^{***}	42.86	5.34^{***}	42.51	2.86^{**}	47.54	6.28^{***}	42.80	7.34^{***}	47.90	5.41^{***}	56.47
High	5.57^{***}	41.32	4.73^{***}	42.38	3.23^{***}	44.58	5.68^{***}	41.00	5.83^{***}	41.43	3.79^{***}	54.02
High−Low	0.64	3.80	3.42^{**}	27.03	-2.13	44.27	1.07	4.73	2.44	14.96	2.95^{*}	15.18

Panel B: Book-to-market sorted portfolios.

Portfolio	α	$\bar{R}^2$	α	$\bar{R}^2$	α	$\bar{R}^2$	α	$\bar{R}^2$	α	$\bar{R}^2$	α	$\bar{R}^2$
	1960:01−1985:12						1986:01−2011:12					
	CAPM		Fama-French		Carhart		CAPM		Fama-French		Carhart	
Low	8.85^{***}	47.28	6.73^{***}	50.18	3.82^{**}	54.47	5.73^{***}	38.73	5.31^{***}	39.24	2.70^{**}	55.19
2	6.79^{***}	39.90	5.90^{***}	41.24	3.74^{***}	44.75	4.64^{***}	34.17	5.26^{***}	36.47	3.49^{***}	45.72
3	6.05^{***}	44.53	6.11^{***}	44.54	3.48^{***}	50.12	5.75^{***}	38.90	6.24^{***}	40.37	4.95^{***}	46.11
4	5.67^{***}	44.70	6.42^{***}	44.89	4.13^{***}	48.68	5.82^{***}	37.94	7.08^{***}	45.64	5.42^{***}	51.59
5	4.53^{***}	35.35	4.83^{***}	35.51	2.31^{*}	42.32	5.73^{***}	37.34	6.98^{***}	45.80	5.63^{***}	50.44
6	4.26^{***}	30.02	4.92^{***}	30.31	2.88^{**}	35.70	6.24^{***}	42.65	7.49^{***}	49.49	5.88^{***}	55.06
7	4.31^{***}	27.90	4.40^{***}	27.83	3.13^{**}	30.17	5.83^{***}	32.28	7.04^{***}	42.41	5.68^{***}	47.46
8	2.94^{***}	25.21	3.98^{***}	26.75	1.98^{*}	32.22	4.86^{***}	28.70	6.88^{***}	46.80	5.44^{***}	50.85
9	3.81^{***}	26.76	5.32^{***}	30.06	2.54^{**}	38.49	7.58^{***}	37.69	9.04^{***}	47.54	7.42^{***}	53.02
High	4.66^{***}	27.20	4.80^{***}	27.75	2.68^{*}	33.41	7.44^{***}	31.32	9.86^{***}	44.26	7.41^{***}	50.62
High−Low	4.19^{**}	19.10	1.93	25.34	1.14	25.58	-1.71	2.30	-4.54^{***}	26.87	-4.70^{***}	26.65

Table 3 Continued.

Panel C: Cash-flow-to-price sorted portfolios.

Portfolio	α	$\bar{R}^2$	α	$\bar{R}^2$	α	$\bar{R}^2$	α	$\bar{R}^2$	α	$\bar{R}^2$	α	$\bar{R}^2$
	1960:01−1985:12						1986:01−2011:12					
	CAPM		Fama-French		Carhart		CAPM		Fama-French		Carhart	
Low	9.25^{***}	49.14	6.78^{***}	52.37	2.81^{*}	59.14	8.29^{***}	40.95	8.00^{***}	40.84	5.22^{***}	54.33
2	6.54^{***}	43.03	5.11^{***}	44.70	2.94^{**}	47.95	4.82^{***}	36.95	5.28^{***}	38.45	3.51^{***}	49.08
3	7.13^{***}	49.09	7.44^{***}	49.66	5.43^{***}	52.47	4.49^{***}	32.85	5.04^{***}	36.14	3.56^{***}	44.60
4	5.69^{***}	40.51	5.99^{***}	40.91	4.33^{***}	43.10	4.81^{***}	29.88	5.98^{***}	40.37	4.11^{***}	50.84
5	4.65^{***}	35.82	5.45^{***}	36.14	2.59^{**}	43.12	5.71^{***}	36.14	7.18^{***}	47.22	5.56^{***}	53.33
6	5.14^{***}	37.95	5.21^{***}	37.86	2.87^{**}	43.58	5.85^{***}	33.19	7.31^{***}	46.19	5.85^{***}	51.44
7	5.07^{***}	32.99	5.88^{***}	33.49	4.36^{***}	35.84	4.14^{***}	25.96	4.96^{***}	33.68	3.89^{***}	38.22
8	4.07^{***}	30.50	5.20^{***}	31.88	2.50^{*}	39.77	4.59^{***}	26.93	5.77^{***}	38.75	4.41^{***}	44.85
9	3.43^{***}	22.60	3.44^{***}	22.30	2.34^{*}	24.95	4.69^{***}	30.23	5.80^{***}	37.88	4.62^{***}	41.65
High	3.86^{***}	26.30	5.31^{***}	28.50	2.10	38.32	5.20^{***}	28.43	6.73^{***}	39.60	4.91^{***}	46.98
High−Low	5.38^{***}	16.33	1.47	27.52	0.71	27.59	3.09^{**}	3.77	1.28	19.96	0.31	21.96

Panel D: Earnings-to-price sorted portfolios.

Portfolio	α	$\bar{R}^2$	α	$\bar{R}^2$	α	$\bar{R}^2$	α	$\bar{R}^2$	α	$\bar{R}^2$	α	$\bar{R}^2$
	1960:01−1985:12						1986:01−2011:12					
	CAPM		Fama-French		Carhart		CAPM		Fama-French		Carhart	
Low	10.14^{***}	50.87	7.30^{***}	54.90	3.09^{*}	61.93	7.42^{***}	39.45	7.26^{***}	39.11	3.92^{**}	57.63
2	6.67^{***}	45.15	5.51^{***}	46.01	3.27^{***}	49.26	5.88^{***}	38.33	6.44^{***}	40.37	4.83^{***}	47.76
3	6.21^{***}	39.85	5.90^{***}	39.80	3.25^{***}	45.40	3.60^{***}	31.86	4.16^{***}	34.65	2.81^{***}	42.14
4	5.09^{***}	40.53	5.30^{***}	40.17	2.32^{**}	48.19	4.48^{***}	29.23	5.34^{***}	41.24	3.65^{***}	50.49
5	5.68^{***}	40.76	6.56^{***}	41.27	4.83^{***}	43.69	4.49^{***}	33.99	5.48^{***}	42.14	4.17^{***}	48.87
6	3.93^{***}	30.23	4.63^{***}	30.52	2.30^{*}	36.20	3.81^{***}	26.95	5.02^{***}	39.78	3.62^{***}	46.30
7	4.97^{***}	27.60	4.86^{***}	27.14	3.11^{**}	31.75	4.13^{***}	26.26	5.29^{***}	39.87	3.93^{***}	46.93
8	3.15^{***}	21.93	4.57^{***}	24.71	2.51^{*}	29.71	4.34^{**}	27.15	5.64^{***}	38.60	4.28^{**}	43.48
9	3.75^{***}	25.78	5.59^{***}	30.32	3.54^{***}	34.63	6.68^{***}	35.75	8.07^{***}	44.31	6.17^{***}	51.07
High	4.87^{***}	28.59	6.92^{***}	35.10	4.15^{***}	42.05	4.90^{***}	33.04	6.61^{***}	45.08	4.83^{***}	51.25
High−Low	5.27^{***}	16.49	0.38	33.81	-1.06	34.66	2.52	0.88	0.65	15.23	-0.91	19.82

Panel E: Dividend-price sorted portfolios.

Portfolio	α	$\bar{R}^2$	α	$\bar{R}^2$	α	$\bar{R}^2$	α	$\bar{R}^2$	α	$\bar{R}^2$	α	$\bar{R}^2$
	1960:01−1985:12						1986:01−2011:12					
	CAPM		Fama-French		Carhart		CAPM		Fama-French		Carhart	
Low	9.04^{***}	46.30	7.00^{***}	48.49	3.81^{**}	53.03	9.00^{***}	46.01	9.51^{***}	46.44	7.25^{***}	53.68
2	6.54^{***}	44.21	4.98^{***}	45.97	2.10	50.93	5.76^{***}	36.25	6.61^{***}	39.46	4.96^{***}	45.35
3	5.96^{***}	42.34	4.82^{***}	43.95	2.62^{**}	47.84	5.57^{***}	36.25	6.21^{***}	38.82	4.56^{***}	45.52
4	6.55^{***}	43.36	6.36^{***}	43.12	4.46^{***}	45.79	3.44^{***}	31.36	4.25^{***}	37.95	2.95^{**}	45.52
5	5.99^{***}	38.84	5.76^{***}	38.62	3.44^{***}	43.28	5.35^{***}	26.52	6.80^{***}	44.41	5.12^{***}	50.93
6	5.42^{***}	35.47	5.77^{***}	35.22	3.75^{***}	39.24	5.46^{***}	27.34	6.17^{***}	37.16	5.39^{***}	39.29
7	5.15^{***}	30.26	4.83^{***}	30.72	2.98^{***}	34.76	4.45^{***}	27.13	5.50^{***}	42.62	4.01^{***}	48.43
8	4.40^{***}	25.69	4.80^{***}	25.64	3.90^{***}	26.71	2.86^{**}	15.80	4.10^{***}	42.23	2.49^{**}	50.08
9	3.71^{***}	23.14	3.93^{***}	23.08	2.96^{**}	24.89	4.39^{***}	22.89	5.85^{***}	38.54	4.12^{***}	46.32
High	4.93^{***}	25.77	7.69^{***}	34.62	5.33^{***}	39.50	5.79^{***}	16.81	8.25^{***}	40.72	6.76^{***}	43.76
High−Low	4.11^{***}	12.25	-0.68	28.92	-1.52	29.07	3.22^{**}	6.17	1.26	20.94	0.49	21.45

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Table 3 Continued.

Panel F: Short-term reversal sorted portfolios.

Portfolio	α	$\bar{R}^2$	α	$\bar{R}^2$	α	$\bar{R}^2$	α	$\bar{R}^2$	α	$\bar{R}^2$	α	$\bar{R}^2$
	1960:01−1985:12						1986:01−2011:12					
	CAPM		Fama-French		Carhart		CAPM		Fama-French		Carhart	
Low	7.10***	34.53	5.98***	36.95	1.24	46.73	13.46***	47.29	14.44***	48.35	9.99***	57.76
2	6.49***	31.96	5.57***	32.75	3.15**	37.48	9.73***	44.23	10.89***	46.94	9.27***	49.61
3	4.31***	37.18	4.29***	36.75	0.51	45.65	7.16***	39.49	7.97***	41.64	6.59***	44.74
4	5.50***	36.18	5.79***	36.09	3.18**	42.52	5.80***	35.99	6.50***	38.34	4.84***	45.48
5	5.39***	39.98	5.12***	39.80	2.36**	45.90	4.76***	37.41	5.41***	39.64	3.62***	48.91
6	4.94***	35.84	4.47***	35.86	2.33*	40.32	5.70***	41.99	6.29***	44.22	5.20***	48.19
7	5.21***	43.06	4.96***	42.80	2.46**	48.52	4.87***	38.22	5.23***	39.05	3.05**	54.31
8	5.42***	41.86	5.66***	41.53	3.68***	44.97	5.71***	37.23	6.26***	38.94	3.90***	52.41
9	7.32***	46.34	7.36***	46.15	5.18***	50.25	6.70***	33.30	6.92***	33.43	4.45**	46.13
High	7.77***	45.68	7.66***	45.31	4.17**	53.06	8.25***	37.29	8.78***	37.61	5.78**	49.18
High−Low	-0.67	-0.15	-1.67	4.63	-2.93*	5.69	5.21*	13.52	5.66**	13.88	4.21	14.98

Panel G: Medium-term momentum sorted portfolios.

Portfolio	α	$\bar{R}^2$	α	$\bar{R}^2$	α	$\bar{R}^2$	α	$\bar{R}^2$	α	$\bar{R}^2$	α	$\bar{R}^2$
	1960:01−1985:12						1986:01−2011:12					
	CAPM		Fama-French		Carhart		CAPM		Fama-French		Carhart	
Low	13.38***	46.46	14.84***	51.23	5.49*	70.74	18.43***	48.19	18.76***	47.99	9.49**	74.08
2	8.96***	43.24	9.95***	43.92	2.96	61.07	9.58***	39.89	11.18***	43.91	6.24***	63.21
3	6.96***	38.84	7.77***	39.17	2.36	53.60	8.40***	35.33	9.17***	37.91	4.41**	62.25
4	6.05***	40.63	5.89***	40.76	1.40	52.68	5.71***	34.34	6.95***	42.59	4.32***	54.91
5	5.97***	42.86	5.98***	42.73	3.39***	47.92	5.37***	33.94	6.61***	43.34	4.50***	53.08
6	5.68***	40.81	5.69***	40.40	3.32***	44.97	6.09***	43.75	6.81***	46.41	5.05***	54.10
7	6.22***	43.94	5.87***	43.72	4.82***	44.55	3.77***	28.64	4.32***	32.76	3.12***	39.00
8	3.98***	36.59	3.45***	36.63	1.46	40.90	3.57***	33.59	4.41***	41.98	3.78***	43.92
9	3.12***	30.97	2.94***	30.74	1.63	33.08	5.34***	32.92	5.91***	35.51	6.18***	35.54
High	4.47***	37.87	3.29***	39.62	1.28	43.41	6.36***	27.50	6.91***	28.57	7.27***	28.61
High−Low	8.91***	22.61	11.55***	34.08	4.21	52.27	12.07***	31.00	11.84***	30.60	2.22	65.30

Panel H: Long-term reversal sorted portfolios.

Portfolio	α	$\bar{R}^2$	α	$\bar{R}^2$	α	$\bar{R}^2$	α	$\bar{R}^2$	α	$\bar{R}^2$	α	$\bar{R}^2$
	1960:01−1985:12						1986:01−2011:12					
	CAPM		Fama-French		Carhart		CAPM		Fama-French		Carhart	
Low	4.69***	20.03	7.63***	28.21	2.46	41.42	7.85***	35.57	9.61***	43.29	7.10***	50.74
2	5.35***	24.58	5.35***	25.51	2.77	33.02	5.98***	32.06	7.46***	42.56	6.59***	44.17
3	5.19***	30.52	5.12***	30.49	3.81**	32.47	4.09***	24.26	5.34***	34.65	4.53***	36.58
4	4.24***	29.73	5.04***	30.13	2.81**	35.15	5.25***	35.70	6.46***	43.15	4.79***	50.06
5	4.94***	37.83	5.68***	38.17	3.63***	41.84	4.01***	30.83	5.29***	40.95	3.69***	48.49
6	4.24***	32.94	4.91***	33.17	3.09**	36.83	3.85***	29.59	4.80***	37.85	3.74***	42.15
7	4.08***	37.06	4.35***	36.72	1.69*	43.34	4.00***	27.72	4.76***	35.14	3.62***	41.00
8	5.46***	43.74	5.26***	43.41	3.30***	46.48	5.24***	34.06	5.92***	39.03	4.55***	45.07
9	7.56***	47.14	6.90***	47.15	4.75***	49.80	5.44***	34.78	6.13***	38.75	5.11***	41.71
High	10.99***	53.59	8.93***	55.88	5.66***	59.47	7.53***	37.20	7.32***	36.97	4.19**	51.44
High−Low	-6.30***	12.25	-1.30	23.48	-3.20	24.45	0.32	-0.12	2.29	9.96	2.92	10.13

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Table 3 Continued.

Panel I: Industry sorted portfolios.

Portfolio	α	$\bar{R}^2$	α	$\bar{R}^2$	α	$\bar{R}^2$	α	$\bar{R}^2$	α	$\bar{R}^2$	α	$\bar{R}^2$
	1960:01−1985:12						1986:01−2011:12					
	CAPM		Fama-French		Carhart		CAPM		Fama-French		Carhart	
NoDur	4.40^{***}	38.80	4.63^{***}	38.90	1.76	45.51	2.80^{***}	16.64	3.44^{***}	30.11	2.52^{***}	34.40
Durbl	6.33^{***}	34.52	8.36^{***}	39.90	5.85^{***}	44.12	10.33^{***}	37.76	12.86^{***}	46.57	8.80^{***}	57.30
Manuf	5.75^{***}	44.52	5.54^{***}	44.39	2.56^{**}	50.82	5.79^{***}	37.82	7.08^{***}	45.08	5.33^{***}	51.58
Enrgy	5.41^{***}	25.83	4.52^{**}	27.46	3.04	29.05	5.63^{***}	26.09	6.47^{***}	30.91	6.22^{***}	30.89
HiTec	9.30^{***}	43.95	8.50^{***}	44.38	5.62^{***}	48.64	10.50^{***}	36.97	9.33^{***}	39.26	4.49^{*}	58.52
Telcm	4.07^{***}	21.03	4.01^{***}	22.96	2.81^{**}	25.18	7.98^{***}	31.78	7.68^{***}	31.98	5.22^{***}	41.03
Shops	6.28^{***}	38.49	7.68^{***}	42.61	4.15^{**}	49.11	3.51^{***}	29.16	4.27^{***}	32.48	2.58^{**}	41.32
Hlth	6.04^{***}	26.08	3.31^{**}	32.21	1.01	34.79	3.59^{***}	19.21	3.67^{***}	19.40	2.75^{***}	22.98
Utils	4.50^{***}	27.91	6.14^{***}	31.52	4.94^{***}	32.80	3.22^{***}	12.41	3.95^{***}	21.87	3.36^{***}	23.00
Other	6.34^{***}	40.35	6.63^{***}	40.12	3.14^{**}	47.32	8.16^{***}	42.48	10.07^{***}	53.81	7.92^{***}	60.14

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Table 4. Alternative Moving Averages Lag Lengths.

This table reports the sensitivity of the average annualized MAP(q) excess returns to the length of the moving average using portfolios sorted by several variables. The sample period covers 1960:01 until 2011:12 with value-weighted portfolio returns. The length of the moving average window is q months. A one-way transaction cost of 0.5% has been imposed in constructing the switching moving average strategy excess returns. Newey and West (1987) standard errors with q lags are used in reporting statistical significance of a one-sided null hypothesis $\Delta\mu > 0$ at the 1%, 5%, and 10% level is given by a ***, a **, and a *, respectively.

Panel A: Size sorted portfolios.

Portfolio	MAP(6)	MAP(12)	MAP(36)	MAP(48)	MAP(60)
Low	14.43***	9.31***	3.23**	3.36**	2.69*
2	14.24***	9.77***	3.31**	2.83*	3.03*
3	13.11***	8.59***	2.98**	3.37**	2.31*
4	12.75***	8.10***	2.77*	2.39*	1.88
5	12.17***	8.00***	2.45*	1.79	1.58
6	11.44***	7.01***	2.74**	1.40	1.27
7	11.26***	6.98***	2.01*	1.41	1.55
8	10.49***	7.23***	2.03*	1.63	1.51
9	10.51***	6.58***	2.18**	1.31	1.21
High	9.02***	6.37***	2.10**	1.21	1.07
High−Low	-5.41***	-2.94**	-1.13	-2.15	-1.63

Panel B: Book-to-market sorted portfolios.

Portfolio	MAP(6)	MAP(12)	MAP(36)	MAP(48)	MAP(60)
Low	12.19***	8.60***	3.38***	2.38*	2.13*
2	9.61***	7.15***	2.02*	1.77*	1.46
3	9.90***	7.64***	1.95**	1.06	1.45*
4	10.13***	6.63***	2.07*	1.68	1.81*
5	9.58***	6.11***	2.24**	1.14	1.31
6	9.17***	6.51***	1.92*	1.55	1.91*
7	9.06***	6.05***	1.34	1.39	1.41*
8	8.73***	5.93***	0.91	1.30	0.54
9	9.20***	6.32***	1.48	0.99	1.63*
High	11.32***	7.58***	2.27*	2.13	1.65
High−Low	-0.87	-1.03	-1.11	-0.25	-0.48

Panel C: Cash-flow-to-price sorted portfolios.

Portfolio	MAP(6)	MAP(12)	MAP(36)	MAP(48)	MAP(60)
Low	13.03***	9.96***	3.63**	2.51*	2.11*
2	10.69***	7.23***	2.40**	1.20	0.92
3	9.34***	6.75***	2.35**	1.48*	1.38
4	9.64***	7.18***	1.96*	1.91*	1.93*
5	9.64***	6.09***	1.59	1.30	1.14
6	9.56***	7.06***	2.17**	0.96	0.90
7	8.78***	5.79***	1.62*	1.21	1.16
8	8.94***	6.26***	1.67*	1.32	1.10
9	8.26***	5.22***	1.49*	1.44*	0.97
High	9.49***	6.14***	1.68	1.56	1.42
High−Low	-3.54**	-3.82***	-1.95*	-0.95	-0.69

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Table 4 Continued.

Panel D: Earnings-to-price sorted portfolios.

Portfolio	MAP(6)	MAP(12)	MAP(36)	MAP(48)	MAP(60)
Low	13.87***	9.58***	3.32**	2.69*	2.33*
2	10.50***	7.84***	2.74**	1.12	1.06
3	9.58***	7.01***	2.00**	1.70*	1.51*
4	9.26***	6.27***	2.11**	1.55*	1.20
5	9.19***	6.30***	1.75*	1.04	1.12
6	8.84***	5.72***	2.00**	1.05	1.46*
7	8.70***	5.58***	1.24	1.08	0.77
8	8.85***	6.04***	1.81*	0.73	0.42
9	9.19***	5.43***	2.22**	1.18	1.18
High	10.17***	6.28***	2.31**	1.91*	1.19
High−Low	-3.70***	-3.30**	-1.01	-0.79	-1.14

Panel E: Dividend-price sorted portfolios.

Portfolio	MAP(6)	MAP(12)	MAP(36)	MAP(48)	MAP(60)
Low	13.76***	9.47***	4.13***	2.92**	2.53*
2	11.91***	7.80***	2.52**	1.97*	1.44
3	10.63***	7.88***	2.19**	1.12	0.60
4	10.04***	7.26***	2.52**	0.92	1.20
5	9.82***	7.38***	2.32**	1.34	1.33
6	8.58***	6.23***	1.89**	1.23	0.83
7	9.26***	6.53***	2.10**	1.18	0.99
8	7.75***	5.20***	1.71**	1.54**	1.07
9	7.89***	5.35***	1.73**	1.14	0.75
High	8.89***	6.36***	2.12*	1.02	0.57
High−Low	-4.86***	-3.11**	-2.01	-1.89	-1.96

Panel F: Short-term reversal sorted portfolios.

Portfolio	MAP(6)	MAP(12)	MAP(36)	MAP(48)	MAP(60)
Low	16.19***	10.01***	4.96**	2.88	3.72*
2	11.38***	8.26***	2.49*	1.42	1.57
3	9.93***	6.53***	2.17*	1.25	1.14
4	9.94***	7.11***	2.03*	1.93*	1.03
5	9.12***	6.50***	2.13**	1.14	1.09
6	9.46***	6.43***	2.45**	1.07	1.11
7	9.63***	6.38***	2.12**	1.08	1.33
8	10.25***	6.47***	2.43**	1.40	0.65
9	11.05***	8.22***	3.33***	2.53**	2.10*
High	14.57***	10.33***	4.22**	3.32**	2.32*
High−Low	-1.62	0.33	-0.74	0.44	-1.40

Panel G: Medium-term momentum sorted portfolios.

Portfolio	MAP(6)	MAP(12)	MAP(36)	MAP(48)	MAP(60)
Low	21.64***	15.02***	8.99***	7.73**	6.83**
2	15.09***	10.37***	3.00*	2.60	2.30
3	12.24***	8.24***	2.05	1.25	1.84
4	10.54***	6.41***	1.68	1.65	1.56
5	9.69***	6.39***	2.99**	1.92*	1.19
6	9.95***	6.45***	2.35**	1.29	0.65
7	8.98***	6.11***	1.64*	0.97	0.78
8	8.57***	5.48***	1.20	1.11	0.90
9	9.81***	6.27***	1.75*	0.83	0.66
High	11.87***	8.94***	1.57	0.58	0.45
High−Low	-9.77***	8.94***	-7.42***	-7.15**	-6.37**

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Table 4 Continued.

Panel H: Long-term reversal sorted portfolios.

Portfolio	MAP(6)	MAP(12)	MAP(36)	MAP(48)	MAP(60)
Low	12.66***	8.97***	2.86*	2.21	2.56*
2	10.43***	6.62***	2.04*	1.84	1.70
3	8.49***	6.22***	1.48	0.70	1.47*
4	8.90***	6.08***	2.44**	1.53	1.80*
5	8.84***	5.74***	1.10	1.25	1.59*
6	9.05***	5.76***	1.72*	1.31	1.33*
7	8.70***	5.78***	1.44*	1.24	0.98
8	9.51***	6.47***	1.84**	0.68	0.73
9	11.12***	7.47***	2.99**	1.88*	1.64
High	14.79***	10.53***	3.66**	3.39**	2.52*
High−Low	2.13	1.56	0.80	1.19	-0.05

Panel I: Industry sorted portfolios.

Portfolio	MAP(6)	MAP(12)	MAP(36)	MAP(48)	MAP(60)
NoDur	8.33***	5.90***	1.20	1.05	0.87
Durbl	13.85***	8.76***	4.02**	3.53**	2.69*
Manuf	11.32***	7.27***	2.32**	1.20	1.36
Enrgy	10.84***	6.78***	1.20	0.85	0.83
HiTec	15.15***	10.76***	4.47**	3.22**	2.24
Telcm	10.96***	7.38***	2.98**	3.02**	2.36**
Shops	11.22***	7.33***	2.64**	1.81*	1.17
Hlth	9.81***	6.79***	1.46	1.29	0.86
Utils	8.67***	5.90***	2.10**	0.86	1.34
Other	12.12***	8.73***	2.98**	1.80	1.32

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Table 5. Trading Frequency and Break-Even Transaction Cost.

This table reports the results for the improvement delivered by the MA switching strategy over the buy-and-hold strategy, the trading frequency as well as the break-even transaction cost using ten decile portfolios sorted by several variables. The sample period covers 1960:01 until 2011:12 with value-weighted portfolio returns. $\Delta\mu$ is the annualized improvement in the average in-sample monthly return, $\Delta\sigma$ is the annualized improvement in the return standard deviation, p_A is the proportion of months during which there is a hold signal, NT is the number of transactions (buy or sell) over the entire sample period, BETC is the break-even one-sided transaction cost in percent, p_1 is the proportion of months during which a buy signal was followed by a positive return of the underlying portfolio and p_2 is the proportion of months during which a buy signal was followed by a portfolio return in excess of the risk-free rate. The length of the moving average window is 24 months. A one-way transaction cost of 0.5% has been imposed in the reported $\Delta\mu$ and $\Delta\sigma$. Statistical significance of the one-sided null hypotheses that $\Delta\mu > 0$, $\Delta\sigma > 0$, $p_1 > 0.5$ and $p_2 > 0.5$ at the 1%, 5%, and 10% level is given by a ***, a **, and a *, respectively.

Panel A: Size sorted portfolios.

Portfolio	$\Delta\mu$	$\Delta\sigma$	p_A	NT	BETC	p_1	p_2
Low	4.37^{**}	5.40^{***}	0.74	39	5.60	0.60^{***}	0.57^{***}
2	5.00^{***}	5.44^{***}	0.77	46	5.43	0.57^{***}	0.55^{***}
3	4.00^{**}	5.05^{***}	0.80	44	4.55	0.59^{***}	0.57^{***}
4	4.69^{***}	5.35^{***}	0.79	50	4.69	0.59^{***}	0.56^{***}
5	4.18^{**}	5.14^{***}	0.80	44	4.75	0.61^{***}	0.57^{***}
6	4.11^{***}	4.85^{***}	0.80	38	5.41	0.60^{***}	0.56^{***}
7	3.91^{***}	4.77^{***}	0.81	32	6.11	0.60^{***}	0.57^{***}
8	4.01^{***}	4.55^{***}	0.81	42	4.77	0.60^{***}	0.56^{***}
9	3.98^{***}	4.31^{***}	0.81	42	4.74	0.59^{***}	0.57^{***}
High	3.64^{***}	3.29^{***}	0.80	38	4.79	0.61^{***}	0.57^{***}

Panel B: Book-to-market sorted portfolios.

Portfolio	$\Delta\mu$	$\Delta\sigma$	p_A	NT	BETC	p_1	p_2
Low	5.23^{***}	4.86^{***}	0.72	42	6.22	0.57^{***}	0.54^{**}
2	4.17^{***}	3.97^{***}	0.81	44	4.74	0.58^{***}	0.56^{***}
3	4.34^{***}	3.86^{***}	0.79	50	4.34	0.60^{***}	0.56^{***}
4	3.91^{***}	4.52^{***}	0.80	40	4.88	0.60^{***}	0.58^{***}
5	3.63^{***}	3.82^{***}	0.82	30	6.04	0.62^{***}	0.58^{***}
6	3.58^{***}	3.78^{***}	0.84	38	4.71	0.61^{***}	0.56^{***}
7	3.50^{***}	2.78^{***}	0.84	34	5.15	0.62^{***}	0.58^{***}
8	2.50^{**}	3.60^{***}	0.86	36	3.47	0.62^{***}	0.58^{***}
9	4.06^{***}	3.88^{***}	0.84	44	4.61	0.63^{***}	0.59^{***}
High	4.04^{**}	4.53^{***}	0.83	29	6.96	0.62^{***}	0.58^{***}

Panel C: Cash-flow-to-price sorted portfolios.

Portfolio	$\Delta\mu$	$\Delta\sigma$	p_A	NT	BETC	p_1	p_2
Low	6.36^{***}	5.73^{***}	0.73	52	6.11	0.57^{***}	0.54^{**}
2	4.08^{***}	3.87^{***}	0.78	51	4.00	0.58^{***}	0.54^{**}
3	4.01^{***}	3.38^{***}	0.79	46	4.36	0.58^{***}	0.55^{***}
4	3.82^{***}	3.86^{***}	0.81	44	4.34	0.58^{***}	0.56^{***}
5	3.57^{***}	4.34^{***}	0.83	32	5.58	0.60^{***}	0.58^{***}
6	3.99^{***}	3.84^{***}	0.80	36	5.55	0.60^{***}	0.56^{***}
7	3.49^{***}	3.19^{***}	0.84	36	4.85	0.61^{***}	0.58^{***}
8	3.14^{***}	3.24^{***}	0.84	44	3.56	0.61^{***}	0.57^{***}
9	2.60^{***}	2.35^{***}	0.87	26	4.99	0.64^{***}	0.59^{***}
High	3.10^{**}	3.37^{***}	0.86	30	5.16	0.64^{***}	0.60^{***}

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Table 5 Continued.

Panel D: Earnings-to-price sorted portfolios.

Portfolio	$\Delta\mu$	$\Delta\sigma$	p_A	NT	BETC	p_1	p_2
Low	6.27^{***}	5.87^{***}	0.73	50	6.27	0.56^{***}	0.53^{*}
2	4.52^{***}	4.24^{***}	0.77	44	5.14	0.58^{***}	0.55^{***}
3	3.56^{***}	3.53^{***}	0.81	40	4.45	0.59^{***}	0.56^{***}
4	3.38^{***}	3.76^{***}	0.80	34	4.97	0.60^{***}	0.55^{***}
5	3.74^{***}	3.51^{***}	0.81	40	4.68	0.60^{***}	0.56^{***}
6	2.70^{**}	3.40^{***}	0.84	28	4.82	0.61^{***}	0.57^{***}
7	3.14^{***}	2.38^{***}	0.85	34	4.62	0.63^{***}	0.58^{***}
8	2.59^{**}	3.21^{***}	0.86	34	3.80	0.61^{***}	0.58^{***}
9	3.18^{**}	3.71^{***}	0.85	38	4.19	0.65^{***}	0.62^{***}
High	3.29^{**}	3.75^{***}	0.82	37	4.44	0.61^{***}	0.58^{***}

Panel E: Dividend-price sorted portfolios.

Portfolio	$\Delta\mu$	$\Delta\sigma$	p_A	NT	BETC	p_1	p_2
Low	6.32^{***}	5.93^{***}	0.72	51	6.19	0.58^{***}	0.55^{***}
2	4.22^{***}	4.69^{***}	0.77	53	3.98	0.57^{***}	0.55^{***}
3	4.09^{***}	3.86^{***}	0.78	55	3.72	0.59^{***}	0.56^{***}
4	3.68^{***}	3.44^{***}	0.80	38	4.84	0.61^{***}	0.56^{***}
5	4.21^{***}	4.13^{***}	0.78	40	5.26	0.58^{***}	0.55^{**}
6	4.21^{***}	3.46^{***}	0.82	44	4.79	0.60^{***}	0.55^{***}
7	3.11^{***}	3.09^{***}	0.82	32	4.85	0.60^{***}	0.55^{***}
8	2.81^{**}	3.07^{***}	0.86	38	3.70	0.63^{***}	0.58^{***}
9	2.68^{***}	2.73^{***}	0.85	26	5.15	0.63^{***}	0.57^{***}
High	3.50^{**}	5.06^{***}	0.82	44	3.98	0.62^{***}	0.57^{***}

Panel F: Short-term reversal sorted portfolios.

Portfolio	$\Delta\mu$	$\Delta\sigma$	p_A	NT	BETC	p_1	p_2
Low	6.25^{***}	8.82^{***}	0.75	37	8.44	0.58^{***}	0.56^{***}
2	5.49^{***}	5.39^{***}	0.82	51	5.38	0.61^{***}	0.57^{***}
3	3.67^{**}	5.09^{***}	0.80	34	5.39	0.61^{***}	0.58^{***}
4	4.03^{***}	3.64^{***}	0.82	38	5.30	0.61^{***}	0.56^{***}
5	3.46^{***}	3.86^{***}	0.81	32	5.40	0.62^{***}	0.57^{***}
6	3.72^{***}	3.39^{***}	0.79	40	4.65	0.60^{***}	0.56^{***}
7	3.55^{***}	3.73^{***}	0.78	40	4.44	0.61^{***}	0.56^{***}
8	3.91^{***}	4.08^{***}	0.77	36	5.43	0.61^{***}	0.57^{***}
9	5.30^{***}	4.46^{***}	0.75	40	6.63	0.58^{***}	0.54^{**}
High	5.70^{***}	5.33^{***}	0.70	32	8.91	0.55^{***}	0.53^{*}

Panel G: Medium-term momentum sorted portfolios.

Portfolio	$\Delta\mu$	$\Delta\sigma$	p_A	NT	BETC	p_1	p_2
Low	10.68^{***}	14.49^{***}	0.58	69	7.74	0.50	0.46^{**}
2	5.57^{***}	7.69^{***}	0.76	44	6.33	0.55^{**}	0.51
3	4.64^{***}	6.48^{***}	0.76	44	5.27	0.56^{***}	0.52
4	3.80^{**}	5.31^{***}	0.80	42	4.52	0.57^{***}	0.53^{*}
5	3.93^{***}	4.70^{***}	0.80	52	3.78	0.58^{***}	0.55^{***}
6	4.13^{***}	4.28^{***}	0.78	38	5.43	0.58^{***}	0.56^{***}
7	3.82^{***}	3.42^{***}	0.80	44	4.34	0.61^{***}	0.57^{***}
8	2.65^{**}	2.65^{***}	0.81	38	3.49	0.62^{***}	0.58^{***}
9	3.19^{***}	2.73^{***}	0.82	32	4.98	0.63^{***}	0.60^{***}
High	3.96^{***}	3.09^{***}	0.81	41	4.83	0.63^{***}	0.60^{***}

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Table 5 Continued.

Panel H: Long-term reversal sorted portfolios.

Portfolio	$\Delta\mu$	$\Delta\sigma$	p_A	NT	BETC	p_1	p_2
Low	4.51^{**}	5.51^{***}	0.81	35	6.45	0.57^{***}	0.55^{***}
2	4.56^{***}	3.66^{***}	0.84	37	6.16	0.59^{***}	0.56^{***}
3	3.79^{***}	3.13^{***}	0.87	36	5.26	0.60^{***}	0.56^{***}
4	3.31^{***}	3.93^{***}	0.82	42	3.94	0.60^{***}	0.57^{***}
5	3.04^{**}	3.71^{***}	0.85	34	4.48	0.61^{***}	0.59^{***}
6	2.94^{***}	3.11^{***}	0.84	36	4.08	0.63^{***}	0.59^{***}
7	2.87^{**}	3.09^{***}	0.83	42	3.42	0.62^{***}	0.58^{***}
8	3.78^{***}	3.71^{***}	0.82	50	3.78	0.62^{***}	0.59^{***}
9	4.71^{***}	4.40^{***}	0.77	50	4.71	0.59^{***}	0.56^{***}
High	6.58^{***}	6.36^{***}	0.69	42	7.83	0.57^{***}	0.53^{*}

Panel I: Industry sorted portfolios.

Portfolio	$\Delta\mu$	$\Delta\sigma$	p_A	NT	BETC	p_1	p_2
NoDur	2.20^{**}	2.89^{***}	0.81	30	3.67	0.61^{***}	0.56^{***}
Durbl	5.39^{***}	7.35^{***}	0.71	59	4.56	0.55^{***}	0.52
Manuf	3.85^{***}	4.51^{***}	0.81	36	5.35	0.58^{***}	0.56^{***}
Enrgy	4.05^{***}	2.86^{***}	0.84	40	5.06	0.59^{***}	0.56^{***}
HiTec	6.92^{***}	6.50^{***}	0.72	56	6.18	0.55^{**}	0.53
Telcm	3.96^{***}	3.78^{***}	0.78	36	5.49	0.59^{***}	0.54^{**}
Shops	3.46^{**}	4.41^{***}	0.77	48	3.60	0.59^{***}	0.55^{***}
Hlth	3.33^{**}	3.67^{***}	0.77	46	3.62	0.60^{***}	0.57^{***}
Utils	2.79^{***}	3.09^{***}	0.80	48	2.91	0.60^{***}	0.55^{***}
Other	4.87^{***}	5.56^{***}	0.78	39	6.25	0.58^{***}	0.56^{***}

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Table 6. Trading and Break-Even Transaction Costs at Various MA Lags.

This table reports the number of trades and the break-even transaction costs involved in the MA switching strategy over the buy-and-hold strategy using ten decile portfolios sorted by several variables. The sample period covers 1960:01 until 2011:12 with value-weighted portfolio returns. NT is the number of transactions (buy or sell) over the entire sample period and BETC is the break-even one-sided transaction cost in percent.

Panel A: Size sorted portfolios.

Portfolio	NT	BETC	NT	BETC	NT	BETC	NT	BETC	NT	BETC
	MAP(6)		MAP(12)		MAP(36)		MAP(48)		MAP(60)	
Low	97	7.66	55	8.63	30	5.28	26	6.20	28	4.52
2	116	6.32	65	7.66	32	5.08	26	5.23	24	5.93
3	126	5.36	71	6.17	30	4.87	26	6.22	24	4.53
4	120	5.47	73	5.66	24	5.66	24	4.78	18	4.91
5	114	5.50	71	5.75	22	5.46	20	4.30	16	4.64
6	128	4.60	61	5.86	28	4.80	26	2.58	16	3.73
7	122	4.75	63	5.65	24	4.10	22	3.08	20	3.64
8	122	4.43	71	5.20	26	3.83	24	3.26	22	3.23
9	126	4.29	65	5.16	30	3.56	22	2.86	16	3.55
High	116	4.01	54	6.02	22	4.68	26	2.23	18	2.78

Panel B: Book-to-market sorted portfolios.

Portfolio	NT	BETC	NT	BETC	NT	BETC	NT	BETC	NT	BETC
	MAP(6)		MAP(12)		MAP(36)		MAP(48)		MAP(60)	
Low	116	5.41	74	5.93	35	4.74	24	4.77	20	5.01
2	128	3.87	77	4.73	28	3.53	24	3.54	20	3.42
3	124	4.11	74	5.26	28	3.41	26	1.96	22	3.11
4	110	4.74	69	4.90	26	3.91	26	3.09	32	2.65
5	114	4.33	60	5.19	26	4.23	18	3.04	16	3.86
6	128	3.69	71	4.67	20	4.71	20	3.73	18	4.99
7	96	4.86	66	4.68	18	3.66	18	3.71	14	4.74
8	108	4.16	73	4.15	16	2.79	14	4.46	10	2.53
9	116	4.08	65	4.96	24	3.01	20	2.37	24	3.20
High	101	5.77	65	5.94	27	4.12	27	3.79	21	3.69

Panel C: Cash-flow-to-price sorted portfolios.

Portfolio	NT	BETC	NT	BETC	NT	BETC	NT	BETC	NT	BETC
	MAP(6)		MAP(12)		MAP(36)		MAP(48)		MAP(60)	
Low	119	5.64	85	5.97	37	4.81	18	6.70	26	3.81
2	127	4.34	59	6.25	32	3.67	18	3.20	18	2.41
3	124	3.88	76	4.53	31	3.71	18	3.96	16	4.05
4	118	4.21	83	4.41	24	4.00	22	4.18	24	3.78
5	134	3.70	64	4.85	20	3.88	22	2.84	18	2.97
6	112	4.40	61	5.91	32	3.32	14	3.28	14	3.01
7	108	4.19	62	4.77	18	4.40	20	2.90	18	3.03
8	110	4.19	72	4.43	18	4.54	24	2.64	18	2.87
9	114	3.73	57	4.67	16	4.58	14	4.93	18	2.53
High	110	4.44	58	5.40	22	3.75	20	3.74	18	3.70

Panel D: Earnings-to-price sorted portfolios.

Portfolio	NT	BETC	NT	BETC	NT	BETC	NT	BETC	NT	BETC
	MAP(6)		MAP(12)		MAP(36)		MAP(48)		MAP(60)	
Low	118	6.05	71	6.88	29	5.62	22	5.88	20	5.46
2	127	4.26	83	4.82	32	4.20	22	2.44	24	2.08
3	119	4.14	73	4.90	26	3.77	24	3.39	20	3.56
4	120	3.97	65	4.92	26	3.99	20	3.72	20	2.81
5	106	4.47	75	4.29	22	3.89	18	2.78	16	3.30
6	120	3.79	58	5.03	30	3.26	18	2.80	20	3.44
7	106	4.23	64	4.45	16	3.81	14	3.69	14	2.60
8	114	4.00	64	4.81	20	4.43	8	4.41	6	3.31
9	94	5.03	51	5.43	30	3.62	22	2.57	16	3.46
High	118	4.44	57	5.62	28	4.04	22	4.16	18	3.10

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Table 6 Continued.

Panel E: Dividend-price sorted portfolios.

Portfolio	NT	BETC	NT	BETC	NT	BETC	NT	BETC	NT	BETC
	MAP(6)		MAP(12)		MAP(36)		MAP(48)		MAP(60)	
Low	139	5.10	73	6.62	34	5.95	21	6.67	13	9.16
2	118	5.20	73	5.45	35	3.52	33	2.87	25	2.71
3	131	4.18	75	5.36	30	3.57	20	2.69	12	2.34
4	124	4.17	62	5.97	38	3.25	16	2.75	18	3.13
5	116	4.36	73	5.16	26	4.36	18	3.58	20	3.14
6	116	3.81	75	4.24	34	2.73	18	3.28	12	3.25
7	110	4.34	76	4.38	32	3.21	20	2.84	16	2.92
8	114	3.50	64	4.15	24	3.50	20	3.69	16	3.15
9	106	3.83	58	4.71	24	3.53	18	3.03	14	2.51
High	94	4.87	62	5.23	28	3.72	16	3.07	8	3.35

Panel F: Short-term reversal sorted portfolios.

Portfolio	NT	BETC	NT	BETC	NT	BETC	NT	BETC	NT	BETC
	MAP(6)		MAP(12)		MAP(36)		MAP(48)		MAP(60)	
Low	137	6.09	87	5.87	32	7.59	27	5.12	29	6.02
2	140	4.19	85	4.96	26	4.69	16	4.26	17	4.33
3	116	4.41	61	5.46	24	4.42	18	3.34	15	3.56
4	126	4.06	71	5.11	24	4.14	26	3.56	16	3.02
5	108	4.35	70	4.74	28	3.73	18	3.05	14	3.66
6	118	4.13	62	5.29	26	4.62	14	3.68	22	2.37
7	108	4.59	63	5.17	22	4.73	10	5.21	14	4.48
8	106	4.98	54	6.11	20	5.95	24	2.80	22	1.38
9	124	4.59	67	6.25	31	5.26	18	6.75	22	4.48
High	133	5.64	79	6.67	35	5.90	31	5.14	22	4.95

Panel G: Medium-term momentum sorted portfolios.

Portfolio	NT	BETC	NT	BETC	NT	BETC	NT	BETC	NT	BETC
	MAP(6)		MAP(12)		MAP(36)		MAP(48)		MAP(60)	
Low	113	9.86	83	9.23	72	6.12	45	8.24	33	9.72
2	137	5.67	69	7.66	29	5.07	24	5.21	22	4.92
3	118	5.34	69	6.09	25	4.01	16	3.74	24	3.61
4	118	4.60	63	5.19	26	3.16	22	3.61	22	3.33
5	116	4.30	89	3.66	38	3.86	24	3.84	18	3.10
6	114	4.49	58	5.68	28	4.12	20	3.10	12	2.53
7	130	3.56	61	5.11	20	4.01	16	2.92	20	1.83
8	114	3.87	47	5.95	14	4.20	18	2.96	16	2.64
9	122	4.14	63	5.08	16	5.36	12	3.31	14	2.22
High	107	5.71	77	5.92	14	5.50	12	2.32	12	1.77

Panel H: Long-term reversal sorted portfolios.

Portfolio	NT	BETC	NT	BETC	NT	BETC	NT	BETC	NT	BETC
	MAP(6)		MAP(12)		MAP(36)		MAP(48)		MAP(60)	
1	131	4.98	79	5.79	23	6.10	19	5.58	25	4.82
2	126	4.26	69	4.89	27	3.70	21	4.20	21	3.80
3	118	3.70	67	4.74	20	3.62	18	1.86	18	3.83
4	126	3.64	71	4.36	28	4.27	22	3.33	24	3.53
5	112	4.06	63	4.64	24	2.25	22	2.72	22	3.40
6	112	4.16	61	4.81	20	4.22	20	3.15	20	3.13
7	108	4.15	58	5.08	22	3.22	20	2.98	16	2.88
8	116	4.22	74	4.46	26	3.47	22	1.49	14	2.44
9	133	4.31	69	5.52	30	4.88	24	3.77	24	3.22
10	114	6.68	62	8.66	37	4.85	32	5.09	16	7.39

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Table 6 Continued.

Panel I: Industry sorted portfolios.

Portfolio	NT	BETC	NT	BETC	NT	BETC	NT	BETC	NT	BETC
	MAP(6)		MAP(12)		MAP(36)		MAP(48)		MAP(60)	
NoDur	102	4.21	70	4.30	22	2.68	12	4.20	12	3.42
Durbl	111	6.43	77	5.80	48	4.10	42	4.03	35	3.61
Manuf	126	4.63	61	6.08	31	3.66	24	2.40	22	2.91
Enrgy	132	4.23	77	4.49	18	3.28	18	2.26	18	2.17
HiTec	132	5.91	93	5.90	43	5.09	26	5.95	16	6.57
Telcm	128	4.41	74	5.08	26	5.62	30	4.83	24	4.63
Shops	110	5.25	78	4.79	32	4.05	28	3.10	18	3.07
Hlth	124	4.08	76	4.56	21	3.40	22	2.82	18	2.25
Utils	112	3.99	66	4.56	28	3.67	18	2.30	26	2.42
Other	118	5.29	71	6.27	26	5.62	17	5.09	15	4.14

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Table 7. Market Timing Regressions: Monthly Decile Portfolios.

This table reports alphas, betas, and adjusted R^2 of the market timing regressions of the MAP excess returns on the market factor using portfolios sorted by several variables. The TM panel reports the results using the Treynor and Mazuy (1966) quadratic regression with the squared market factor (β_{m^2}) while the HM panel reports the results using the Merton and Henriksson (1981) regression with option-like returns on the market (γ_m). The sample period covers 1960:01 until 2011:12 with value-weighted portfolio returns. The length of the moving average window is 24 months. A one-way transaction cost of 0.5% has been imposed in constructing the switching moving average strategy excess returns. Newey and West (1987) standard errors with 24 lags are used in reporting statistical significance of a two-sided null hypothesis at the 1%, 5%, and 10% level is given by a ***, a **, and a *, respectively.

Panel A: Size sorted portfolios.

Portfolio	α	β_m	β_{m^2}	$\bar{R}^2$	α	β_m	γ_m	$\bar{R}^2$
	TM				HM			
Low	2.19	-0.52***	0.02***	41.20	-1.67	-0.75***	0.41***	39.97
2	2.53*	-0.52***	0.02***	42.50	-1.86	-0.77***	0.45***	41.27
3	0.89	-0.49***	0.02***	44.08	-4.09***	-0.77***	0.50***	42.54
4	1.50	-0.50***	0.02***	46.46	-3.97**	-0.79***	0.54***	45.11
5	1.37	-0.49***	0.02***	47.19	-3.33**	-0.75***	0.48***	45.67
6	1.08	-0.47***	0.02***	49.83	-4.32***	-0.75***	0.52***	48.54
7	1.12	-0.46***	0.02***	47.78	-3.81**	-0.72***	0.48***	46.49
8	1.43	-0.44***	0.02***	48.24	-3.47***	-0.69***	0.46***	47.19
9	1.59*	-0.42***	0.02***	49.68	-3.09**	-0.65***	0.44***	48.71
High	4.38***	-0.34***	0.00***	38.59	0.19	-0.47***	0.25***	40.16
High−Low	-2.20	-0.18***	0.02***	9.20	-1.86	-0.28***	0.17**	6.82

Panel B: Book-to-market sorted portfolios.

Portfolio	α	β_m	β_{m^2}	$\bar{R}^2$	α	β_m	γ_m	$\bar{R}^2$
	TM				HM			
Low	4.42***	-0.48***	0.01***	46.44	-0.10	-0.68***	0.37***	46.72
2	1.76*	-0.38***	0.02***	44.28	-2.81**	-0.61***	0.43***	43.40
3	2.13***	-0.39***	0.02***	48.20	-2.78**	-0.62***	0.43***	47.84
4	1.13	-0.43***	0.02***	48.84	-3.51**	-0.67***	0.46***	47.33
5	1.32	-0.36***	0.02***	43.61	-2.33*	-0.56***	0.37***	42.05
6	0.55	-0.36***	0.02***	45.41	-3.56***	-0.59***	0.43***	43.11
7	3.75***	-0.27***	0.00**	28.24	0.29	-0.38***	0.22***	29.46
8	0.78	-0.31***	0.01***	32.00	-2.30*	-0.48***	0.30***	31.11
9	1.36*	-0.35***	0.02***	40.03	-3.57***	-0.59***	0.45***	39.30
High	1.46	-0.40***	0.02***	33.52	-2.73*	-0.62***	0.42***	32.38
High−Low	2.97*	-0.09***	-0.01*	1.22	2.62	-0.05	-0.05	0.86

Panel C: Cash-flow-to-price sorted portfolios.

Portfolio	α	β_m	β_{m^2}	$\bar{R}^2$	α	β_m	γ_m	$\bar{R}^2$
	TM				HM			
Low	5.90***	-0.55***	0.01***	47.99	1.42	-0.75***	0.37***	48.19
2	2.76***	-0.40***	0.01***	44.60	-1.11	-0.58***	0.34***	44.35
3	4.36***	-0.36***	0.01***	38.41	-0.79	-0.51***	0.31***	40.56
4	1.76**	-0.36***	0.02***	41.90	-2.63**	-0.58***	0.40***	41.42
5	0.70	-0.39***	0.02***	44.17	-3.68***	-0.62***	0.44***	42.47
6	1.62*	-0.36***	0.02***	42.78	-2.44*	-0.57***	0.39***	41.55
7	1.18	-0.30***	0.02***	37.65	-2.35*	-0.48***	0.35***	36.21
8	1.71**	-0.30***	0.01***	34.51	-1.00	-0.45***	0.27***	33.64
9	1.74**	-0.23***	0.01***	26.37	-1.63	-0.37***	0.26***	27.15
High	1.46*	-0.33***	0.01***	32.70	-1.75	-0.50***	0.31***	31.97
High−Low	4.44***	-0.22***	-0.00	10.04	3.17**	-0.25***	0.06	10.11

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Table 7 Continued.

Panel D: Earnings-price sorted portfolios.

Portfolio	α	β_m	β_{m^2}	$\bar{R}^2$	α	β_m	γ_m	$\bar{R}^2$
	TM				HM			
Low	6.18***	-0.57***	0.01***	47.73	2.43*	-0.74***	0.32***	47.73
2	3.33***	-0.43***	0.01***	46.08	-1.13	-0.62***	0.37***	46.29
3	2.04**	-0.35***	0.01***	41.09	-1.97	-0.54***	0.35***	40.98
4	1.72**	-0.35***	0.01***	40.70	-1.76*	-0.53***	0.33***	39.94
5	1.91**	-0.35***	0.01***	43.53	-2.50**	-0.56***	0.38***	43.41
6	1.12	-0.31***	0.01***	34.67	-1.53	-0.46***	0.28***	33.56
7	2.84***	-0.23***	0.01***	26.43	-0.60	-0.36***	0.23***	27.71
8	0.75	-0.28***	0.01***	30.91	-1.87	-0.44***	0.28***	29.56
9	2.84***	-0.33***	0.01***	29.73	-0.93	-0.47***	0.27***	30.46
High	0.75	-0.36***	0.02***	37.95	-3.45***	-0.58***	0.41***	36.76
High−Low	5.43***	-0.21***	-0.01**	7.48	5.88***	-0.16***	-0.09	7.22

Panel E: Dividend-price sorted portfolios.

Portfolio	α	β_m	β_{m^2}	$\bar{R}^2$	α	β_m	γ_m	$\bar{R}^2$
	TM				HM			
Low	5.36***	-0.58***	0.02***	49.59	0.43	-0.80***	0.42***	49.63
2	3.81***	-0.46***	0.01***	43.54	0.63	-0.61***	0.28***	43.41
3	3.09***	-0.41***	0.01***	43.65	-0.85	-0.58***	0.33***	43.74
4	1.52*	-0.36***	0.02***	44.12	-2.92**	-0.57***	0.40***	43.54
5	2.26**	-0.37***	0.02***	38.56	-1.37	-0.56***	0.36***	37.59
6	1.62*	-0.31***	0.02***	40.14	-2.73**	-0.53***	0.41***	39.05
7	3.17***	-0.28***	0.01***	27.41	-0.17	-0.40***	0.22***	28.33
8	0.06	-0.24***	0.02***	29.34	-3.19**	-0.43***	0.34***	27.18
9	2.88***	-0.23***	0.00**	21.13	0.08	-0.32***	0.18***	21.97
High	4.27***	-0.30***	0.00	18.25	1.53	-0.38***	0.16***	18.67
High−Low	1.09	-0.28***	0.01***	13.28	-1.11	-0.42***	0.25***	12.60

Panel F: Short-term reversal sorted portfolios.

Portfolio	α	β_m	β_{m^2}	$\bar{R}^2$	α	β_m	γ_m	$\bar{R}^2$
	TM				HM			
Low	3.76**	-0.73***	0.02***	43.98	-3.80*	-1.08***	0.65***	43.90
2	1.55	-0.48***	0.03***	46.14	-5.89***	-0.83***	0.66***	45.63
3	2.87***	-0.47***	0.01***	42.00	-1.56	-0.66***	0.36***	42.27
4	2.10***	-0.36***	0.02***	42.40	-2.62**	-0.58***	0.40***	42.40
5	1.69**	-0.38***	0.01***	44.50	-2.77**	-0.59***	0.39***	44.34
6	1.54**	-0.34***	0.02***	45.84	-3.32***	-0.57***	0.42***	45.78
7	2.38***	-0.38***	0.01***	45.33	-1.43	-0.55***	0.33***	45.29
8	2.75***	-0.39***	0.01***	44.00	-1.33	-0.58***	0.34***	44.10
9	3.56***	-0.42***	0.02***	44.70	-0.26	-0.62***	0.37***	43.90
High	4.43***	-0.51***	0.02***	44.78	1.31	-0.69***	0.33***	43.87
High−Low	-0.67	-0.22***	0.01***	6.30	-5.11**	-0.38***	0.32***	6.76

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Table 7 Continued.

Panel G: Medium-term momentum sorted portfolios.

Portfolio	α	β_m	β_{m^2}	$\bar{R}^2$	α	β_m	γ_m	$\bar{R}^2$
	TM				HM			
Low	14.80***	-1.03***	0.00	45.82	12.85***	-1.11***	0.14	45.85
2	8.80***	-0.64***	-0.00	37.83	5.66***	-0.71***	0.15**	38.04
3	7.35***	-0.51***	-0.00	33.38	4.22***	-0.57***	0.14***	33.64
4	2.49**	-0.45***	0.01***	41.47	-1.72	-0.65***	0.37***	41.29
5	1.51	-0.40***	0.02***	45.18	-3.17**	-0.64***	0.44***	44.30
6	0.71	-0.40***	0.02***	51.94	-4.89***	-0.69***	0.53***	50.39
7	1.24	-0.34***	0.02***	44.76	-3.63***	-0.57***	0.44***	44.12
8	1.40**	-0.30***	0.01***	40.19	-1.65	-0.45***	0.28***	39.74
9	-0.10	-0.30***	0.02***	42.90	-4.51***	-0.53***	0.44***	40.51
High	1.63**	-0.37***	0.02***	39.19	-3.23***	-0.60***	0.43***	38.83
High−Low	13.17***	-0.66***	-0.01***	24.23	16.08***	-0.51***	-0.29***	24.06

Panel H: Long-term reversal sorted portfolios.

Portfolio	α	β_m	β_{m^2}	$\bar{R}^2$	α	β_m	γ_m	$\bar{R}^2$
	TM				HM			
Low	2.72*	-0.49***	0.02***	33.82	-1.35	-0.70***	0.40***	33.20
2	1.95*	-0.34***	0.02***	36.80	-2.20	-0.56***	0.41***	35.52
3	-0.85	-0.28***	0.02***	42.81	-6.05***	-0.57***	0.54***	38.70
4	1.52**	-0.35***	0.01***	38.89	-2.10*	-0.54***	0.34***	38.12
5	1.68**	-0.35***	0.01***	39.62	-2.16*	-0.53***	0.33***	39.52
6	0.36	-0.30***	0.02***	40.28	-3.62***	-0.51***	0.39***	38.77
7	2.11***	-0.32***	0.01***	36.76	-0.47	-0.44***	0.24***	36.48
8	2.18***	-0.37***	0.01***	44.31	-2.04*	-0.56***	0.37***	44.21
9	3.17***	-0.43***	0.01***	45.85	-1.11	-0.63***	0.38***	45.57
High	6.10***	-0.61***	0.01***	48.15	0.81	-0.83***	0.42***	48.54
High−Low	-3.38*	0.12***	0.00	1.28	-2.17	0.13**	-0.02	1.22

Panel I: Industry sorted portfolios.

Portfolio	α	β_m	β_{m^2}	$\bar{R}^2$	α	β_m	γ_m	$\bar{R}^2$
	TM				HM			
NoDur	3.51***	-0.28***	0.00	26.04	1.69	-0.32***	0.09**	26.31
Durbl	3.86***	-0.58***	0.02***	37.98	-0.09	-0.80***	0.40***	37.30
Manuf	1.30	-0.44***	0.02***	47.86	-3.04**	-0.67***	0.44***	46.40
Enrgy	4.36***	-0.28***	0.00**	24.36	0.56	-0.40***	0.23***	25.56
HiTec	5.20***	-0.59***	0.02***	43.13	-0.93	-0.87***	0.52***	43.23
Telcm	4.56***	-0.30***	0.00	23.39	1.46	-0.40***	0.19***	24.06
Shops	1.02	-0.41***	0.02***	40.28	-3.00*	-0.63***	0.41***	38.96
Hlth	5.57***	-0.30***	-0.00	20.81	4.26***	-0.31***	0.03	20.68
Utils	2.61***	-0.23***	0.01***	21.05	0.01	-0.33***	0.19***	21.55
Other	3.62***	-0.51***	0.02***	45.31	-0.94	-0.72***	0.40***	45.17

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Table 8. Factor Regressions with Business Cycles and Up Markets: Monthly Decile Portfolios.

This table reports alphas, betas, and adjusted R^2 of the factor regressions of the MAP excess returns using the Carhart four-factor model with NBER recession indicator dummy variable (RI) and up market indicators (UP) using portfolios sorted by several variables. Alphas are annualized and in percent. The sample period covers 1960:01 until 2011:12 with value-weighted portfolio returns. The length of the moving average window is 24 months. A one-way transaction cost of 0.5% has been imposed in constructing the switching moving average strategy excess returns. Newey and West (1987) standard errors with 24 lags are used in reporting statistical significance of a two-sided null hypothesis at the 1%, 5%, and 10% level is given by a ***, a **, and a *, respectively.

Panel A: Size sorted portfolios.

Portfolio	α	β_m	β_s	β_h	β_u	RI	$\bar{R}^2$	α	β_m	β_s	β_h	β_u	UP	$\bar{R}^2$
	Recession Dummy							Up Market Dummy						
Low	4.95***	-0.46***	-0.36***	-0.13***	0.27***	0.58**	53.18	-6.11***	-0.62***	-0.37***	-0.13***	0.26***	1.88***	54.97
2	5.94***	-0.48***	-0.33***	-0.18***	0.27***	0.53**	54.36	-5.47***	-0.64***	-0.34***	-0.19***	0.26***	1.92***	56.32
3	4.51***	-0.45***	-0.27***	-0.11***	0.25***	0.48**	51.43	-8.20***	-0.63***	-0.27***	-0.11***	0.24***	2.10***	54.17
4	5.63***	-0.47***	-0.27***	-0.12***	0.24***	0.39**	52.85	-6.57***	-0.64***	-0.27***	-0.12***	0.22***	2.00***	55.37
5	3.85***	-0.45***	-0.21***	-0.05*	0.27***	0.60***	54.79	-7.80***	-0.62***	-0.22***	-0.05*	0.26***	1.98***	57.25
6	4.26***	-0.44***	-0.17***	-0.03	0.22***	0.44***	52.99	-7.52***	-0.61***	-0.18***	-0.03	0.21***	1.95***	55.86
7	4.12***	-0.44***	-0.14***	-0.08***	0.21***	0.58***	51.13	-7.55***	-0.61***	-0.15***	-0.08***	0.19***	1.97***	54.01
8	4.18***	-0.44***	-0.10***	-0.08***	0.20***	0.53***	51.36	-6.57***	-0.59***	-0.10***	-0.08***	0.19***	1.82***	54.01
9	4.52***	-0.42***	-0.05**	-0.07***	0.17***	0.35*	50.66	-6.40***	-0.57***	-0.06**	-0.07***	0.16***	1.79***	53.86
High	2.35***	-0.33***	0.07***	0.06***	0.17***	0.53***	46.73	-2.80**	-0.41***	0.07***	0.06***	0.16***	0.95***	47.47
High−Low	2.60**	-0.13***	-0.43***	-0.19***	0.10***	0.05	21.70	-3.31*	-0.21***	-0.44***	-0.19***	0.09***	0.93***	22.26

Panel B: Book-to-market sorted portfolios.

Portfolio	α	β_m	β_s	β_h	β_u	RI	$\bar{R}^2$	α	β_m	β_s	β_h	β_u	UP	$\bar{R}^2$
	Recession Dummy							Up Market Dummy						
Low	3.40***	-0.45***	0.07***	0.21***	0.21***	0.57***	52.25	-4.40**	-0.57***	0.07***	0.21***	0.20***	1.37***	53.41
2	3.99***	-0.37***	-0.03	0.02	0.14***	0.47**	43.08	-5.46***	-0.51***	-0.04	0.02	0.13***	1.60***	45.56
3	4.86***	-0.39***	-0.06***	-0.02	0.12***	0.35**	46.53	-5.06***	-0.53***	-0.06***	-0.02	0.11***	1.63***	49.51
4	5.33***	-0.45***	-0.05**	-0.16***	0.14***	0.28	49.37	-5.98***	-0.61***	-0.06**	-0.16***	0.13***	1.83***	52.54
5	4.51***	-0.38***	-0.03	-0.14***	0.13***	0.37**	44.75	-4.63***	-0.52***	-0.03	-0.14***	0.12***	1.52***	47.34
6	3.98***	-0.37***	-0.06***	-0.14***	0.14***	0.61***	46.32	-6.24***	-0.53***	-0.07***	-0.14***	0.13***	1.75***	49.51
7	2.85***	-0.28***	0.03	-0.13***	0.13***	0.82***	38.54	0.59	-0.34***	0.03	-0.13***	0.13***	0.59**	37.54
8	3.81***	-0.35***	-0.06***	-0.27***	0.14***	0.41**	42.21	-5.01***	-0.48***	-0.06***	-0.27***	0.13***	1.48***	44.64
9	5.02***	-0.37***	-0.08***	-0.21***	0.17***	0.38*	45.99	-4.32**	-0.50***	-0.09***	-0.21***	0.16***	1.55***	48.54
High	4.91***	-0.41***	-0.12***	-0.23***	0.21***	0.49*	40.70	-4.19*	-0.55***	-0.13***	-0.23***	0.19***	1.55***	42.27
High−Low	-1.51	-0.03	0.19***	0.44***	0.00	0.09	15.09	-0.21	-0.02	0.19***	0.44***	0.01	-0.17	14.97

Panel C: Cash-flow-to-price sorted portfolios.

Portfolio	α	β_m	β_s	β_h	β_u	RI	$\bar{R}^2$	α	β_m	β_s	β_h	β_u	UP	$\bar{R}^2$
	Recession Dummy							Up Market Dummy						
Low	4.20***	-0.50***	0.05*	0.23***	0.25***	0.72***	54.78	-4.76**	-0.64***	0.04	0.23***	0.24***	1.60***	55.99
2	3.74***	-0.39***	0.03	0.05**	0.14***	0.45**	45.31	-5.38***	-0.53***	0.03	0.05*	0.13***	1.54***	47.65
3	3.27***	-0.34***	-0.03**	-0.03*	0.15***	0.78***	44.39	-1.69	-0.43***	-0.04*	-0.04	0.14***	1.00***	44.59
4	4.66***	-0.38***	-0.04*	-0.12***	0.14***	0.33*	43.84	-4.24***	-0.51***	-0.04**	-0.12***	0.13***	1.47***	46.20
5	4.57***	-0.41***	-0.06***	-0.18***	0.15***	0.43**	46.66	-7.68***	-0.58***	-0.07***	-0.18***	0.14***	2.02***	50.69
6	4.95***	-0.40***	0.01	-0.16***	0.13***	0.37*	45.29	-3.62**	-0.52***	0.01	-0.17***	0.12***	1.43***	47.53
7	4.21***	-0.32***	-0.02	-0.13***	0.08***	0.47***	36.86	-4.17**	-0.45***	-0.02	-0.13***	0.07***	1.43***	39.48
8	3.57***	-0.33***	-0.03	-0.17***	0.14***	0.52***	41.31	-4.35***	-0.45***	-0.03	-0.17***	0.13***	1.38***	43.49
9	2.19**	-0.25***	0.02	-0.11***	0.12***	0.62***	32.95	-1.59	-0.32***	0.01	-0.11***	0.11***	0.77***	33.02
High	3.61***	-0.34***	-0.08***	-0.21***	0.18***	0.46**	42.85	-4.52***	-0.46***	-0.08***	-0.21***	0.17***	1.39***	44.74
High−Low	0.59	-0.16***	0.13***	0.43***	0.07***	0.26	23.43	-0.24	-0.18***	0.13***	0.43***	0.06***	0.20	23.26

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Table 8 Continued.

Panel D: Earnings-price sorted portfolios.

Portfolio	α	β_m	β_s	β_h	β_u	RI	$\bar{R}^2$	α	β_m	β_s	β_h	β_u	UP	$\bar{R}^2$
	Recession Dummy							Up Market Dummy						
Low	3.61***	-0.51***	0.05*	0.24***	0.29***	0.81***	56.74	-5.45**	-0.66***	0.04	0.24***	0.27***	1.63***	57.86
2	4.39***	-0.42***	0.02	0.02	0.13***	0.54***	46.52	-4.63***	-0.56***	0.01	0.02	0.12***	1.55***	48.57
3	3.85***	-0.35***	-0.03	-0.01	0.13***	0.29	41.25	-4.20***	-0.46***	-0.03	-0.01	0.12***	1.33***	43.31
4	3.70***	-0.38***	0.05**	-0.10***	0.16***	0.32*	45.04	-5.12***	-0.51***	0.05**	-0.10***	0.15***	1.46***	47.47
5	4.86***	-0.37***	-0.06***	-0.13***	0.10***	0.38**	44.55	-3.28**	-0.49***	-0.07***	-0.13***	0.09***	1.37***	46.74
6	3.40***	-0.34***	-0.01	-0.16***	0.12***	0.42**	39.16	-4.66***	-0.46***	-0.01	-0.16***	0.11***	1.37***	41.36
7	2.32***	-0.25***	0.03*	-0.11***	0.14***	0.72***	36.89	-1.52	-0.32***	0.03	-0.11***	0.13***	0.80***	36.76
8	2.84***	-0.31***	-0.03	-0.21***	0.13***	0.72***	38.48	-2.94	-0.41***	-0.03	-0.21***	0.12***	1.10***	39.17
9	3.36***	-0.34***	-0.05**	-0.21***	0.19***	0.58***	42.79	-4.63***	-0.46***	-0.06**	-0.21***	0.18***	1.41***	44.53
High	4.61***	-0.38***	-0.15***	-0.25***	0.17***	0.38**	46.72	-5.04***	-0.51***	-0.16***	-0.25***	0.16***	1.60***	49.15
High−Low	-1.00	-0.13***	0.20***	0.49***	0.11***	0.43*	23.60	-0.41	-0.14***	0.20***	0.49***	0.11***	0.03	23.27

Panel E: Dividend-price sorted portfolios.

Portfolio	α	β_m	β_s	β_h	β_u	RI	$\bar{R}^2$	α	β_m	β_s	β_h	β_u	UP	$\bar{R}^2$
	Recession Dummy							Up Market Dummy						
Low	5.61***	-0.55***	0.01	0.10***	0.20***	0.67***	51.89	-3.59	-0.69***	0.00	0.10***	0.19***	1.62***	53.12
2	4.36***	-0.46***	0.02	0.01	0.15***	0.43**	45.36	-5.44***	-0.60***	0.02	0.01	0.14***	1.64***	47.42
3	3.86***	-0.41***	0.05**	-0.00	0.14***	0.54***	45.39	-4.16**	-0.54***	0.05**	-0.00	0.13***	1.40***	47.04
4	4.07***	-0.36***	-0.04*	-0.06***	0.10***	0.53***	42.39	-4.24***	-0.49***	-0.04*	-0.06**	0.09***	1.44***	44.55
5	5.15***	-0.42***	0.08***	-0.17***	0.14***	0.30	43.28	-2.75	-0.53***	0.08***	-0.17***	0.13***	1.31***	44.91
6	5.58***	-0.35***	0.03	-0.11***	0.08***	0.08	37.58	-3.64**	-0.47***	0.03	-0.11***	0.07***	1.45***	40.51
7	2.58***	-0.32***	0.14***	-0.11***	0.15***	0.55***	39.49	-0.76	-0.38***	0.14***	-0.12***	0.15***	0.68***	39.51
8	3.26***	-0.31***	0.12***	-0.20***	0.11***	0.42**	36.20	-3.66**	-0.41***	0.11***	-0.20***	0.10***	1.19***	38.05
9	2.24***	-0.25***	0.05***	-0.17***	0.15***	0.63***	35.96	-0.28	-0.31***	0.05**	-0.17***	0.14***	0.57***	35.52
High	4.66***	-0.35***	-0.03	-0.43***	0.17***	0.70***	40.03	-1.66	-0.46***	-0.03	-0.43***	0.16***	1.18***	40.67
High−Low	0.96	-0.20***	0.04	0.53***	0.03	-0.03	24.94	-1.94	-0.23***	0.04	0.53***	0.03	0.44	24.94

Panel F: Short-term reversal sorted portfolios.

Portfolio	α	β_m	β_s	β_h	β_u	RI	$\bar{R}^2$	α	β_m	β_s	β_h	β_u	UP	$\bar{R}^2$
	Recession Dummy							Up Market Dummy						
Low	4.11***	-0.65***	-0.17***	0.11***	0.41***	1.01***	51.37	-9.78***	-0.86***	-0.17***	0.11**	0.39***	2.44***	52.86
2	5.29***	-0.48***	-0.06***	-0.03	0.17***	0.84***	43.22	-8.65***	-0.69***	-0.07**	-0.03	0.15***	2.40***	46.55
3	4.16***	-0.47***	-0.02	-0.05**	0.17***	0.41**	44.47	-7.97***	-0.64***	-0.03	-0.05*	0.15***	1.99***	47.45
4	3.76***	-0.35***	-0.07***	-0.05**	0.16***	0.62***	44.72	-5.86***	-0.50***	-0.07***	-0.05*	0.14***	1.67***	47.46
5	3.03***	-0.37***	-0.05**	-0.01	0.17***	0.59***	46.77	-7.06***	-0.52***	-0.05**	-0.01	0.15***	1.73***	49.77
6	3.30***	-0.35***	-0.01	-0.02	0.11***	0.75***	44.36	-3.29**	-0.46***	-0.01	-0.02	0.10***	1.24***	45.46
7	3.37***	-0.37***	0.01	0.01	0.18***	0.24	49.44	-5.00***	-0.48***	0.00	0.01	0.17***	1.36***	51.70
8	3.58***	-0.39***	-0.01	-0.03	0.18***	0.50***	48.53	-3.55**	-0.50***	-0.01	-0.03	0.17***	1.25***	49.89
9	5.27***	-0.41***	-0.01	0.02	0.19***	0.24	46.90	-1.64	-0.51***	-0.02	0.02	0.18***	1.14***	48.06
High	4.72***	-0.48***	-0.04	0.02	0.26***	0.67**	50.70	-0.04	-0.57***	-0.04	0.02	0.25***	0.93***	50.82
High−Low	-0.61	-0.16***	-0.13***	0.09**	0.15***	0.34	8.16	-9.73***	-0.29***	-0.13***	0.09*	0.14***	1.51***	9.14

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Table 8 Continued.

Panel G: Medium-term momentum sorted portfolios.

Portfolio	α	β_m	β_s	β_h	β_u	RI	$\bar{R}^2$	α	β_m	β_s	β_h	β_u	UP	$\bar{R}^2$
	Recession Dummy							Up Market Dummy						
Low	7.33***	-0.83***	-0.26***	0.20***	0.84***	0.06	71.70	-0.55	-0.94***	-0.27***	0.20***	0.83***	1.23***	71.97
2	3.35***	-0.55***	-0.11***	-0.08***	0.51***	0.74***	60.27	-3.49	-0.67***	-0.12***	-0.08**	0.50***	1.27***	60.62
3	1.93**	-0.45***	0.00	-0.02	0.45***	0.63***	56.88	-2.84*	-0.53***	-0.00	-0.02	0.45***	0.92***	57.02
4	3.92***	-0.45***	-0.00	-0.08***	0.27***	0.13	50.81	-7.51***	-0.60***	-0.01	-0.08***	0.26***	1.80***	53.46
5	4.66***	-0.43***	-0.00	-0.11***	0.18***	0.23	48.12	-6.21***	-0.57***	-0.01	-0.11***	0.17***	1.75***	51.15
6	4.94***	-0.42***	-0.02	-0.05**	0.15***	0.17	48.79	-6.81***	-0.58***	-0.03	-0.05*	0.14***	1.86***	52.52
7	4.70***	-0.36***	0.01	-0.04*	0.07***	0.26	39.96	-5.40***	-0.50***	0.00	-0.04	0.06***	1.63***	43.55
8	3.46***	-0.32***	0.00	-0.06***	0.07***	0.29*	39.09	-5.10***	-0.44***	-0.00	-0.06***	0.06***	1.41***	42.24
9	4.36***	-0.34***	0.01	-0.07***	-0.00	0.49**	34.92	-4.91***	-0.47***	0.01	-0.08***	-0.01	1.57***	38.24
High	4.88***	-0.38***	-0.01	-0.01	0.01	0.56***	34.62	-5.42***	-0.54***	-0.01	-0.01	-0.01	1.75***	37.45
High−Low	2.45	-0.45***	-0.25***	0.21***	0.83***	-0.51	57.70	4.86*	-0.40***	-0.25***	0.21***	0.83***	-0.52	57.61

Panel H: Long-term reversal sorted portfolios.

Portfolio	α	β_m	β_s	β_h	β_u	RI	$\bar{R}^2$	α	β_m	β_s	β_h	β_u	UP	$\bar{R}^2$
	Recession Dummy							Up Market Dummy						
Low	6.68***	-0.46***	-0.26***	-0.23***	0.28***	-0.20	45.41	-8.43***	-0.65***	-0.27***	-0.23***	0.26***	2.28***	48.30
2	5.62***	-0.35***	-0.09***	-0.13***	0.11***	0.40	36.41	-4.26*	-0.49***	-0.10***	-0.13***	0.09***	1.64***	39.14
3	4.64***	-0.31***	-0.08***	-0.13***	0.06***	0.56**	33.76	-4.28*	-0.45***	-0.09***	-0.13***	0.05**	1.54***	36.49
4	4.24***	-0.37***	-0.07***	-0.14***	0.14***	0.32*	42.59	-4.17***	-0.49***	-0.07***	-0.14***	0.13***	1.39***	44.69
5	3.78***	-0.37***	-0.06***	-0.15***	0.13***	0.50***	44.06	-6.88***	-0.52***	-0.06***	-0.15***	0.12***	1.79***	47.63
6	3.76***	-0.32***	-0.03	-0.13***	0.09***	0.41**	38.99	-4.89***	-0.45***	-0.04*	-0.13***	0.08***	1.46***	41.88
7	3.24***	-0.33***	-0.00	-0.09***	0.12***	0.39**	40.02	-5.35***	-0.45***	-0.01	-0.09***	0.11***	1.44***	42.80
8	4.18***	-0.38***	0.03	-0.06**	0.12***	0.38**	44.72	-6.76***	-0.54***	0.02	-0.06**	0.11***	1.80***	48.63
9	5.00***	-0.44***	0.00	-0.04	0.10***	0.69***	44.77	-2.50	-0.56***	-0.00	-0.04	0.09***	1.36***	45.94
High	4.93***	-0.55***	-0.00	0.21***	0.26***	0.66***	53.52	-2.53	-0.67***	-0.01	0.21***	0.24***	1.35***	54.15
High−Low	1.75	0.08***	-0.25***	-0.44***	0.02	-0.86***	11.13	-5.91**	0.02	-0.26***	-0.44***	0.02	0.93**	10.93

Panel I: Industry sorted portfolios.

Portfolio	α	β_m	β_s	β_h	β_u	RI	$\bar{R}^2$	α	β_m	β_s	β_h	β_u	UP	$\bar{R}^2$
	Recession Dummy							Up Market Dummy						
NoDur	2.28***	-0.28***	0.03	-0.07***	0.13***	0.25	32.22	-2.59*	-0.35***	0.03	-0.07***	0.12***	0.83***	33.08
Durbl	6.87***	-0.58***	-0.16***	-0.30***	0.32***	0.34	50.07	-6.69***	-0.77***	-0.16***	-0.30***	0.30***	2.19***	52.20
Manuf	4.36***	-0.45***	-0.06**	-0.10***	0.16***	0.56***	48.35	-8.33***	-0.63***	-0.06***	-0.10***	0.14***	2.12***	52.16
Enrgy	4.29***	-0.30***	0.05*	-0.05*	0.06***	0.48**	25.81	-0.96	-0.38***	0.05	-0.06*	0.05**	0.95***	26.54
HiTec	3.76***	-0.50***	-0.03	0.32***	0.36***	0.64**	53.19	-5.40**	-0.64***	-0.03	0.32***	0.35***	1.60***	54.14
Telcm	1.72	-0.28***	0.09***	0.07**	0.21***	0.70***	32.93	-0.42	-0.33***	0.09***	0.07*	0.20***	0.54*	32.41
Shops	4.75***	-0.39***	-0.17***	-0.08***	0.17***	0.09	42.85	-5.72***	-0.53***	-0.18***	-0.08***	0.15***	1.64***	45.19
Hlth	2.66**	-0.29***	0.14***	0.14***	0.11***	0.08	25.03	-2.54	-0.36***	0.14***	0.14***	0.10***	0.82***	25.67
Utils	4.32***	-0.27***	0.03	-0.19***	0.06***	0.07	27.08	-1.39	-0.35***	0.02	-0.19***	0.06***	0.90***	28.33
Other	5.86***	-0.52***	-0.05*	-0.19***	0.22***	0.49**	52.31	-5.12**	-0.68***	-0.06**	-0.20***	0.20***	1.84***	54.48

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Table 9. Conditional Regressions with Investor Sentiment, Default Spread, and Liquidity Factor.

This table reports alphas, betas, and adjusted R^2 of the market timing regressions of the MAP excess returns on the four Carhart factors plus one instrumental variable and an interaction term of the instrumental variable with the market's excess return using portfolios sorted by several variables. Alphas are annualized and in percent. The sample period covers 1968:08 until 2010:12 for the change in investor sentiment variable (ΔS) from Baker and Wurgler (2007), 1960:01 until 2010:12 using the default spread (D) based on the difference between Moody's BAA and AAA corporate bond yields, and 1968:01 until 2010:12 using the liquidity factor (L) from Pastor and Stambaugh (2003). The length of the moving average window is 24 months. A one-way transaction cost of 0.5% has been imposed in constructing the switching moving average strategy excess returns. Newey and West (1987) standard errors with 24 lags are used in reporting statistical significance of a two-sided null hypothesis at the 1%, 5%, and 10% level is given by a ***, a **, and a *, respectively.

Panel A: Size sorted portfolios.

Portfolio	α	ΔS	$\Delta S \times r_m$	R^2	α	D	$D \times r_m$	R^2	α	L	$L \times r_m$	R^2
	Change in Investor Sentiment				Default Spread				Liquidity Factor			
Low	5.17***	0.31**	0.06***	54.73	1.85	0.32*	-0.14***	53.27	6.95***	-3.46	0.31	54.20
2	6.82***	0.37***	0.04**	57.14	3.46	0.28*	-0.12***	55.32	8.24***	-3.69	-0.10	56.88
3	4.89***	0.31***	0.05***	53.76	0.72	0.37**	-0.15***	52.82	6.67***	-6.57***	0.05	53.75
4	5.52***	0.25**	0.06***	54.85	2.42	0.32**	-0.07***	53.56	7.52***	-6.63***	-0.01	54.69
5	4.58***	0.18*	0.06***	56.82	-1.26	0.49***	-0.09***	55.77	6.26***	-5.12**	-0.18	56.71
6	3.83***	0.18**	0.06***	53.87	1.31	0.30**	-0.04	53.51	5.63***	-6.10***	-0.08	53.96
7	4.77***	0.20**	0.04**	51.65	1.28	0.31**	-0.10***	51.93	6.28***	-6.43***	0.40	52.35
8	4.77***	0.21**	0.04**	51.70	-0.10	0.42***	-0.08***	52.19	6.03***	-5.01**	0.48	52.23
9	4.83***	0.18**	0.05***	52.89	2.78	0.19	-0.17***	53.16	6.01***	-1.29	0.77**	53.31
High	2.49***	-0.07	0.04***	46.73	-1.15	0.36***	-0.11***	48.09	3.39***	0.89	0.39	47.48
High−Low	2.67**	0.39***	0.02	22.78	3.00	-0.04	-0.03	20.82	3.56***	-4.35*	-0.08	22.39

Panel B: Book-to-market sorted portfolios.

Portfolio	α	ΔS	$\Delta S \times r_m$	R^2	α	D	$D \times r_m$	R^2	α	L	$L \times r_m$	R^2
	Change in Investor Sentiment				Default Spread				Liquidity Factor			
Low	3.47***	-0.09	0.09***	54.45	-1.83	0.52***	-0.16***	54.38	5.65***	-2.19	-0.13	53.44
2	3.95***	0.22**	0.05***	43.96	1.87	0.24	-0.08***	43.64	5.38***	-2.19	0.46	43.96
3	5.15***	0.31***	0.04***	48.12	5.24***	0.03	-0.03	46.74	5.85***	-1.17	-0.75***	48.45
4	4.95***	0.21**	0.05***	50.16	4.06*	0.15	-0.16***	51.59	6.30***	-2.14	-0.11	49.83
5	4.94***	0.12	0.05***	47.29	2.52	0.22	-0.17***	47.48	5.98***	-0.61	-0.09	47.14
6	4.98***	0.20**	0.02	48.18	-1.26	0.50***	-0.20***	50.06	5.79***	-2.86	0.29	48.63
7	4.31***	0.14	-0.00	36.81	-1.28	0.45***	-0.09***	38.84	4.51***	2.63	1.34***	38.77
8	5.21***	0.21**	-0.02	44.55	-2.86	0.60***	-0.31***	51.54	4.82***	3.05	-0.46	45.25
9	5.87***	0.21**	0.01	47.89	1.26	0.36**	-0.14***	48.04	6.28***	-3.02	-0.48	48.66
High	5.79***	0.32**	-0.02	39.80	-0.90	0.51**	-0.35***	46.67	5.56***	8.48***	1.69***	42.05
High−Low	-2.32*	-0.41***	0.11***	20.23	-0.93	0.01	0.19***	17.83	0.09	-10.66***	-1.82***	19.54

Table 9 Continued.

Panel C: Cash-flow-to-price sorted portfolios.

Portfolio	α	ΔS	$\Delta S \times r_m$	R^2	α	D	$D \times r_m$	R^2	α	L	$L \times r_m$	R^2
	Change in Investor Sentiment				Default Spread				Liquidity Factor			
Low	4.16***	-0.14	0.10***	56.63	-1.00	0.52***	-0.16***	56.18	6.70***	-1.92	0.29	55.41
2	3.64***	0.12	0.06***	47.05	2.05	0.20	-0.20***	48.59	4.91***	2.95	0.10	46.88
3	4.19***	0.14*	0.04***	42.97	1.09	0.31***	-0.04**	44.55	5.35***	-1.57	0.48	43.30
4	4.13***	0.26***	0.06***	46.04	3.85**	0.11	-0.11***	44.96	5.68***	-1.65	0.20	44.90
5	4.75***	0.07	0.05***	46.92	-0.18	0.45***	-0.14***	48.52	6.00***	-1.02	0.19	46.72
6	5.50***	0.29***	0.02	47.03	2.81	0.23	-0.19***	48.63	5.51***	6.52***	-0.81**	48.32
7	5.68***	0.31***	0.01	39.78	2.65	0.22	-0.09***	38.20	6.11***	-2.01	-0.56*	40.29
8	5.61***	0.29***	-0.03*	42.04	0.11	0.38***	-0.16***	44.45	5.02***	-0.02	-1.48***	43.45
9	3.72***	0.30***	-0.04***	33.70	-2.58	0.45***	-0.19***	37.35	3.45***	0.32	1.50***	34.92
High	5.19***	0.14	-0.01	45.33	-0.18	0.40***	-0.28***	50.05	5.56***	-3.42	0.32	46.27
High−Low	-1.03	-0.29***	0.12***	29.20	-0.83	0.13	0.12***	24.62	1.14	1.50	-0.04	25.16

Panel D: Earnings-to-price sorted portfolios.

Portfolio	α	ΔS	$\Delta S \times r_m$	R^2	α	D	$D \times r_m$	R^2	α	L	$L \times r_m$	R^2
	Change in Investor Sentiment				Default Spread				Liquidity Factor			
Low	3.62***	-0.27**	0.10***	58.86	-4.66**	0.78***	-0.19***	58.87	5.93***	-0.96	-0.01	57.65
2	4.66***	0.08	0.04***	45.95	1.74	0.29**	-0.15***	48.17	5.84***	1.48	0.07	46.31
3	3.78***	0.17*	0.02	40.57	1.15	0.26*	-0.07***	41.85	4.61***	-2.19	0.06	41.49
4	3.43***	0.10	0.05***	44.29	0.97	0.27**	-0.08***	45.87	4.47***	-0.96	0.05	44.49
5	4.85***	0.15*	0.03**	43.85	2.01	0.28**	-0.08***	45.41	5.65***	-0.23	-0.47	44.11
6	4.30***	0.25***	0.01	40.51	0.18	0.32**	-0.15***	41.43	4.33***	1.41	-1.27***	42.00
7	3.42***	0.22***	-0.01	37.47	-1.41	0.41***	-0.16***	39.96	3.92***	1.38	1.87***	40.15
8	5.42***	0.35***	-0.04**	41.55	0.22	0.34**	-0.21***	42.88	4.53***	1.68	-1.79***	43.17
9	4.67***	0.17**	0.03**	45.68	1.07	0.27*	-0.20***	46.04	5.51***	-3.14	0.53*	46.17
High	5.26***	0.18**	0.04***	48.21	1.90	0.28*	-0.20***	48.85	6.22***	-3.60*	0.11	48.61
High−Low	-1.64	-0.45***	0.06***	28.13	-6.56***	0.50***	0.01	24.76	-0.29	2.65	-0.12	26.38

Panel E: Dividend-price sorted portfolios.

Portfolio	α	ΔS	$\Delta S \times r_m$	R^2	α	D	$D \times r_m$	R^2	α	L	$L \times r_m$	R^2
	Change in Investor Sentiment				Default Spread				Liquidity Factor			
Low	5.99***	0.06	0.08***	52.35	-2.09	0.70***	-0.17***	53.01	8.27***	-5.73*	0.36	52.51
2	3.99***	0.18*	0.05***	44.54	-0.12	0.40***	-0.21***	48.13	5.49***	-1.31	0.60	44.99
3	4.11***	0.09	0.03**	45.08	1.64	0.24	-0.19***	48.38	5.23***	-0.17	0.18	45.62
4	4.79***	0.25***	0.04**	43.79	2.43	0.23*	-0.07***	43.39	5.62***	-0.09	-0.60*	43.83
5	5.32***	0.27**	0.02	43.20	1.66	0.33**	-0.21***	46.84	5.72***	3.39	0.69*	43.84
6	4.49***	0.25***	0.05***	37.98	5.16***	0.02	-0.01	37.39	5.29***	-0.60	-0.63*	37.71
7	3.01***	0.07	0.01	39.67	-1.39	0.40***	-0.14***	41.46	3.61***	4.35**	1.70***	42.42
8	3.37***	0.15	0.06***	38.91	0.57	0.30*	-0.09***	37.60	3.97***	7.40***	-0.06	38.93
9	3.76***	0.29***	-0.03**	37.68	-0.78	0.35**	-0.13***	38.22	3.10***	7.44***	0.23	37.98
High	6.48***	0.08	0.01	40.24	-1.81	0.65***	-0.32***	47.29	5.79***	11.63***	-1.40***	43.47
High−Low	-0.48	-0.02	0.07***	26.35	-0.28	0.05	0.14***	26.25	2.48*	-17.36***	1.76***	29.61

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Table 9 Continued.

Panel F: Short-term reversal sorted portfolios.

Portfolio	α	ΔS	$\Delta S \times r_m$	R^2	α	D	$D \times r_m$	R^2	α	L	$L \times r_m$	R^2
	Change in Investor Sentiment				Default Spread				Liquidity Factor			
Low	4.64**	-0.31*	0.11***	51.50	-8.05**	1.10***	-0.24***	52.82	7.13***	1.46	1.80***	51.98
2	5.95***	0.24**	0.08***	44.22	-2.95	0.77***	-0.19***	45.09	7.88***	0.47	2.09***	45.42
3	4.76***	0.15	0.02	44.39	-3.08	0.62***	-0.19***	47.32	5.57***	-2.36	-0.57	45.44
4	4.49***	0.12	0.04**	45.60	-1.00	0.46***	-0.15***	47.19	5.54***	-3.18	-0.33	46.29
5	4.18***	0.24***	0.02	46.65	-2.09	0.50***	-0.10***	47.88	4.55***	2.13	-0.72**	47.56
6	4.20***	-0.00	0.05***	44.87	-1.25	0.47***	-0.12***	45.55	5.47***	-1.81	-0.17	45.47
7	3.26***	-0.02	0.04**	49.71	1.13	0.21	-0.09***	50.57	4.13***	0.11	-0.16	49.61
8	3.87***	-0.06	0.05***	48.32	2.64	0.17	-0.10***	49.83	4.85***	0.62	-0.77**	48.96
9	4.83***	0.03	0.06***	45.91	5.09*	0.07	-0.05	47.84	5.96***	-0.45	-0.19	46.32
High	4.90***	-0.15	0.06***	50.31	1.34	0.40*	-0.10***	51.77	6.19***	1.54	0.22	50.55
High−Low	-0.26	-0.17	0.05*	8.28	-9.39**	0.71***	-0.14***	8.43	0.94	-0.07	1.59**	9.22

Panel G: Medium-term momentum sorted portfolios.

Portfolio	α	ΔS	$\Delta S \times r_m$	R^2	α	D	$D \times r_m$	R^2	α	L	$L \times r_m$	R^2
	Change in Investor Sentiment				Default Spread				Liquidity Factor			
Low	7.41***	-0.41***	0.05*	72.93	1.96	0.41	-0.28***	72.78	8.51***	0.89	-0.18	72.98
2	4.84***	0.14	0.01	60.03	1.61	0.26	-0.27***	62.75	5.66***	-1.53	1.36***	60.98
3	3.52***	-0.08	-0.02	56.53	-0.09	0.26*	-0.13***	57.76	3.65***	-0.37	1.19***	57.52
4	3.58***	0.36***	0.03*	51.35	2.58	0.14	-0.13***	52.14	4.07***	3.07	0.40	50.77
5	4.95***	0.24***	0.04***	50.93	4.32**	0.07	-0.17***	50.63	5.42***	5.20***	-0.12	51.36
6	4.55***	0.20**	0.07***	52.24	5.64***	-0.03	-0.14***	50.59	5.77***	1.15	-0.48	51.16
7	3.88***	0.18**	0.07***	39.72	4.87**	0.03	-0.05**	40.28	5.10***	3.41	0.19	38.82
8	3.46***	0.20**	0.03**	38.90	-0.19	0.33***	-0.10***	40.57	4.36***	1.33	0.58**	39.41
9	4.47***	0.11	0.07***	36.31	1.69	0.29*	-0.13***	36.42	6.21***	-3.91*	0.20	36.43
High	4.66***	0.02	0.10***	36.99	0.07	0.44***	-0.17***	36.86	6.72***	0.06	0.19	35.26
High−Low	2.75*	-0.43***	-0.06**	59.44	1.89	-0.03	-0.12***	57.95	1.80	0.83	-0.37	58.86

Panel H: Long-term reversal sorted portfolios.

Portfolio	α	ΔS	$\Delta S \times r_m$	R^2	α	D	$D \times r_m$	R^2	α	L	$L \times r_m$	R^2
	Change in Investor Sentiment				Default Spread				Liquidity Factor			
Low	6.50***	0.09	0.01	47.70	1.87	0.30*	-0.18***	46.70	6.98***	-6.55**	-0.55	48.86
2	6.18***	0.34***	0.03	37.09	-0.14	0.49**	-0.16***	38.01	6.27***	6.78**	0.08	37.75
3	5.55***	0.24*	0.04*	33.83	0.89	0.38*	-0.11***	34.83	5.57***	10.95***	0.32	35.99
4	4.58***	0.21**	0.02	44.59	2.10	0.22*	-0.16***	45.02	5.07***	-0.17	-0.92***	45.56
5	4.80***	0.32***	-0.01	44.53	0.11	0.36***	-0.18***	47.19	4.71***	4.07**	-0.38	44.97
6	4.24***	0.24**	0.00	39.08	1.42	0.25*	-0.14***	40.98	4.70***	-2.38	-0.47	39.65
7	4.07***	0.13	0.02*	40.44	1.77	0.19	-0.18***	43.89	4.70***	0.87	-0.28	40.47
8	3.97***	0.19**	0.06***	45.52	4.22**	0.06	-0.14***	46.49	5.57***	-1.22	0.18	44.83
9	5.78***	0.15	0.02	42.71	2.37	0.32*	-0.12***	45.61	6.84***	-2.39	-0.20	43.74
High	3.90***	-0.26**	0.09***	53.82	1.59	0.39**	-0.14***	54.88	6.46***	-1.65	1.12***	53.71
High−Low	2.60*	0.35***	-0.07***	14.11	0.28	-0.09	-0.04	11.41	0.52	-4.89	-1.67***	14.17

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Table 9 Continued.

Panel I: Industry sorted portfolios.

Portfolio	α	ΔS	$\Delta S \times r_m$	R^2	α	D	$D \times r_m$	R^2	α	L	$L \times r_m$	R^2
	Change in Investor Sentiment				Default Spread				Liquidity Factor			
NoDur	2.65***	0.22***	0.01	31.00	3.97**	-0.08	-0.03	32.75	3.47***	-4.43**	0.21	31.73
Durbl	7.20***	0.18	0.04**	51.61	5.07*	0.18	-0.23***	51.62	8.46***	-7.92***	0.84**	52.54
Manuf	4.69***	0.24***	0.04**	47.32	1.51	0.31**	-0.19***	51.01	5.75***	-0.82	0.29	47.75
Enrgy	4.92***	0.25**	0.02	26.57	-1.30	0.50***	-0.20***	29.99	5.40***	1.61	1.75***	29.11
HiTec	4.15***	-0.25**	0.09***	54.12	-3.54	0.69***	-0.10***	54.06	6.31***	-3.15	-0.94*	54.08
Telcm	2.77*	-0.04	0.02	31.60	-0.91	0.33	-0.08**	33.27	3.50**	-1.62	0.11	32.63
Shops	4.45***	0.21**	0.08***	44.84	6.25***	-0.08	-0.03	43.76	6.23***	-7.34***	-1.03***	44.96
Hlth	2.89***	0.44***	0.00	25.61	-0.38	0.26	-0.07**	25.71	3.57***	-3.00	1.54***	25.91
Utils	4.24***	0.21**	0.02	26.47	4.46**	0.02	-0.01	27.65	4.81***	-1.79	0.17	27.44
Other	6.05***	0.30**	0.03	54.00	2.65	0.33*	-0.18***	53.18	6.66***	5.22*	-0.02	54.13

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Table 10. Conditional Regressions with Investor Sentiment, Default Spread, Liquidity Factor, and Recession Dummy.

This table reports alphas, betas, and adjusted R^2 of the market timing regressions of the MAP excess returns on the four Carhart factors plus one instrumental variable (change in investor sentiment ΔS from Baker and Wurgler (2007), default spread D using the difference betwee Moody's BAA and AAA corporate bond yields, liquidity factor L from Pastor and Stambaugh (2003), and a recession dummy RI) as well as interaction terms of the instrumental variable with the market's excess return using portfolios sorted by several variables. Alphas are annualized and in percent. The sample period covers 1968:08 until 2010:12. The length of the moving average window is 24 months. A one-way transaction cost of 0.5% has been imposed in constructing the switching moving average strategy excess returns. Newey and West (1987) standard errors with 24 lags are used in reporting statistical significance of a two-sided null hypothesis at the 1%, 5%, and 10% level is given by a ***, a **, and a *, respectively.

Panel A: Size sorted portfolios.

Portfolio	α	ΔS	D	L	RI	$\Delta S \times r_m$	$D \times r_m$	$L \times r_m$	$RI \times r_m$	R^2
Low	-0.64	0.31***	0.37	-3.76	-0.03	0.07***	-0.05	-0.02	-0.30***	57.35
2	1.54	0.36***	0.34	-3.92	-0.15	0.05***	0.01	-0.44	-0.37***	60.12
3	-1.96	0.30***	0.47**	-7.34***	-0.19	0.07***	-0.03	-0.37	-0.39***	58.49
4	-0.93	0.24***	0.47**	-6.25***	-0.35	0.07***	0.05	-0.40	-0.39***	58.67
5	-2.86	0.16*	0.48***	-5.57***	-0.03	0.07***	0.03	-0.60*	-0.43***	61.97
6	-2.30	0.16**	0.41**	-6.24***	-0.14	0.07***	0.07**	-0.47	-0.42***	59.30
7	-0.44	0.18**	0.29*	-7.51***	0.15	0.05***	0.03	-0.09	-0.49***	60.23
8	-2.61	0.19**	0.46***	-6.30***	0.06	0.05***	0.05*	0.04	-0.49***	60.35
9	1.23	0.16**	0.16	-3.01	0.05	0.06***	-0.02	0.16	-0.46***	62.76
High	-3.39*	-0.08	0.30**	-0.84	0.21	0.05***	-0.01	-0.12	-0.42***	58.34
High−Low	2.76	0.39***	0.07	-2.92	-0.24	0.02	-0.04	0.10	0.12**	22.34

Panel B: Book-to-market sorted portfolios.

Portfolio	α	ΔS	D	L	RI	$\Delta S \times r_m$	$D \times r_m$	$L \times r_m$	$RI \times r_m$	R^2
Low	-4.41*	-0.11	0.48***	-3.09	-0.13	0.11***	-0.06**	-0.86**	-0.49***	64.67
2	-0.89	0.22**	0.29	-2.63	0.07	0.06***	-0.01	0.12	-0.30***	48.29
3	3.84*	0.27***	-0.01	-1.06	-0.02	0.05***	0.12***	-1.14***	-0.45***	55.94
4	1.62	0.19**	0.17	-3.91*	0.06	0.07***	-0.15***	-0.65*	-0.24***	55.83
5	2.32	0.09	0.08	-2.20	0.24	0.07***	-0.10***	-0.66*	-0.27***	53.03
6	-2.54	0.19**	0.45***	-5.26***	0.33	0.03***	-0.11***	-0.11	-0.30***	56.00
7	-1.67	0.15*	0.26	-0.06	0.79***	0.01	-0.02	1.19***	-0.32***	50.62
8	-5.23**	0.20**	0.65***	-0.43	0.07	0.01	-0.24***	-1.08***	-0.27***	57.28
9	0.30	0.19*	0.34	-4.65*	0.10	0.02	-0.07*	-0.91**	-0.27***	52.65
High	-3.43	0.35**	0.53*	5.58*	0.39	0.01	-0.31***	1.05**	-0.17***	49.49
High−Low	-0.98	-0.46***	-0.05	-8.67***	-0.51	0.11***	0.24***	-1.90***	-0.32***	25.98

Panel C: Cash-flow-to-price sorted portfolios.

Portfolio	α	ΔS	D	L	RI	$\Delta S \times r_m$	$D \times r_m$	$L \times r_m$	$RI \times r_m$	R^2
Low	-2.75	-0.15	0.40*	-2.55	0.10	0.12***	-0.09**	-0.33	-0.38***	61.97
2	-0.03	0.09	0.11	2.00	0.12	0.09***	-0.08**	-0.62*	-0.47***	60.22
3	-1.32	0.12*	0.24*	-2.75*	0.43***	0.05***	0.07***	0.01	-0.53***	59.21
4	0.69	0.25***	0.19	-1.94	-0.02	0.07***	-0.07**	-0.26	-0.26***	50.62
5	-2.61	0.07	0.46**	-2.37	0.12	0.06***	-0.11***	-0.30	-0.24***	52.14
6	1.23	0.27***	0.17	5.00**	0.11	0.05***	-0.11***	-1.35***	-0.28***	54.77
7	2.89	0.29***	0.11	-3.03*	0.14	0.02*	0.03	-0.87***	-0.32***	45.33
8	0.90	0.25***	0.20	-2.49	0.42**	-0.01	-0.14***	-1.94***	-0.22***	51.08
9	-3.35	0.31***	0.41**	-2.88	0.59***	-0.03**	-0.14***	1.30***	-0.19***	46.46
High	-1.18	0.12	0.36**	-7.02***	0.14	0.01	-0.14***	-0.33	-0.45***	59.58
High−Low	-1.56	-0.27**	0.04	4.47*	-0.04	0.11***	0.04	0.00	0.07	29.01

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Table 10 Continued.

Panel D: Earnings-to-price sorted portfolios.

Portfolio	α	ΔS	D	L	RI	$\Delta S \times r_m$	$D \times r_m$	$L \times r_m$	$RI \times r_m$	R^2
Low	-7.28**	-0.27***	0.68***	-2.17	0.13	0.12***	-0.14***	-0.70*	-0.39***	65.60
2	-0.48	0.06	0.24	0.70	0.12	0.06***	-0.07**	-0.56*	-0.41***	55.58
3	-2.06	0.16*	0.38**	-3.11	-0.13	0.03**	0.02	-0.34	-0.37***	47.77
4	-1.25	0.09	0.27	-2.16	0.07	0.06***	-0.05	-0.34	-0.28***	49.43
5	-0.43	0.14	0.30*	-1.50	0.07	0.04***	-0.07**	-0.94***	-0.26***	50.18
6	-0.70	0.23***	0.25*	-0.35	0.13	0.02**	-0.08***	-1.76***	-0.27***	48.09
7	-3.64**	0.24***	0.39***	-0.81	0.55***	-0.00	-0.09***	1.54***	-0.27***	53.79
8	0.97	0.30***	0.12	-1.07	0.53**	-0.02	-0.12***	-2.36***	-0.34***	54.56
9	1.25	0.14*	0.10	-5.99***	0.39**	0.05***	-0.01	0.01	-0.54***	59.43
High	0.52	0.15*	0.25	-5.77***	0.10	0.05***	-0.06*	-0.48	-0.44***	57.86
High−Low	-7.80***	-0.43***	0.43**	3.60	0.04	0.07***	-0.08**	-0.22	0.06	28.03

Panel E: Dividend-price sorted portfolios.

Portfolio	α	ΔS	D	L	RI	$\Delta S \times r_m$	$D \times r_m$	$L \times r_m$	$RI \times r_m$	R^2
Low	-4.12	0.05	0.67***	-6.57**	-0.04	0.10***	-0.06	-0.23	-0.47***	59.89
2	-3.01	0.17*	0.41**	-2.89	0.04	0.07***	-0.13***	-0.15	-0.42***	55.49
3	0.36	0.06	0.12	-1.65	0.27	0.06***	-0.10***	-0.46	-0.43***	56.54
4	0.55	0.23***	0.20	-1.01	0.16	0.05***	0.00	-0.96***	-0.33***	49.96
5	-1.43	0.27***	0.39**	1.43	0.06	0.04**	-0.14***	0.15	-0.33***	51.86
6	3.36	0.23***	0.04	-0.97	-0.09	0.06***	0.04	-0.85***	-0.22***	40.22
7	-4.32**	0.09	0.43***	2.03	0.35*	0.02**	-0.09***	1.38***	-0.26***	50.59
8	-1.95	0.16	0.28	7.01**	0.14	0.07***	-0.06	-0.32	-0.15***	42.58
9	-2.81	0.30***	0.33**	5.75***	0.44**	-0.02*	-0.08***	-0.09	-0.20***	45.01
High	-3.55	0.06	0.49**	8.49***	0.41	0.04**	-0.27***	-2.26***	-0.33***	55.58
High−Low	-0.57	-0.01	0.18	-15.07***	-0.45	0.06***	0.20***	2.03***	-0.14**	30.29

Panel F: Short-term reversal sorted portfolios.

Portfolio	α	ΔS	D	L	RI	$\Delta S \times r_m$	$D \times r_m$	$L \times r_m$	$RI \times r_m$	R^2
Low	-12.10***	-0.28*	1.09***	-0.55	0.08	0.13***	-0.04	1.03*	-0.62***	58.11
2	-6.65**	0.28***	0.81***	-0.66	0.24	0.09***	-0.03	1.60***	-0.45***	53.15
3	-5.91**	0.14	0.70***	-4.54**	-0.25	0.05***	-0.05	-1.24***	-0.54***	55.78
4	-2.75	0.10	0.40**	-4.18**	0.18	0.05***	-0.03	-0.88***	-0.46***	57.50
5	-4.17**	0.22***	0.48***	1.00	0.05	0.04***	0.02	-1.23***	-0.46***	57.63
6	-2.63	-0.02	0.37***	-3.02*	0.28	0.06***	-0.00	-0.62**	-0.42***	56.08
7	-0.13	-0.04	0.17	-1.00	-0.02	0.05***	-0.05	-0.77**	-0.31***	56.23
8	2.27	-0.10	-0.04	-0.86	0.35	0.07***	-0.05	-1.34***	-0.34***	55.62
9	3.97	0.01	0.00	-0.82	0.08	0.07***	-0.06	-0.53	-0.16***	47.04
High	-0.39	-0.15	0.27	0.23	0.51	0.07***	-0.13***	-0.06	-0.11*	51.91
High−Low	-11.71**	-0.14	0.82**	-0.77	-0.43	0.06**	0.09	1.09	-0.51***	13.05

Panel G: Medium-term momentum sorted portfolios.

Portfolio	α	ΔS	D	L	RI	$\Delta S \times r_m$	$D \times r_m$	$L \times r_m$	$RI \times r_m$	R^2
Low	3.35	-0.44***	0.24	-1.38	-0.50	0.07***	-0.11**	-1.12**	-0.48***	75.19
2	0.93	0.10	0.07	-5.19**	0.50*	0.03**	-0.09**	0.50	-0.69***	70.78
3	0.53	-0.11	0.03	-4.01**	0.51**	0.00	0.05*	0.62**	-0.64***	66.58
4	-1.10	0.35***	0.26	0.65	-0.17	0.05***	-0.02	0.04	-0.45***	58.80
5	3.13	0.21**	0.00	4.09**	-0.05	0.06***	-0.04	-0.79**	-0.42***	59.09
6	4.72**	0.16**	-0.12	0.71	-0.08	0.09***	-0.04	-1.16***	-0.37***	59.41
7	2.11	0.17**	0.02	3.24	0.02	0.09***	-0.00	-0.34	-0.33***	46.78
8	-3.12	0.20***	0.43***	0.22	-0.13	0.05***	-0.03	0.13	-0.33***	48.83
9	0.13	0.09	0.23	-4.73**	0.12	0.08***	-0.03	-0.35	-0.35***	45.08
High	-1.76	0.01	0.36**	-0.67	0.07	0.12***	-0.06*	-0.29	-0.39***	44.92
High−Low	5.12	-0.45***	-0.12	-0.71	-0.57	-0.05**	-0.05	-0.83	-0.09	59.32

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Table 10 Continued.

Panel H: Long-term reversal sorted portfolios.

Portfolio	α	ΔS	D	L	RI	$\Delta S \times r_m$	$D \times r_m$	$L \times r_m$	$RI \times r_m$	R^2
Low	2.00	0.07	0.36	-8.09***	-0.43	0.03	-0.06	-1.02**	-0.25***	49.60
2	-1.78	0.35***	0.47*	5.69*	0.11	0.05**	-0.06	-0.23	-0.24***	41.88
3	-0.89	0.25**	0.30	9.67***	0.31	0.05**	-0.02	-0.01	-0.29***	41.79
4	0.30	0.18**	0.22	-2.05	-0.04	0.04***	-0.07**	-1.38***	-0.33***	51.54
5	-2.28	0.30***	0.36**	1.82	0.08	0.01	-0.06**	-1.04***	-0.49***	60.38
6	-0.86	0.22***	0.29*	-4.27**	0.16	0.02	-0.10***	-0.83***	-0.26***	46.50
7	0.63	0.10	0.12	0.00	0.08	0.05***	-0.09***	-0.99***	-0.41***	54.54
8	2.68	0.17**	0.00	-2.21	0.14	0.07***	-0.11***	-0.38	-0.27***	52.30
9	0.83	0.13	0.24	-3.89	0.28	0.04**	-0.07**	-0.73*	-0.35***	49.95
High	-3.56	-0.26***	0.44**	-3.33	0.10	0.11***	-0.10***	0.38	-0.46***	61.09
High−Low	5.57	0.33***	-0.08	-4.76	-0.53	-0.08***	0.04	-1.40***	0.21***	15.71

Panel I: Industry sorted portfolios.

Portfolio	α	ΔS	D	L	RI	$\Delta S \times r_m$	$D \times r_m$	$L \times r_m$	$RI \times r_m$	R^2
Nodur	3.32*	0.18***	-0.13	-5.43***	0.06	0.02*	0.05**	-0.25	-0.43***	43.07
Durbl	4.91	0.14	0.06	-10.24***	0.31	0.05***	-0.06	0.25	-0.45***	56.41
Manuf	-0.97	0.21**	0.26	-2.74	0.23	0.06***	-0.08**	-0.45	-0.52***	60.21
Enrgy	-3.41	0.27***	0.52**	-1.83	0.31	0.03*	-0.11***	1.60***	-0.31***	39.42
HiTec	-5.07	-0.27**	0.59**	-3.54	-0.26	0.11***	0.03	-1.64***	-0.51***	59.10
Telcm	-1.25	-0.04	0.18	-2.45	0.57*	0.03	-0.10**	-0.14	-0.11*	33.62
Shops	5.39*	0.16	-0.11	-7.14***	-0.24	0.09***	0.08**	-1.60***	-0.43***	51.19
Hlth	-3.18	0.46***	0.46**	-3.34	-0.26	0.01	-0.04	1.29***	-0.26***	31.12
Utils	2.25	0.19**	0.11	-2.38	-0.13	0.02*	0.06*	-0.17	-0.30***	31.40
Other	-1.09	0.29***	0.39*	3.67	0.01	0.05***	-0.04	-0.60	-0.43***	60.87

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Table 11. Performance of Portfolios of MA Strategies.

This table reports the mean, standard deviation, skewness and Sharpe ratios (SR) of portfolios of MA strategies and buy and hold (BH) value-weighted (VW) and equal-weighted (EW) benchmark portfolio returns, as well as the spread between the MA portfolio and BH portfolio returns using sets of 10 portfolios sorted by several variables. The sample period covers 1960:01 until 2011:12 with value-weighted portfolio returns. μ is the annualized average return, σ is annualized standard deviation of returns, s is the annualized skewness, and SR is the annualized Sharpe ratio. The length of the moving average window is 24 months. A one-way transaction cost of 0.5% has been imposed in the computation of the MA and BH returns. ME refers to the portfolio consisting of ten market capitalization deciles, BM refers to the portfolio constructed based on ten book-to-market deciles, CP is the portfolio constructed based on ten deciles sorted on cash-flow-to-price, EP consists of a portfolio of ten deciles sorted on earnings-to-price, DP is the portfolio constructed from ten deciles sorted on dividend-to-price, ST consists of ten deciles sorted on short-term reversal, MT is constructed based on ten deciles sorted on medium-term momentum, LT is based on ten deciles sorted on long-term reversal and IND consists of ten industry portfolios. Statistical significance of a two-sided null hypothesis at the 1%, 5%, and 10% level is given by a ***, a **, and a *, respectively.

Portfolio	μ	σ	s	SR	μ	σ	s	SR	μ	σ	s	SR
	Portfolio of MA Strategies				Portfolio of BH Strategies				Spread of Portfolios MA−BH			
ME VW	14.233***	39.407	0.140	0.231	10.363***	54.121	-0.468	0.097	3.870***	31.785	0.857	0.122
ME EW	16.585***	45.668	0.076	0.251	12.396***	63.860	-0.497	0.114	4.189***	39.290	1.300	0.107
BM VW	14.586***	38.272	0.249	0.247	10.391***	53.862	-0.450	0.098	4.196***	31.922	1.349	0.131
BM EW	15.706***	38.839	0.244	0.273	11.812***	54.016	-0.434	0.124	3.894***	31.124	1.624	0.125
CP VW	14.570***	38.358	0.201	0.247	10.482***	53.199	-0.423	0.101	4.088***	30.751	1.112	0.133
CP EW	15.330***	38.715	0.250	0.264	11.515***	52.993	-0.414	0.121	3.815***	29.630	1.408	0.129
EP VW	14.427***	38.375	0.138	0.243	10.488***	53.076	-0.421	0.101	3.939***	30.712	1.168	0.128
EP EW	15.258***	39.146	0.170	0.259	11.621***	53.357	-0.388	0.122	3.637***	29.701	1.239	0.122
DP VW	14.361***	37.069	0.150	0.249	10.535***	51.254	-0.419	0.106	3.827***	29.107	1.299	0.131
DP EW	14.835***	37.023	0.182	0.263	10.953***	51.699	-0.411	0.113	3.882***	29.608	1.398	0.131
ST VW	14.455***	38.457	0.158	0.243	10.248***	54.425	-0.469	0.094	4.207***	32.968	1.540	0.128
ST EW	15.087***	39.302	0.208	0.254	10.580***	57.313	-0.419	0.095	4.507***	35.281	1.508	0.128
MT VW	14.589***	38.078	0.231	0.249	10.346***	54.089	-0.458	0.097	4.243***	32.193	1.272	0.132
MT EW	14.761***	38.012	0.326	0.254	10.126***	58.079	-0.286	0.086	4.635***	36.678	0.454	0.126
LT VW	14.475***	38.176	0.157	0.245	10.465***	53.079	-0.440	0.101	4.009***	31.202	1.644	0.129
LT EW	15.834***	39.320	0.228	0.273	11.826***	55.108	-0.373	0.122	4.009***	31.377	1.832	0.128
IND VW	14.886***	37.371	0.283	0.261	10.363***	54.120	-0.468	0.097	4.524***	31.857	0.943	0.142
IND EW	15.139***	35.243	0.286	0.284	11.057***	51.636	-0.432	0.115	4.082***	30.185	0.758	0.135

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Table 12. Monte Carlo Simulations.

This table reports the results for the improvement delivered by the MA switching strategy over the buy-and-hold strategy, the trading frequency as well as the break-even transaction cost using 1000 Monte Carlo simulations with randomly generated returns designed to match the first two moments of ten decile portfolios sorted by several variables. The sample period covers 1960:01 until 2011:12 with value-weighted portfolio returns. $\Delta\mu$ is the annualized improvement in the average in-sample monthly return, $\Delta\sigma$ is the annualized improvement in the return standard deviation, p_A is the proportion of months during which there is a hold signal, NT is the number of transactions (buy or sell) over the entire sample period, BETC is the break-even one-sided transaction cost in percent, p_1 is the proportion of months during which a buy signal was followed by a positive return of the underlying portfolio, α_{TM} is the intercept from the Treynor-Mazuy market-timing regression and α_{HM} is the intercept of the Henriksson-Merton market timing regression. The length of the moving average window is 24 months. A one-way transaction cost of 0.5% has been imposed in the reported $\Delta\mu$ and $\Delta\sigma$.

Panel A: Size sorted portfolios.

Portfolio	$\Delta\mu$	$\Delta\sigma$	p_A	NT	BETC	p_1	α_{TM}	α_{HM}
Low	6.233	3.957	0.717	58.550	5.393	0.696	0.520^{***}	0.519^{***}
2	6.397	4.054	0.709	59.572	5.447	0.698	0.533^{***}	0.530^{***}
3	5.616	3.504	0.737	56.110	5.064	0.691	0.465^{***}	0.460^{***}
4	5.483	3.395	0.736	56.769	4.878	0.691	0.456^{***}	0.454^{***}
5	5.036	3.099	0.751	54.798	4.657	0.688	0.419^{***}	0.417^{***}
6	4.718	2.860	0.756	54.165	4.405	0.686	0.393^{***}	0.392^{***}
7	4.515	2.735	0.763	53.271	4.287	0.685	0.376^{***}	0.374^{***}
8	4.493	2.701	0.760	53.611	4.247	0.685	0.374^{***}	0.372^{***}
9	4.048	2.397	0.769	52.421	3.910	0.683	0.336^{***}	0.335^{***}
High	4.094	2.383	0.751	54.835	3.785	0.685	0.340^{***}	0.338^{***}

Panel B: Book-to-market sorted portfolios.

Portfolio	$\Delta\mu$	$\Delta\sigma$	p_A	NT	BETC	p_1	α_{TM}	α_{HM}
Low	5.873	3.557	0.688	61.167	4.868	0.701	0.489^{***}	0.484^{***}
2	4.570	2.711	0.741	55.712	4.155	0.688	0.380^{***}	0.378^{***}
3	4.077	2.412	0.766	53.354	3.880	0.683	0.338^{***}	0.334^{***}
4	4.347	2.591	0.755	54.129	4.072	0.686	0.362^{***}	0.359^{***}
5	3.741	2.202	0.780	50.998	3.709	0.681	0.311^{***}	0.310^{***}
6	3.736	2.209	0.784	50.408	3.738	0.681	0.312^{***}	0.309^{***}
7	3.324	1.955	0.805	47.599	3.542	0.677	0.277^{***}	0.274^{***}
8	3.335	1.981	0.808	47.060	3.575	0.677	0.279^{***}	0.279^{***}
9	3.451	2.066	0.809	46.743	3.718	0.677	0.286^{***}	0.283^{**}
High	4.770	2.951	0.773	51.940	4.635	0.685	0.395^{***}	0.390^{***}

Panel C: Cash-flow-to-price sorted portfolios.

Portfolio	$\Delta\mu$	$\Delta\sigma$	p_A	NT	BETC	p_1	α_{TM}	α_{HM}
Low	6.650	4.101	0.667	62.527	5.405	0.707	0.554^{***}	0.550^{***}
2	4.791	2.845	0.731	56.517	4.295	0.691	0.399^{***}	0.395^{***}
3	4.573	2.696	0.736	56.042	4.132	0.689	0.381^{***}	0.379^{***}
4	4.120	2.429	0.763	53.031	3.920	0.684	0.344^{***}	0.343^{***}
5	3.891	2.307	0.775	51.148	3.835	0.682	0.325^{***}	0.324^{***}
6	3.920	2.303	0.772	51.799	3.822	0.682	0.328^{***}	0.326^{***}
7	3.230	1.880	0.807	46.804	3.484	0.676	0.270^{***}	0.268^{**}
8	3.284	1.919	0.807	46.640	3.562	0.677	0.275^{***}	0.276^{***}
9	2.821	1.663	0.837	41.915	3.389	0.674	0.236^{***}	0.235^{**}
High	3.545	2.131	0.816	45.172	3.957	0.678	0.296^{***}	0.294^{**}

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Table 12 Continued.

Panel D: Earnings-to-price sorted portfolios.

Portfolio	$\Delta\mu$	$\Delta\sigma$	p_A	NT	BETC	p_1	α_{TM}	α_{HM}
Low	6.918	4.272	0.661	63.063	5.569	0.709	0.572^{***}	0.570^{***}
2	5.255	3.130	0.705	58.932	4.544	0.696	0.434^{***}	0.430^{***}
3	4.210	2.479	0.758	53.581	3.975	0.685	0.347^{***}	0.344^{***}
4	4.151	2.436	0.753	53.890	3.897	0.685	0.344^{***}	0.342^{***}
5	3.949	2.310	0.769	52.165	3.836	0.682	0.326^{***}	0.324^{***}
6	3.147	1.847	0.811	46.399	3.430	0.675	0.261^{***}	0.260^{**}
7	2.768	1.619	0.837	42.568	3.280	0.672	0.230^{***}	0.231^{**}
8	3.062	1.806	0.823	44.513	3.476	0.674	0.254^{***}	0.253^{**}
9	3.197	1.902	0.824	44.576	3.613	0.675	0.264^{***}	0.262^{**}
High	3.745	2.263	0.807	46.915	4.024	0.678	0.308^{***}	0.304^{**}

Panel E: Dividend-to-price sorted portfolios.

Portfolio	$\Delta\mu$	$\Delta\sigma$	p_A	NT	BETC	p_1	α_{TM}	α_{HM}
Low	6.728	4.182	0.673	61.975	5.533	0.706	0.561^{***}	0.559^{***}
2	5.651	3.433	0.699	59.466	4.830	0.699	0.472^{***}	0.471^{***}
3	4.948	2.960	0.732	56.459	4.441	0.691	0.413^{***}	0.412^{***}
4	4.159	2.466	0.764	52.729	3.995	0.684	0.347^{***}	0.345^{***}
5	4.848	2.888	0.728	57.080	4.303	0.692	0.404^{***}	0.402^{***}
6	3.648	2.133	0.782	50.600	3.654	0.681	0.304^{***}	0.303^{***}
7	3.744	2.198	0.778	51.263	3.705	0.681	0.313^{***}	0.313^{***}
8	2.776	1.612	0.833	43.177	3.245	0.673	0.231^{***}	0.229^{**}
9	2.832	1.647	0.825	44.127	3.247	0.674	0.236^{***}	0.235^{**}
High	3.949	2.329	0.770	51.854	3.855	0.683	0.330^{***}	0.328^{***}

Panel F: Short-term reversal sorted portfolios.

Portfolio	$\Delta\mu$	$\Delta\sigma$	p_A	NT	BETC	p_1	α_{TM}	α_{HM}
Low	8.546	5.659	0.646	63.439	6.856	0.716	0.713^{***}	0.711^{***}
2	5.053	3.154	0.754	53.913	4.753	0.689	0.422^{***}	0.424^{***}
3	4.256	2.574	0.776	51.140	4.211	0.684	0.357^{***}	0.358^{***}
4	4.032	2.393	0.773	51.372	3.980	0.683	0.337^{***}	0.336^{***}
5	3.922	2.299	0.773	51.546	3.859	0.682	0.329^{***}	0.330^{***}
6	3.962	2.320	0.761	53.181	3.775	0.684	0.332^{***}	0.333^{***}
7	3.986	2.323	0.759	53.301	3.790	0.685	0.333^{***}	0.334^{***}
8	4.199	2.469	0.753	54.182	3.925	0.685	0.351^{***}	0.350^{***}
9	5.649	3.370	0.681	60.754	4.724	0.702	0.472^{***}	0.469^{***}
High	7.724	4.734	0.613	65.896	5.967	0.722	0.645^{***}	0.641^{***}

Panel G: Medium-term momentum sorted portfolios.

Portfolio	$\Delta\mu$	$\Delta\sigma$	p_A	NT	BETC	p_1	α_{TM}	α_{HM}
Low	14.519	9.904	0.450	67.526	11.113	0.776	1.209^{***}	1.204^{***}
2	8.422	5.366	0.610	65.728	6.548	0.724	0.702^{***}	0.700^{***}
3	6.120	3.744	0.683	61.190	5.080	0.703	0.508^{***}	0.504^{***}
4	5.015	2.976	0.723	57.578	4.428	0.693	0.420^{***}	0.420^{***}
5	4.621	2.708	0.728	57.089	4.099	0.692	0.385^{***}	0.382^{***}
6	4.264	2.519	0.751	54.078	3.986	0.687	0.354^{***}	0.351^{***}
7	3.986	2.337	0.763	52.913	3.818	0.684	0.330^{***}	0.326^{***}
8	3.391	1.986	0.804	47.714	3.576	0.677	0.281^{***}	0.280^{***}
9	3.671	2.185	0.800	48.301	3.843	0.679	0.303^{***}	0.300^{***}
High	4.419	2.763	0.801	48.140	4.624	0.681	0.365^{***}	0.359^{**}

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Table 12 Continued.

Panel H: Long-term reversal sorted portfolios.

Portfolio	$\Delta\mu$	$\Delta\sigma$	p_A	NT	BETC	p_1	α_{TM}	α_{HM}
Low	6.213	3.973	0.725	56.682	5.545	0.696	0.520^{***}	0.521^{***}
2	4.405	2.682	0.770	52.104	4.283	0.684	0.368^{***}	0.369^{***}
3	3.742	2.225	0.793	49.133	3.846	0.680	0.312^{***}	0.311^{***}
4	3.645	2.155	0.788	49.691	3.721	0.679	0.304^{***}	0.300^{***}
5	3.528	2.077	0.793	48.619	3.676	0.679	0.293^{***}	0.290^{***}
6	3.344	1.950	0.800	48.051	3.516	0.678	0.279^{***}	0.277^{***}
7	3.618	2.121	0.786	50.591	3.619	0.680	0.302^{***}	0.299^{***}
8	3.857	2.286	0.771	51.787	3.772	0.682	0.321^{***}	0.321^{***}
9	5.071	3.024	0.717	58.595	4.401	0.694	0.424^{***}	0.422^{***}
High	7.070	4.462	0.664	62.898	5.696	0.709	0.590^{***}	0.590^{***}

Panel I: Industry sorted portfolios.

Portfolio	$\Delta\mu$	$\Delta\sigma$	p_A	NT	BETC	p_1	α_{TM}	α_{HM}
Nodur	3.032	1.768	0.820	44.652	3.430	0.674	0.251^{***}	0.249^{**}
Durbl	7.503	4.761	0.653	63.230	6.059	0.711	0.624^{***}	0.619^{***}
Manuf	4.900	2.940	0.733	56.089	4.428	0.691	0.407^{***}	0.404^{***}
Enrgy	4.552	2.787	0.764	52.900	4.340	0.684	0.382^{***}	0.384^{***}
HiTec	7.609	4.873	0.662	62.711	6.161	0.711	0.632^{***}	0.630^{***}
Telcm	4.614	2.744	0.738	55.921	4.178	0.689	0.383^{***}	0.379^{***}
Shops	4.777	2.914	0.748	54.239	4.458	0.688	0.399^{***}	0.401^{***}
Hlth	4.471	2.670	0.760	53.955	4.206	0.686	0.373^{***}	0.372^{***}
Utils	3.355	1.948	0.786	50.494	3.356	0.678	0.280^{***}	0.281^{***}
Other	5.493	3.351	0.714	58.150	4.810	0.695	0.459^{***}	0.458^{***}

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Table 13. Bootstrap Simulations.

This table reports the results for the improvement delivered by the MA switching strategy over the buy-and-hold strategy, the trading frequency as well as the break-even transaction cost using 1000 bootstrap simulations with randomly drawn returns from the historical returns ten decile portfolios sorted by several variables. The sample period covers 1960:01 until 2011:12 with value-weighted portfolio returns. $\Delta\mu$ is the annualized improvement in the average in-sample monthly return, $\Delta\sigma$ is the annualized improvement in the return standard deviation, p_A is the proportion of months during which there is a hold signal, NT is the number of transactions (buy or sell) over the entire sample period, BETC is the break-even one-sided transaction cost in percent, p_1 is the proportion of months during which a buy signal was followed by a positive return of the underlying portfolio, α_{TM} is the intercept from the Treynor-Mazuy market-timing regression and α_{HM} is the intercept of the Henriksson-Merton market timing regression. The length of the moving average window is 24 months. A one-way transaction cost of 0.5% has been imposed in the reported $\Delta\mu$ and $\Delta\sigma$. Statistical significance of the two-tailed null hypotheses that $\alpha_{TM} = 0$ and $\alpha_{HM} = 0.5$ at the 1%, 5%, and 10% level is given by a ***, a **, and a *, respectively.

Panel A: Size sorted portfolios.

Portfolio	$\Delta\mu$	$\Delta\sigma$	p_A	NT	BETC	p_1	α_{TM}	α_{HM}
Low	5.999	4.355	0.728	53.025	5.810	0.713	0.028	-0.604***
2	6.168	4.524	0.718	54.910	5.752	0.705	0.034	-0.606***
3	5.531	4.188	0.746	52.878	5.362	0.705	-0.016	-0.624***
4	5.388	4.093	0.745	53.250	5.197	0.705	-0.019	-0.610***
5	5.017	3.799	0.759	51.736	4.972	0.709	-0.046	-0.621***
6	4.691	3.509	0.764	51.186	4.698	0.700	-0.047	-0.583***
7	4.462	3.351	0.771	49.830	4.601	0.700	-0.082	-0.602***
8	4.445	3.244	0.767	50.777	4.493	0.698	-0.040	-0.550***
9	3.999	2.869	0.777	49.728	4.129	0.690	-0.041	-0.489***
High	4.084	2.764	0.757	51.564	4.067	0.712	0.031	-0.412***

Panel B: Book-to-market sorted portfolios.

Portfolio	$\Delta\mu$	$\Delta\sigma$	p_A	NT	BETC	p_1	α_{TM}	α_{HM}
Low	5.801	3.890	0.695	58.149	5.121	0.709	0.173**	-0.343***
2	4.566	3.252	0.748	52.523	4.462	0.697	0.010	-0.452***
3	4.098	2.958	0.772	49.318	4.268	0.702	-0.033	-0.480***
4	4.353	3.191	0.761	49.777	4.504	0.701	-0.041	-0.514***
5	3.742	2.717	0.785	46.914	4.097	0.711	-0.054	-0.465***
6	3.720	2.737	0.791	46.224	4.131	0.698	-0.067	-0.489***
7	3.292	2.170	0.810	44.465	3.794	0.700	0.047	-0.302***
8	3.390	2.648	0.814	41.779	4.171	0.695	-0.057	-0.456***
9	3.506	2.496	0.813	43.614	4.132	0.707	-0.005	-0.413***
High	4.574	3.386	0.782	46.153	5.088	0.707	-0.027	-0.525***

Panel C: Cash-flow-to-price sorted portfolios.

Portfolio	$\Delta\mu$	$\Delta\sigma$	p_A	NT	BETC	p_1	α_{TM}	α_{HM}
Low	6.611	4.619	0.673	59.402	5.718	0.718	0.205***	-0.380***
2	4.655	3.026	0.738	54.017	4.421	0.697	0.057	-0.358***
3	4.525	3.095	0.742	52.648	4.417	0.695	0.043	-0.415***
4	4.110	2.934	0.768	49.871	4.238	0.691	-0.021	-0.463***
5	3.918	3.015	0.782	47.118	4.282	0.697	-0.101*	-0.550***
6	3.928	2.808	0.777	48.651	4.143	0.699	0.004	-0.388***
7	3.263	2.394	0.812	43.714	3.835	0.695	-0.065	-0.422***
8	3.229	2.142	0.813	44.872	3.696	0.691	-0.012	-0.351***
9	2.802	1.939	0.842	39.468	3.642	0.698	-0.017	-0.346***
High	3.670	2.806	0.820	42.638	4.419	0.713	-0.049	-0.506***

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Table 13 Continued.

Panel D: Earnings-to-price sorted portfolios.

Portfolio	$\Delta\mu$	$\Delta\sigma$	p_A	NT	BETC	p_1	α_{TM}	α_{HM}
Low	6.851	4.649	0.664	60.268	5.834	0.718	0.241***	-0.335***
2	5.243	3.544	0.708	56.302	4.788	0.708	0.094*	-0.383***
3	4.193	2.823	0.759	50.837	4.230	0.694	0.038	-0.374***
4	4.167	2.921	0.755	50.172	4.265	0.706	-0.020	-0.437***
5	4.013	2.800	0.771	49.220	4.190	0.704	-0.008	-0.446***
6	3.216	2.280	0.814	44.030	3.754	0.689	-0.054	-0.401***
7	2.935	2.131	0.834	39.287	3.849	0.701	-0.092**	-0.449***
8	3.170	2.254	0.823	40.869	4.002	0.686	-0.030	-0.396***
9	3.317	2.390	0.825	41.271	4.124	0.718	-0.001	-0.410***
High	3.872	2.904	0.807	44.591	4.447	0.692	-0.060	-0.502***

Panel E: Dividend-to-price sorted portfolios.

Portfolio	$\Delta\mu$	$\Delta\sigma$	p_A	NT	BETC	p_1	α_{TM}	α_{HM}
Low	6.606	4.833	0.681	58.818	5.757	0.723	0.112	-0.539***
2	5.526	3.961	0.709	56.513	5.017	0.703	0.071	-0.466***
3	4.780	3.284	0.741	52.641	4.661	0.706	0.041	-0.434***
4	4.080	2.839	0.772	50.319	4.169	0.707	0.013	-0.394***
5	4.681	3.341	0.739	52.806	4.558	0.697	-0.012	-0.443***
6	3.582	2.521	0.789	46.510	3.962	0.693	-0.022	-0.389***
7	3.737	2.761	0.786	46.935	4.105	0.694	-0.051	-0.447***
8	2.781	1.975	0.838	38.868	3.685	0.700	-0.052	-0.359***
9	2.819	1.934	0.831	40.549	3.575	0.697	0.050	-0.237***
High	3.623	2.935	0.789	43.584	4.296	0.704	0.162**	-0.182*

Panel F: Short-term reversal sorted portfolios.

Portfolio	$\Delta\mu$	$\Delta\sigma$	p_A	NT	BETC	p_1	α_{TM}	α_{HM}
Low	8.245	6.389	0.655	57.160	7.408	0.729	0.200**	-0.619***
2	4.997	3.701	0.760	48.757	5.256	0.710	-0.013	-0.594***
3	4.228	3.089	0.781	47.306	4.590	0.703	-0.028	-0.517***
4	4.042	2.844	0.778	48.475	4.278	0.707	0.001	-0.462***
5	3.865	2.734	0.779	47.890	4.150	0.713	-0.018	-0.458***
6	4.012	2.803	0.766	50.292	4.103	0.705	0.007	-0.444***
7	3.977	2.722	0.764	49.701	4.119	0.706	0.009	-0.430***
8	4.239	2.993	0.757	51.274	4.251	0.713	0.059	-0.400***
9	5.500	3.921	0.692	57.340	4.927	0.711	0.105*	-0.372***
High	7.458	5.126	0.621	62.738	6.083	0.727	0.303***	-0.225**

Panel G: Medium-term momentum sorted portfolios.

Portfolio	$\Delta\mu$	$\Delta\sigma$	p_A	NT	BETC	p_1	α_{TM}	α_{HM}
Low	14.009	8.645	0.447	62.438	11.525	0.777	1.010***	0.366**
2	8.029	5.226	0.616	60.257	6.848	0.724	0.410***	-0.182
3	5.769	3.643	0.689	55.939	5.302	0.698	0.223***	-0.226**
4	4.825	3.219	0.729	53.356	4.643	0.696	0.098*	-0.356***
5	4.517	3.073	0.737	53.093	4.375	0.702	0.055	-0.377***
6	4.236	2.992	0.759	50.717	4.291	0.697	-0.038	-0.510***
7	3.973	2.881	0.772	49.665	4.109	0.710	-0.032	-0.465***
8	3.399	2.378	0.810	44.976	3.875	0.702	-0.026	-0.424***
9	3.678	2.819	0.807	44.727	4.218	0.710	-0.090*	-0.536***
High	4.464	3.455	0.805	45.275	5.044	0.709	-0.004	-0.539***

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Table 13 Continued.

Panel H: Long-term reversal sorted portfolios.

Portfolio	$\Delta\mu$	$\Delta\sigma$	p_A	NT	BETC	p_1	α_{TM}	α_{HM}
Low	5.813	3.818	0.735	53.257	5.600	0.692	0.133*	-0.328***
2	4.179	2.972	0.781	47.439	4.521	0.692	-0.012	-0.422***
3	3.642	2.654	0.804	44.408	4.214	0.689	-0.084	-0.450***
4	3.577	2.501	0.797	46.872	3.923	0.692	-0.026	-0.392***
5	3.521	2.472	0.800	45.583	3.966	0.698	-0.023	-0.428***
6	3.375	2.475	0.806	44.279	3.919	0.708	-0.072	-0.453***
7	3.610	2.463	0.792	47.236	3.933	0.702	-0.012	-0.406***
8	3.914	2.692	0.776	49.156	4.095	0.713	0.033	-0.396***
9	5.068	3.659	0.726	54.491	4.792	0.709	0.048	-0.460***
High	7.019	5.032	0.671	60.016	5.989	0.719	0.207**	-0.461***

Panel I: Industry sorted portfolios.

Portfolio	$\Delta\mu$	$\Delta\sigma$	p_A	NT	BETC	p_1	α_{TM}	α_{HM}
Nodur	3.032	2.131	0.826	41.189	3.779	0.688	-0.044	-0.366***
Durbl	7.022	4.883	0.666	58.385	6.172	0.704	0.128	-0.444***
Manuf	4.766	3.495	0.744	52.346	4.681	0.695	-0.025	-0.527***
Enrgy	4.445	2.896	0.772	50.314	4.516	0.693	0.135*	-0.197*
HiTec	7.393	5.232	0.671	60.005	6.313	0.706	0.298***	-0.307**
Telcm	4.520	2.980	0.744	52.973	4.377	0.704	0.235***	-0.123
Shops	4.681	3.310	0.757	51.725	4.643	0.704	0.018	-0.400***
Hlth	4.272	2.794	0.768	51.054	4.288	0.699	0.130*	-0.172*
Utils	3.270	2.084	0.793	47.446	3.537	0.689	0.197***	-0.025
Other	5.443	3.963	0.723	55.371	5.053	0.706	0.066	-0.505***

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Table 14. International Evidence of Moving Average Strategies Performance.

This table reports the results for the improvement delivered by the MA switching strategy over the buy-and-hold strategy, the trading frequency as well as the break-even transaction cost using local currency value-weighted returns of the market portfolios and portfolios sorted by several variables in seven difference countries. $\Delta\mu$ is the annualized improvement in the average in-sample monthly return, $\Delta\sigma$ is the annualized improvement in the return standard deviation, p_A is the proportion of months during which there is a hold signal, NT is the number of transactions (buy or sell) over the entire sample period, BETC is the break-even one-sided transaction cost in percent, p_1 is the proportion of months during which a buy signal was followed by a positive return of the underlying portfolio, α_{TM} is the intercept from the Treynor-Mazuy market-timing regression and α_{HM} is the intercept of the Henriksson-Merton market timing regression. The length of the moving average window is 24 months. A one-way transaction cost of 0.5% has been imposed in the reported $\Delta\mu$ and $\Delta\sigma$. Statistical significance of the two-tailed null hypotheses that $\alpha_{TM} = 0$ and $\alpha_{HM} = 0.5$ at the 1%, 5%, and 10% level is given by a ***, a **, and a *, respectively.

Panel A: Australian portfolios between 1975:01 and 2010:12.

Portfolio	$\Delta\mu$	$\Delta\sigma$	p_A	NT	BETC	p_1	α_{TM}	α_{HM}
MKT	4.253	3.711	0.828	30	4.820	0.711	-0.184	-0.458**
High BM	2.770	3.800	0.880	20	4.710	0.716	-0.273**	-0.479***
Low BM	5.647	5.607	0.740	38	5.052	0.686	-0.159	-0.552***
High EP	2.537	3.325	0.900	18	4.793	0.725	-0.338***	-0.537***
Low EP	6.457	5.674	0.723	48	4.574	0.701	-0.088	-0.499***
High CEP	1.685	1.708	0.897	24	2.387	0.681	0.145*	0.036
Low CEP	7.608	6.423	0.676	42	6.159	0.708	0.052	-0.428**
High DP	1.726	1.778	0.904	16	3.667	0.708	0.170*	0.029
Low DP	6.178	5.721	0.757	36	5.835	0.686	-0.064	-0.370*
Zero DP	11.449	10.351	0.564	42	9.268	0.735	0.411	0.018

Panel B: Canadian portfolios between 1977:01 and 2010:12.

Portfolio	$\Delta\mu$	$\Delta\sigma$	p_A	NT	BETC	p_1	α_{TM}	α_{HM}
MKT	3.409	3.959	0.805	26	4.195	0.706	0.077	-0.185
High BM	4.189	3.714	0.818	26	5.155	0.690	0.490***	0.360**
Low BM	5.881	5.300	0.737	40	4.704	0.698	0.271**	-0.156
High EP	2.943	3.727	0.865	22	4.281	0.698	0.131	-0.005
Low EP	6.450	5.017	0.693	36	5.733	0.706	0.592***	0.193
High CEP	2.770	2.576	0.878	22	4.029	0.690	0.226**	-0.003
Low CEP	6.492	5.846	0.682	30	6.925	0.734	0.269**	-0.142
High DP	3.059	2.957	0.898	22	4.449	0.708	-0.001	-0.260**
Low DP	5.691	4.082	0.737	34	5.356	0.711	0.476***	0.152
Zero DP	11.222	10.956	0.557	40	8.978	0.763	0.920***	0.458

Panel C: French portfolios between 1975:01 and 2010:12.

Portfolio	$\Delta\mu$	$\Delta\sigma$	p_A	NT	BETC	p_1	α_{TM}	α_{HM}
MKT	4.552	5.184	0.723	31	4.993	0.735	0.221**	-0.055
High BM	4.809	6.290	0.748	31	5.275	0.713	0.254*	-0.054
Low BM	4.943	5.001	0.730	31	5.422	0.748	0.194*	-0.136
High EP	5.240	6.796	0.745	31	5.747	0.738	0.343**	0.116
Low EP	5.391	4.608	0.713	29	6.321	0.733	0.272**	0.010
High CEP	4.682	5.734	0.772	33	4.824	0.699	0.376***	0.231*
Low CEP	4.794	5.027	0.767	25	6.520	0.735	0.131	-0.269*
High DP	3.631	4.374	0.811	25	4.938	0.721	0.184*	0.001
Low DP	6.012	6.632	0.676	31	6.594	0.752	0.267**	-0.125
Zero DP	6.781	6.723	0.662	25	9.223	0.708	0.678***	0.322

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Table 14 Continued.

Panel D: German portfolios between 1975:01 and 2010:12.

Portfolio	$\Delta\mu$	$\Delta\sigma$	p_A	NT	BETC	p_1	α_{TM}	α_{HM}
MKT	4.272	5.191	0.755	32	4.539	0.723	0.177*	-0.224
High BM	3.426	4.973	0.804	28	4.160	0.713	0.104	-0.331**
Low BM	5.872	6.532	0.706	29	6.884	0.699	0.187*	-0.383**
High EP	3.914	6.543	0.738	22	6.048	0.730	0.186*	-0.286*
Low EP	5.456	5.889	0.723	33	5.622	0.699	0.306**	-0.044
High CEP	3.377	4.242	0.831	34	3.377	0.696	0.212**	-0.117
Low CEP	5.410	6.327	0.689	25	7.357	0.725	0.185*	-0.341**
High DP	3.045	4.885	0.811	26	3.982	0.733	0.152*	-0.155
Low DP	5.262	6.896	0.718	31	5.771	0.699	0.303**	-0.100
Zero DP	11.785	10.579	0.566	28	14.311	0.750	0.621**	-0.258

Panel E: Italian portfolios between 1975:01 and 2010:12.

Portfolio	$\Delta\mu$	$\Delta\sigma$	p_A	NT	BETC	p_1	α_{TM}	α_{HM}
MKT	6.373	4.863	0.662	29	7.471	0.716	0.456***	0.169
High BM	7.849	6.499	0.623	36	7.413	0.706	0.773***	0.538**
Low BM	6.214	4.560	0.667	31	6.815	0.701	0.421***	0.152
High EP	4.391	5.077	0.694	33	4.524	0.718	0.322**	0.104
Low EP	7.273	5.099	0.618	32	7.727	0.713	0.656***	0.486**
High CEP	5.776	4.714	0.716	32	6.137	0.684	0.469***	0.210
Low CEP	7.413	5.599	0.593	21	12.002	0.745	0.549***	0.391*
High DP	4.266	5.180	0.706	29	5.002	0.708	0.419***	0.235
Low DP	8.315	5.636	0.593	41	6.895	0.730	0.631***	0.335*
Zero DP	9.773	8.406	0.588	29	11.458	0.738	0.904***	0.675***

Panel F: Japanese portfolios between 1975:01 and 2010:12.

Portfolio	$\Delta\mu$	$\Delta\sigma$	p_A	NT	BETC	p_1	α_{TM}	α_{HM}
MKT	6.792	6.082	0.642	22	10.496	0.745	0.531***	0.179
High BM	5.314	5.705	0.735	24	7.529	0.728	0.346**	0.019
Low BM	9.756	7.033	0.583	32	10.366	0.735	0.835***	0.504**
High EP	4.792	4.853	0.730	20	8.146	0.691	0.336**	0.052
Low EP	9.004	7.647	0.608	26	11.775	0.723	0.770***	0.449*
High CEP	4.307	4.073	0.730	16	9.152	0.696	0.290**	0.018
Low CEP	8.933	7.524	0.561	32	9.491	0.755	0.773***	0.465**
High DP	5.743	4.843	0.703	22	8.876	0.708	0.419***	0.163
Low DP	9.647	6.979	0.576	34	9.647	0.735	0.768***	0.401*
Zero DP	9.601	9.626	0.593	28	11.659	0.733	0.680***	0.197

Panel G: UK portfolios between 1975:01 and 2010:12.

Portfolio	$\Delta\mu$	$\Delta\sigma$	p_A	NT	BETC	p_1	α_{TM}	α_{HM}
MKT	2.277	2.030	0.860	20	3.871	0.713	0.256***	0.044
High BM	3.406	3.723	0.860	16	7.237	0.696	0.413***	0.219*
Low BM	3.200	2.684	0.811	22	4.945	0.716	-0.086	-0.388***
High EP	3.653	2.866	0.890	24	5.175	0.672	0.340***	0.028
Low EP	3.866	2.937	0.828	20	6.571	0.725	-0.047	-0.377**
High CEP	2.750	2.701	0.902	20	4.675	0.676	0.313***	0.062
Low CEP	3.432	2.785	0.809	14	8.335	0.735	-0.065	-0.348**
High DP	2.773	3.760	0.877	26	3.626	0.679	0.393***	0.227*
Low DP	3.495	3.370	0.821	14	8.487	0.716	-0.060	-0.343**

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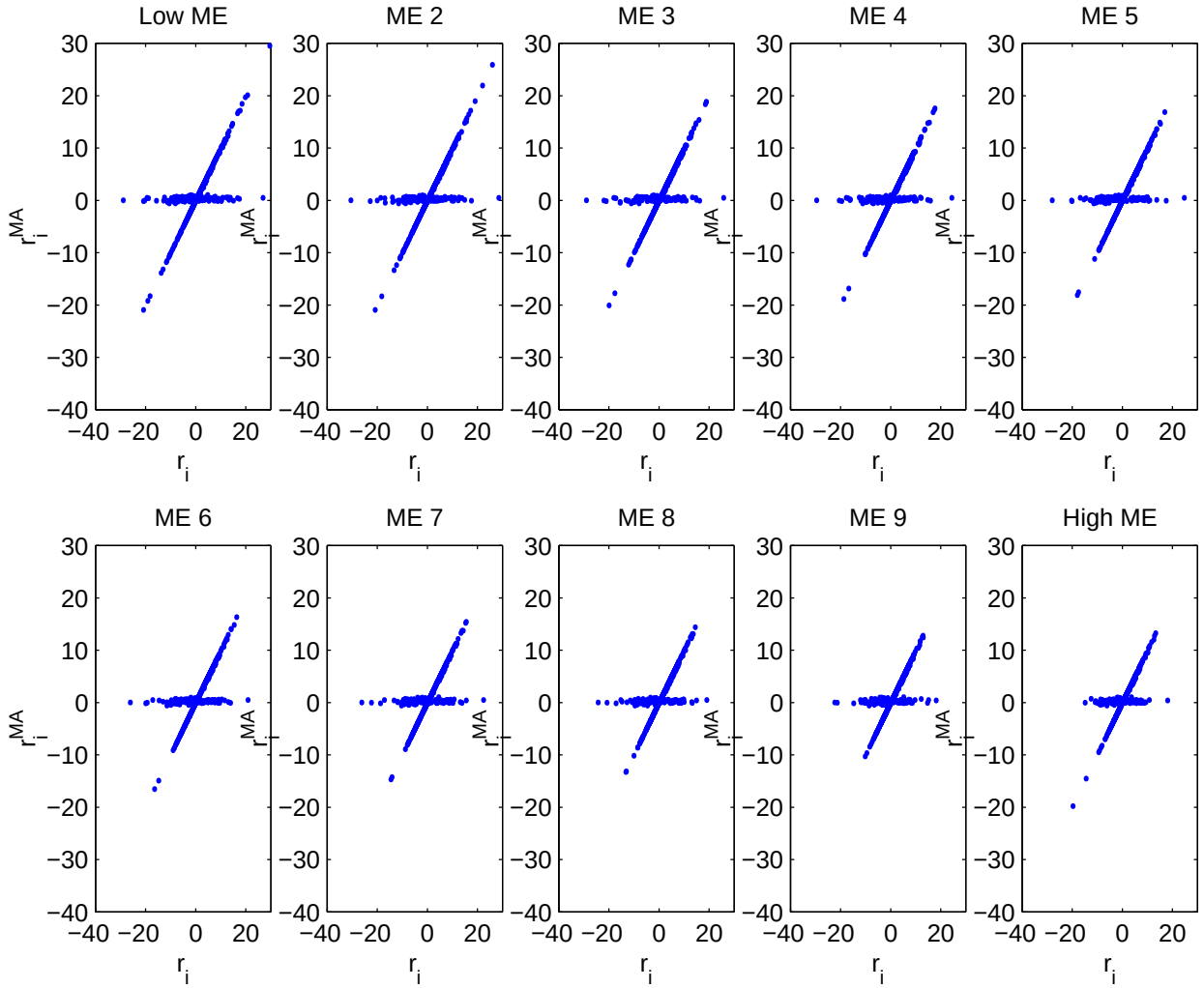
Figure 1. Scatter Plot of Buy-and-Hold returns versus the Moving Average returns



Notes: Figure 1 presents a scatter plot of the returns of the ME-sorted decile buy-and-hold portfolio returns versus the moving average strategy returns. The sample contains 624 monthly observations and the data covers the 1960:01 until 2011:12 period.

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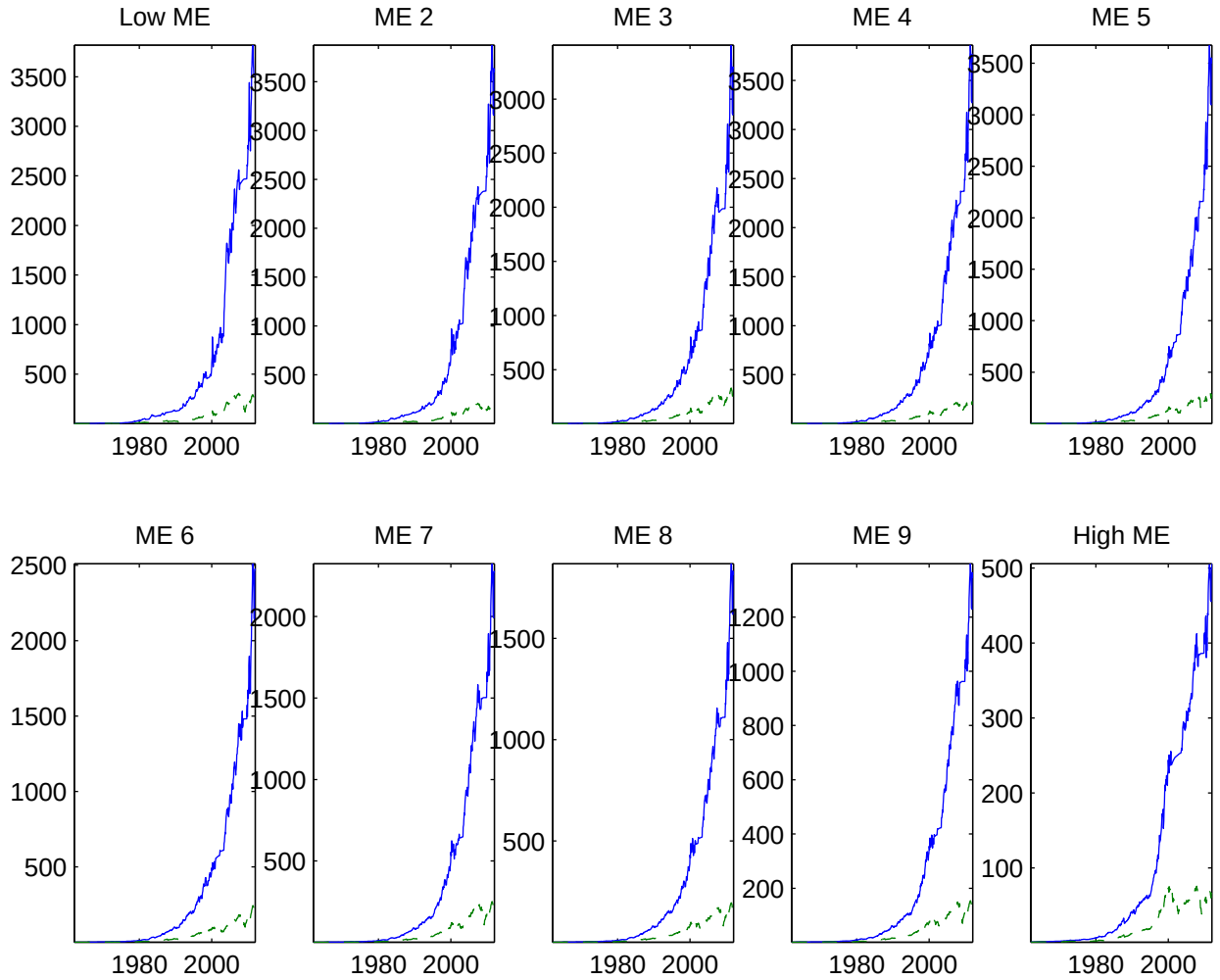
Figure 2. Cumulative Return Plots of Buy-and-Hold ME-sorted decile portfolios and the Moving Average strategy



Notes: Figure 2 presents a time series plot of the cumulative returns of the ME-sorted decile returns (dashed green line) and the moving average strategy returns (solid blue line) over time. The sample contains 624 monthly observations and the data covers the 1960:01 until 2011:12 period.

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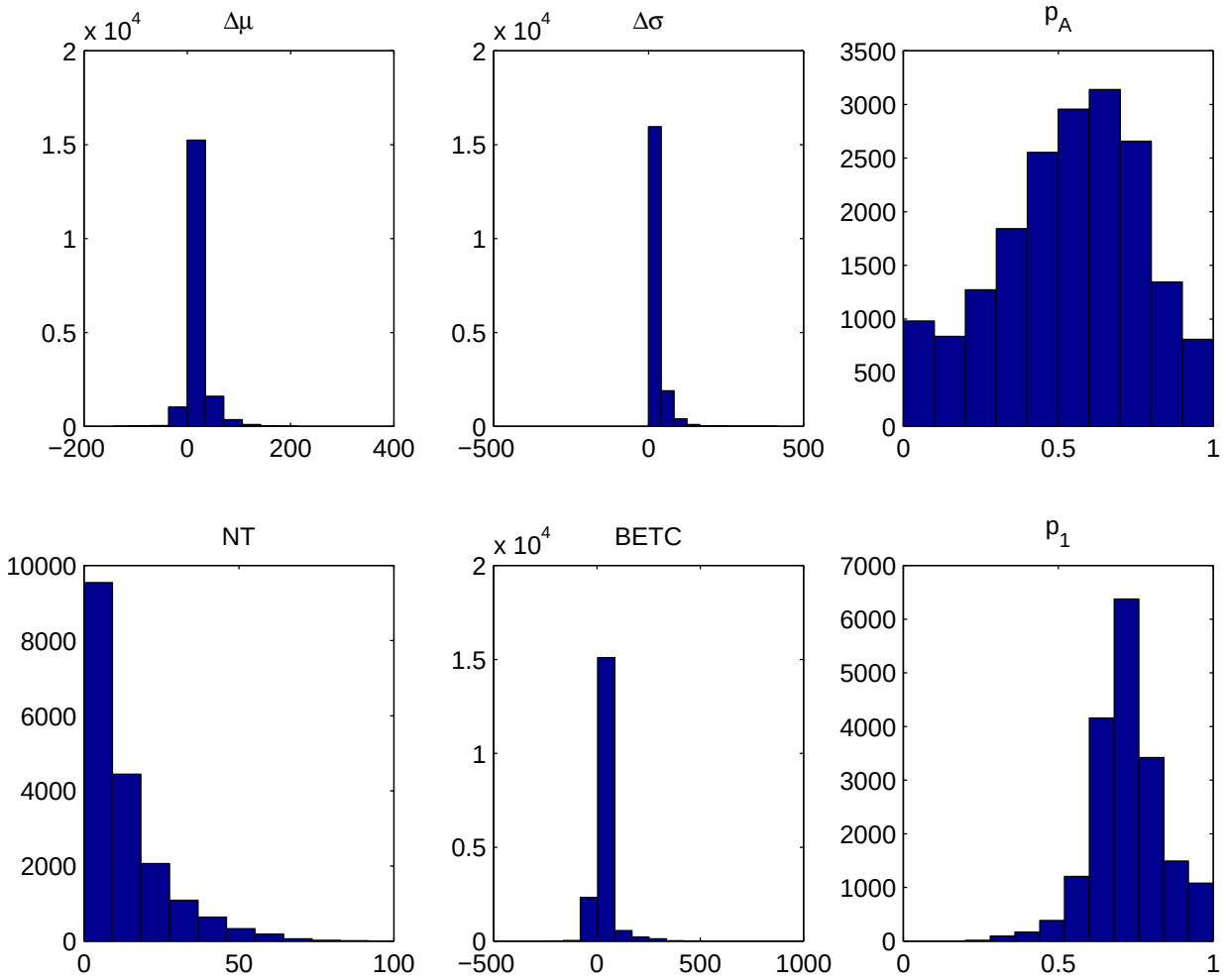
Figure 3. Performance of MA strategy with individual stocks



Notes: Figure 3 presents histograms of the annualized percentage change improvement of MA over BH ($\Delta\mu$), the annualized percentage change improvement in standard deviation of return ($\Delta\sigma$), the percentage active (p_A), the number of trades (NT), break-even transaction cost (BETC) and the percentage of times the MA return exceeds the risk-free rate (p_1) for the entire sample of stock in the CRSP database for which there is at least 48 contiguous non-missing monthly returns available during the 1960:01 until 2011:12 period.

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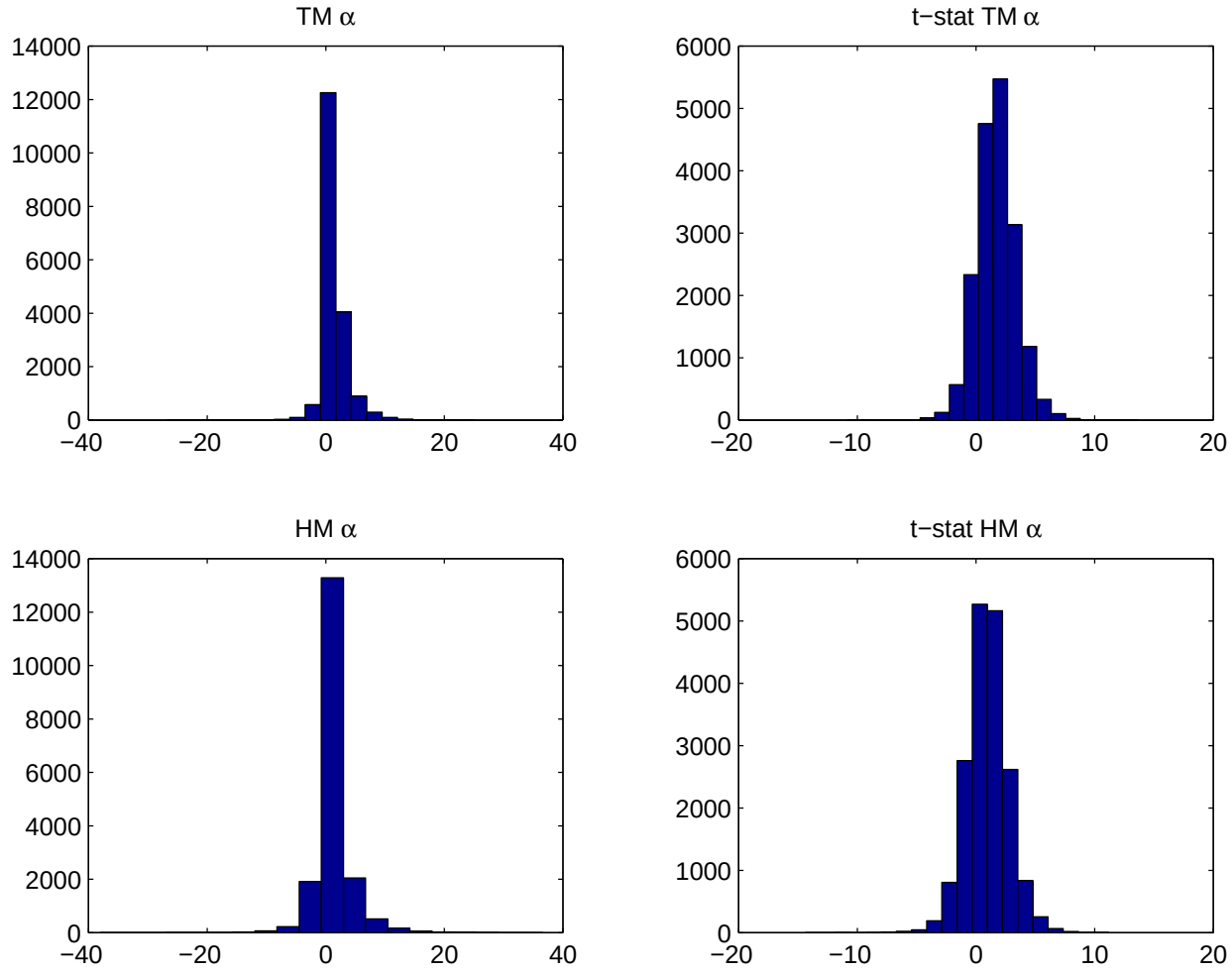
Figure 4. Market timing alphas of MA strategy with individual stocks



Notes: Figure 4 presents histograms of the annualized Treynor-Mazuy (TM) and Henriksson-Merton (HM) alphas as well as their associated t-statistics calculated using Newey-West standard errors with 3 lags for the entire sample of stock in the CRSP database for which there is at least 48 contiguous non-missing monthly returns available during the 1960:01 until 2011:12 period.

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