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Feasible Earnings Momentum in the U.S. Stock Market: An Investor's Perspective

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Abstract

This paper examines earnings momentum strategies in the U.S. stock universe from an investor's perspective. Specifically, we use the software Stock Investor Pro from the American Association of Individual Investors (AAII) to obtain the composition of the U.S. stock universe from 2005-2015 on a weekly basis. Raw data is validated via Thomson Reuters Datastream. Next, we implement long-only and long-short earnings momentum strategies based on earnings estimates revisions. Furthermore, we develop a novel price-earnings momentum strategy by intertwining earnings momentum with a 52 week high strategy. Our findings re-confirm the high returns of the classical earnings momentum strategy with equal-weighted raw returns of 23.6 percent p.a. for the monthly long-only strategy. Most importantly, we find large parts of these raw returns to be robust to a wide spectrum of systematic sources of risk and feasible in light of market frictions, such as trading costs, liquidity constraints and microstructure effects. The enhanced price-earnings momentum strategy invests in earnings momentum stocks with below-median distance to their 52 week high. This simple alteration leads to an improvement of annualized raw returns to 31.0 percent, equally robust to systematic sources of risk and market frictions. We conclude that earnings momentum strategies are feasible and continue to pose a serious challenge to the semi-strong form of market efficiency.

Keywords: Earnings momentum, price momentum, market efficiency, return predictability.

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1. Introduction

Ever since the seminal papers of Jegadeesh and Titman (1993) as well as Ball and Brown (1968), the price momentum and the earnings momentum effect have become two of the most actively researched capital market phenomena. Clearly, the success of these strategies has sparked the interest of individual as well as professional investors. As of today, many nonprofit and commercial providers allow for simple and easy screening of large investment universes according to different capital market anomalies - often initially found to be profitable in academics. Earnings momentum is one of the the most well-known challenges to market efficiency, and it shows persistence up to 2015 (Jacobs, 2015). With the surge of "social trading", stocks fulfilling the criteria of complex capital market anomalies become publicly available - in some cases even for free. Popular websites are for example www.aaii.com, www.meetinvest.com or www.valuestockscreener.com. All three providers also offer a simple interpretation of the earnings momentum effect and provide their users with regularly updated lists of stocks fulfilling the "screening criteria" of this anomaly and many others. Since the computational requirements for such strategies are usually relatively high and implementation is complex, we can say that such websites have the potential to further enhance market efficiency, by making available sophisticated strategies to nonsophisticated investors. The latter puts the question of "feasible earnings momentum strategies" in a new perspective. Clearly, other authors have previously pursued that direction, see Rey and Schmid (2007) and Ammann et al. (2011) for feasible price momentum and Czaja et al. (2013) for feasible earnings momentum strategies. Lesmond et al. (2004) and Korajczyk and Sadka (2004) put a particular focus on market frictions and trading costs.

However, all of the above authors opt for an approach that still requires an investor to filter larger databases in accordance with the rules of their strategies. Instead, we directly use and validate the monthly (weekly) signals of the software Stock Investor Pro (SIP) of the American Association of Individual Investors (AAII) - "an independent, non-profit corporation formed for the purpose of assisting individuals in becoming effective managers of their own assets through programs of education, information and research." (AAII, 2015). We choose AAII for three reasons: First, its investment advice has partially made its way into academics. For example, the AAII sentiment survey been applied in several high impact journals, see, among others, Fisher and Statman (2000);

Brown and Cliff (2004); Jacobs (2015). Second, the organization has high reach with more than 150,000 members. Third, with its foundation in 1978 it has substantial history in investment education even before the digital age.

Regarding their earnings estimates revisions strategy "Est Rev: Up 5%", AAII claims raw returns of more than 20 percent p.a. from January 2005 to April 2015 for the U.S. stock universe. However, the impact of market frictions such as trading costs, liquidity constraints and microstructure effects is not taken into account. Equally, dividends and further corporate actions are omitted. Also, the exposure to common systematic sources of risk has not been evaluated. This article aims to answer the question if investors following the simple AAII earnings estimates revisions screen can feasibly capture statistically significant, risk-adjusted returns in the light of market frictions. Furthermore, we provide with a simple and theoretically sound enhancement of the strategy an average investor could also conceptualize and follow.

By pursuing this goal, we contribute to the literature in several respects: First, we provide an out-of-sample test of an earnings momentum strategy from 2005 until 2015 that is implementable for average investors on the U.S. stock universe. Second, we validate the AAII earnings momentum screen in terms of data quality, trading costs and further market frictions by pairing SIP information with Thomson Reuters Datastream. Also, we run a comprehensive performance evaluation and analyze the distribution of returns, the value at risk, diverse risk-return as well as drawdown metrics and exposure to systematic risk factors. Third, we further enhance the original strategy. Specifically, we intertwine earnings momentum with a form of price momentum, expressed as closeness of the last price to the 52 week high (George and Hwang, 2004). We conjecture that stocks with upward earnings estimates revisions and below-average distance to their 52 week high draw less attention. Hence, investors at first underreact and the subsequent correction of the mispricing should lead to higher performance. Fourth, we test all these strategies on weekly instead of monthly data. The combination of a scientifically rigorous approach with high ease-of-implementation makes this paper highly relevant for researchers and practitioners alike.

We find that our interpretation of the monthly earnings momentum strategy of AAII (2015) shows statistically significant raw returns of 23.6 percent p.a. prior to trading costs. The price-earnings momentum strategy results in an even higher performance of 31.0 percent p.a. Both strategies exhibit monthly Fama-French three-factor alphas of 1.15 percent and 1.71 percent, respectively. These results prove to be robust in light of market frictions, i.e., trading costs of 50 bps per transaction, minimum liquidity requirements and microstructure effects in form of a one-day-waiting rule. An S&P 500 short overlay overproportionally reduces lower partial moment risk measures relative to mean returns, leading to better Sortino ratios. The weekly implementation of all strategies also generates positive and statistically significant returns. However, they are not robust to market frictions, caused by the much higher rebalancing frequency and associated transaction costs.

The rest of this paper is organized as follows: Section 2 provides a structured review of the vast literature about earnings and price momentum. Section 3 covers the data sample used in this study. In section 4, we develop the methodology for the earnings momentum strategies we apply in this paper. Section 5 presents the results and discusses key findings in light of the existing literature. Finally, section 6 concludes and summarizes implications for further research.

2. Background on momentum strategies

The literature on momentum strategies is vast. As of September 2015, there are more than 7,000 direct references to the seminal work of Jegadeesh and Titman (1993) on price momentum and more than 5,000 to the initial report of the earnings momentum effect by Ball and Brown (1968). In the following, we provide a concise overview along three major groups: The first group covers price momentum, the second group analyses earnings momentum and the third group their interactions. Our summary is loosely based on the excellent reviews in Chordia and Shivakumar (2006), Czaja et al. (2013) and Jacobs (2015):

Price momentum: The seminal paper of Jegadeesh and Titman (1993) documents that buying the winners and selling the losers of a K-months formation period leads to significant positive returns over J-months holding periods, with J ranging from 3 to 12 months. This simple strategy has stood the test of time and independent scrutiny. Early evidence by Fama and French (1996) suggests that it is the only anomaly that cannot be explained by their well-known three-factor model. Risk-adjusted excess returns of variations of price momentum strategies have been documented time and again ever since. Many authors interact price momentum with further variables in the formation period - either to explain sources of momentum profits or for augmented returns (Jacobs, 2015):

Market-to-book ratio: Asness (1997) analyses value-momentum strategies and reports improvements of price momentum profits when restraining the strategy to the universe of low-value stocks. Asness et al. (2013) find negative correlation between value and momentum strategies in a truly global setting. Daniel and Titman (1999) and Daniel and Titman (2006) also report stronger momentum for growth than for value firms. *Market capitalization:* Already Jegadeesh and Titman (1993) show that the momentum effect is strongest amongst low capitalization firms. Hong et al. (2000) report that after excluding the smallest capitalization stocks, profitability of price momentum sharply declines with increasing firm size. Zhang (2006) comes to a very similar conclusion. *Turnover:* Lee and Swaminathan (2000) analyze the interaction of trading volume with price momentum and find evidence that the former is predictive for the latter. *Ownership:* Chen et al. (2002) develop a trading strategy based on the breadth of ownership, i.e., the fraction of buyers long in a stock. They find strong correlation between breadth and momentum and relate this result to short-selling constraints in low-breadth stocks. *52 week high:* George and Hwang (2004) compare a 52 week high strategy to the momentum strategy in Jegadeesh and Titman (1993). Specifically, they form portfolios based on stocks' distances to 52 week highs and find that this strategy outperforms classical price momentum. *Return properties during formation:* Grinblatt and Moskowitz (2004) find that return consistency in the formation period strongly affects momentum strategies. Consistent winning during formation can double the return premium of the top momentum portfolio. Conversely, consistent losing seems to have no effect. Bandarchuk and Hilscher (2013) show that enhancing price momentum by the extremity of returns in the formation period leads to higher profitability. Also, the authors argue that their return metric captures the majority of enhanced momentum strategies based on stock-level characteristics. According to their view, "focusing on past returns is sufficient when aiming to maximize momentum profits" (Bandarchuk and Hilscher, 2013, p. 838). *Trading costs:* Korajczyk and Sadka (2004) analyze the profitability of momentum strategies in the light of market frictions. Their results show that profits are not fully eliminated upon consideration of size-induced transaction costs. Conversely, Lesmond et al. (2004) argue that momentum strategies are largely unprofitable after transaction costs. *Information uncertainty:* Jiang et al. (2005) and Zhang (2006) conclude that momentum strategies work better in environments with high information uncertainty. The latter construct is proxied by variables such as firm size, firm age, volatility, turnover, duration of future cash flows, etc. *R squared:* Hou et al. (2006) show that stocks with low R^2 exhibit enhanced price momentum profitability. Thereby, R^2 is the coefficient of determination of a weekly regression of a stocks' returns on the market index and their corresponding Fama-French 48 industries portfolio. *Intermediate momentum:* Novy-Marx (2012) rightfully asks whether momentum really is momentum. From a purely physical perspective, momentum describes the tendency of an object to keep moving in the same direction. Applying this concept to stocks suggests that rising stocks continue to rise and falling stocks continue to fall. Contrary to this intuition, Novy-Marx shows that momentum returns are actually driven by intermediate horizon past performance (12-7 months) instead of recent past performance. This effect is particularly expressed in liquid, large capitalization stocks. *Continuous information arrival:* Da et al. (2014) examine the continuity of information arrival in the formation period and use the latter as additional variable to enhance price momentum. They find that momentum strategies work best on stocks with continuous (as opposed to discrete) information arrival, which does not catch investors' attention. *Weighted signed volume:* Byun et al. (2015) rely on weighted signed volume to measure continuing overreaction and show that it is predictive for future stock returns. Specifically, a momentum strategy based on upward/downward continuing overreaction earns significant positive returns that subsume the classical momentum effect.

Earnings momentum: The anomaly of earnings momentum "refers to the fact that firms reporting unexpectedly high earnings subsequently outperform firms reporting unexpectedly low earnings" (Chordia and Shivakumar, 2006, p. 628). Two major approaches exist: Earnings momentum based on analysts' earnings estimates revisions and earnings momentum based on earnings surprises. The former strategies capitalize on a post-revision stock price drift, the latter on a post-earnings surprise stock price drift. We briefly summarize the literature along these two groups:

Earnings surprises: The post-earnings announcement drift was originally documented by Ball and Brown (1968), who report abnormal returns after actual earnings surprises. Watts (1978), Rendleman et al. (1982) and Foster et al. (1984) were among the first to replicate the strategy. They largely confirm the original results and find them to be robust relative to the Capital Asset Pricing Model. Bernard and Thomas (1989) attribute the abnormal returns to a delayed price response. Along the same line, Chan et al. (1996) find that the market underreacts to past earnings news. Booth et al. (1996) provide initial international evidence of this phenomenon for Finland and Hew et al. (1996) for the United Kingdom. Doyle et al. (2006) define earnings surprises relative to analyst forecasts as opposed to a time series model. They report larger risk-adjusted returns of higher persistence than previous studies. Livnat and Mendenhall (2006) pursue a similar approach and actually show that earnings surprises based on the Institutional Brokers' Estimate System I/B/E/S lead to superior results than earnings surprises based on Compustat data and time series models. Hirshleifer et al. (2009) elaborate on the subject of investor underreaction as potential cause for momentum profits. They find that the post-earnings announcement drift is much more pronounced in case of high investor distraction / limited investor attention - a prominent potential cause of underreaction. Balakrishnan et al. (2010) develop an alternative strategy relying on a post loss/profit announcement drift, whereby the extreme losing or winning deciles are targeted. Their anomaly is incremental to previously documented anomalies of this area. Finally, Loh and Warachka (2012) argue that the market exhibits underreaction in light of streaks of consecutive earnings surprises of the same sign.

Earnings estimates revisions: Givoly and Lakonishok (1979) analyze the impact of analysts' earnings estimates revisions and future returns. They find significant abnormal returns for the two-month period following a revision. Givoly and Lakonishok (1980) construct a corresponding trading strategy to this anomaly. Zacks (1979) and Hawkins et al. (1984) run similar analyses from a practitioner's perspective. Fried and Givoly (1982) elaborate on the quality of analysts' earnings forecasts as proxy for the market expectations of earnings relative to other commonly used prediction models. They argue that earnings forecasts are superior to forecasts from time series models. Stickel (1991) provide further evidence for earnings estimate revisions strategies in the U.S. market and Emanuelli and Pearson (1994) as well as Hong and Susmel (2003) in international settings. A differentiation between several types of revisions is initially provided by Gleason and Lee (2003). They find that the delayed price response is affected by revision quantity (i.e., revision magnitude), revision quality (i.e., level of innovation and analyst ranking) and the density of analyst coverage for the stock in question.

Interactions between price and earnings momentum: Chan et al. (1996) aim at determining the interactions between price and momentum strategies. They find that both momentum approaches have incremental explanatory power for the prediction of future returns and neither strategy subsumes the other. Instead, both rely on underreaction to distinctly separate pieces of information. Conversely, Chordia and Shivakumar (2006) find that price momentum is largely subsumed by the systematic component of earnings momentum. Their results can nevertheless be reconciliated with Chan et al. (1996), who focus on the firm-specific instead of the systematic part of earnings momentum.

3. Data and software

SIP contains data for approximately 10,000 U.S. listed companies, thereof 2,658 NYSE, 363 AMEX, 2,613 NASDAQ Capital, Global and Global Select markets as well as 4,403 NASDAQ Bulletin Board stocks. Moreover, 257 Real Estate Investment Trusts and 503 American Depositary Receipts are included (Lan, 2011). For each stock, more than 2,200 data fields are available, originally supplied to AAII's SIP by Thomson Reuters. Earnings estimates are provided by Thomson Reuters I/B/E/S.

The advantage of SIP versus raw databases such as CRSP and Thomson Reuters Datastream is mainly concentrated on its simplicity, making it highly suitable for analyzing feasible momentum strategies from an investor's perspective. An everyday investor may not have access to expensive professional databases and may not have the programming capabilities to implement complex strategies. SIP addresses both issues: First, it consolidates relevant data from Thomson Reuters for each stock. Second, there are more than sixty strategies pre-implemented - one of them earnings momentum. As such, individual investors are able to obtain a list of stocks to buy and sell simply by pressing a few buttons.

Following this spirit, we obtain the full investment universe and all data relevant to the strategy for any given month's end from January 2005 until April 2015 and for any given week's end from January 2005 until beginning of May 2015. We then apply the pre-defined filtering criteria described in section 4 to obtain stocks exhibiting earnings momentum for each month and week.

When scrutinizing the data, we recognize that the AAII earnings momentum portfolios rely on unadjusted prices supplied by Thomson Reuters. In order to fully account for all corporate actions and stock splits, we match the SIP stocks required during backtesting with Thomson Reuters Datastream and obtain the corresponding return indices. The latter are based on the adjusted price and include all corporate actions, for example, dividend payments. Our matching accuracy between SIP and Datastream exceeds 98 percent; all remaining stocks are excluded from the analysis.

4. Methodology

4.1 Momentum strategies

Earnings momentum: We closely follow the backtesting procedure proposed by AAII (2015). Certainly, it is pragmatic, but nevertheless closely related to the methodologies described in the earnings estimates revisions literature depicted above. We use the software SIP to obtain the investment universe at the end of each month (week) from 2005-2015, as described in section 3. Next, for each month (week), we apply a total of seven screening criteria - see AAII (2015) for the criteria here below. (1) We eliminate all stocks from the investment universe with less than five analysts providing estimates for the current fiscal year t. This filter excludes most low capitalization stocks not in the focus of investors' attention. (2) The most recent earnings per share (EPS) estimate for the current fiscal year t exceeds the estimate one month ago. (3) The most recent EPS estimate for the next fiscal year $t+1$ exceeds the estimate one month ago. (4) At least one upward revision of the EPS estimate for the current fiscal year t occurred over the last month. (5) No downward revision of the EPS estimate for the current fiscal year t occurred over the last month. (6) At least one upward revision of the EPS estimate for the next fiscal year $t+1$ occurred over the last month. (7) No downward revision of the EPS estimate for the next fiscal year $t+1$ occurred over the last month.

Of the firms fulfilling all of the above screening criteria, we calculate the percentage increase of the consensus EPS revision of the current fiscal year t. All companies with at least five percent upward revision are included on the long-side of the portfolio. We invest one dollar in each company and compute equal-weighted as well as value-weighted average returns for every month (week). Rebalancing of the portfolio occurs each month (week): A stock is sold and immediately re-purchased in case it achieves revisions of at least five percent twice in a row. Divestment occurs if a company does not fulfill the screening criteria anymore in the next period.

Price-earnings momentum: Next, we conceptualize a new approach that we call price-earnings momentum. The literature is still vacillating on finding explanations for the profitability of earnings momentum strategies. Some studies argue that investor overreaction and positive feedback trading drive momentum profits (Daniel et al., 1998; De Long et al., 1990). Others favor investor underreaction as possible cause of abnormal returns (Hirshleifer et al., 2009). Following the last stream of literature and the work of George and Hwang (2004), we introduce distance to 52 week high as metric to identify stocks exhibiting potentially stronger underreactions and thus potentially higher return predictability. The choice of this measure is primarily simplicity, following the mainstay of this article to examine a feasible strategy. As George and Hwang (2004, p. 2146) rightfully point out, "virtually every newspaper that publishes stock prices also identifies those that hit 52 week highs and lows" - so this KPI is readily available to any investor.

We conjecture that stocks with higher distance from their 52 week high may benefit more from upward earnings estimates revisions. The farther the most recent price from the past high, the worse the impact of the most recent news and the weaker the most recent performance of the stock. We interpret weak performance as a form of diminishing investor attention in the sense of a "sell and forget" mentality. This behavior relates to a psychological phenomenon called "anchoring", initially documented by Tversky and Kahneman (1974). Thereby, people focus too strongly on a point of reference when making estimates. With higher distance to the 52 week high as point of reference, we conjecture that positive surprises, such as upward revisions then lead to stronger underreaction as it takes investors a longer time to revise their priors. Hence, we expect upward revision to have a higher impact on such neglected stocks than on those quoting close to their 52 week high. Also, there is a complementary explanation. Anti-cyclical, technical traders are bound to consider such a stock as "oversold", ready to drive prices up upon the arrival of good news. Conversely, stocks near to their 52 week high have experienced good news time and again, driving the price to such quotations. Another positive surprise at an already high level is more likely to be anticipated and thus incorporated more quickly in case of its manifestation. In order to test this reasoning, we develop a 52 week high closeness measure, following George and Hwang (2004):

$$C_t = \frac{P_{i,t}}{Hi,t} \tag{1}$$

Thereby, $P_{i,t}$ is the current closing price on day t and $H_{i,t}$ denotes the highest daily closing price of stock i in the past year ending on day t. We next apply the closeness measure to the subgroup of stocks with more than five percent upward earnings estimates revisions - let us call them earnings momentum stocks. The median closeness measure of this group is set as cutoff point. Specifically, a stock is only included on the long-side of the portfolio, if it is an earnings momentum stock with below-median closeness measure. We shall call this group price-earnings momentum stocks. The remaining portfolio formation and rebalancing process stays as described in 4.1. Comparing the performance of price momentum stocks with the performance of price-earnings momentum stocks will show if our conjecture holds in reality.

Note: Our reasoning somewhat differs from that of George and Hwang (2004), even though they use the same metric. The authors argue that stocks at or near their 52 week high exhibit underreaction, because investors are unwilling to push prices past this important mark. Once information prevails, prices adjust and the upward trend continues. The same logic applies to stocks far from their 52 week high, albeit with reversed trading direction. However, the authors hold their positions for 6 months, giving investors time to gradually reduce the mispricing. Conversely, our holding time is just one month (week), meaning that we address a much shorter time frame. Thus, we hypothesize that in the group of earnings momentum stocks (i.e., a fundamental factor), the one's with below-median price performance (i.e., a technical factor), exhibit a short-term upward reversal effect. The salient point is that positive news should arrive more unexpectedly in this case, leading to more vigorous upward price reactions.

Trading frequency: As mentioned throughout the last paragraphs, we have weekly and monthly data at our disposal. In the baseline approach, we rebalance the portfolio on a monthly basis, following AAII. Conversely, we test if rebalancing on a weekly basis leads to improved results. Clearly, we face higher trading costs due to much more elevated trading frequencies. Nevertheless, acting faster upon the arrival of new information may lead to higher risk-adjusted returns. For example, let us assume a stock fulfills all screening criteria of the price-earnings momentum strategy. In the case of monthly portfolio formation, we may have up to a three week waiting time prior to including it in the portfolio. Much of the alpha may already have disappeared in this case - depending on how much time it takes to reduce underreaction to new information. Hence, we also implement weekly variants of all strategies.

4.2 Considerations on feasibility

Short-selling restrictions: Short-selling restrictions are relevant for many investors. Nonsophisticated investors may abstain from it due to the higher risk and complexity involved, and institutional investors frequently underlie regulatory constraints. As such, we first implement a long-only version of the strategy, only including the stocks exhibiting earnings momentum or the stocks exhibiting price-earnings momentum. Second, we also consider a long-short strategy. In this respect, AAII also provides a screen for downward revisions, capturing stocks with at least minus 5 percent earnings estimates revisions. However, the feasibility of momentum strategies is more aggressively challenged on the short-side of the portfolio (Korajczyk and Sadka, 2004; Lesmond et al., 2004). In light of these restrictions, we opt for a simple solution, following Ammann et al. (2011): We create a dollar-neutral portfolio by going short the same dollar amount in the S&P 500 as we are invested in the firms exhibiting upward revisions. Clearly, this strategy is not necessarily market neutral, since the long-portfolio may very well exhibit an aggregate beta unequal to one as well as exposures to further systematic risk factors. Of course, the latter remain unhedged. On the other hand, this long-short strategy is easy to implement for any kind of investor.

Further market frictions: Finally, we incorporate market frictions for all of the above mentioned strategies. First, according to Jones (2002); Do and Faff (2012), average commissions can be estimated with 13 basis points (bps) from 1989 to 2009 and with 8 bps from 2007 to 2009. In our study, we assume 10 bps, which corresponds to current offerings of discount brokers and is thus already feasible for individual investors, see Bogomolov (2013). Second, we provide pragmatic estimations for market impact for earnings momentum strategies. Unfortunately, the data samples of the studies of Korajczyk and Sadka (2004) as well as Lesmond et al. (2004) end before ours begins. In the meantime, liquidity has increased and trading costs have decreased. However, Do and Faff (2012) have studied market impact of a relative-value strategy on the U.S. stock universe, which we use as point of reference. They estimate market impact in form of bid-ask spreads to be at 20 bps per stock for the period from 1989 to 2009. Earlier, Gatev et al. (2006) suggest a higher market impact of approximately 35 bps for the same strategy. This figure is consistent with findings by Petersen and Fialkowski (1994), who estimate average effective spread at 37 bps for all stocks in the CRSP database in 1991. If we only include stocks with above-median capitalization, spreads decline to 29 bps. Considering that this study dates back to 1991, the introduction of decimalization and the digitization of the industry should have considerably eroded bid-ask spreads. We do not aim to provide an in-depth analysis of market impact in this paper, but instead a fair and just approximation. Given the above information and the fact that companies with 5 or more analysts are usually larger and exhibit better liquidity, we conservatively assume bid-ask spreads to be at 30 bps. We pragmatically validate this figure by extracting bid-ask spreads for the earnings momentum portfolio of August 2015, consisting of 51 stocks, from Interactive Brokers at one random point in time. The median bid-ask spread lies at 0.28 percent and confirms our assumption. Hence, in total, we consider trading costs of 50 bps, i.e., one-time bid-ask spread plus two-times commissions. Third, we cover liquidity constraints. In any case, the suggested earnings momentum strategy primarily selects larger capitalization stocks due to a minimum analyst coverage of five. As such, liquidity should not be a major concern compared to a universe of small cap stocks. However, to ensure feasibility, we also run variants of the strategy excluding stocks with daily trading volume below predefined liquidity thresholds. Fourth, we incorporate a one-day-waiting rule to consider the effect of potential microstructure factors, such as the bid-ask bounce (Gatev et al., 2006). It means, that we delay transactions by one day after the signal.

5. Results

We run a fully-fledged performance evaluation. In particular, we examine the return distribution, perform a value at risk analysis, check the risk-return characteristics and evaluate typical drawdown measures. Finally, we assess the exposure to common systematic sources of risk, using different factor models. Thereby, we heavily rely on the statistical software `R`, and most notably, the package `PerformanceAnalytics` by Peterson and Carl (2014). The selected return and risk metrics are discussed in detail in Bacon (2008). All depicted KPIs encompass the entire sample period from January 2005 to April 2015 in case of monthly rebalancing and from January 2005 to beginning of May 2015 in case of weekly rebalancing.

5.1 Monthly rebalancing

Return characteristics: In table 1, the return characteristics of the monthly long-only earnings momentum (E-L), the long-short earnings momentum (E-LS), the long-only price-earnings momentum (PE-L) and long-short price-earnings momentum (PE-LS) strategies are depicted. As potential benchmarks, we select the S&P500, the S&P500 Mid Cap 400 (S&PM) and the MSCI Momentum index (MSMOM). We see that the E-L strategy exhibits high and statistically significant equal-weighted (EW) mean returns of 1.98 percent per month with a Newey-West (NW) t-statistic of 3.70. The E-LS strategy generates lower but significant EW mean returns of 1.28 percent, albeit at much lower levels of volatility. The PE strategy leads to improvements in raw returns with 2.59 percent in case of the long-only and 1.88 percent in case of the long-short strategy - both statistically significant. Again, the short overlay reduces standard deviation. We summarize that the raw returns of both strategy variants are large in a statistical as well as economical sense. The earnings momentum strategies seem to be highly profitable and the price-earnings momentum alternative results in the conjectured improvements, albeit at higher volatility levels. All benchmarks are outperformed by far - their returns are statistically insignificant and do not exceed one percent per month. The remainder of table 1 characterizes the return distributions. All momentum strategies except E-L are positively skewed, indicating fatter right than left tails - a favorable property for investors. Conversely, all benchmarks are negatively skewed. PE-LS is leptokurtic and all other variants as well as the benchmarks exhibit platykurtic distributions - contrary to financial market returns of higher frequencies.

Value at risk: Table 2 reports monthly value at risk (VaR) measures. Primarily, we depict the historical VaR, as defined in Mina and Xiao (2001). In line with Huisman et al. (1999) and Favre and Galeano (2002), we additionally show the Cornish-Fisher (CF) VaR, which leads to better results in case the higher moments are clearly different from those of a normal distribution. The E-L strategy exhibits pronounced tail risk with historical VaR (1%) of -0.1315 and is thus roughly in accordance with relevant benchmarks. We make similar observations for the CF VaR and the maximum drawdown. The PE-L strategy exceeds the tail risk of most benchmarks, irrespective of the VaR metric considered. The short overlay results in substantial improvements for both variants and reduces value at risk levels by approximately 50 percent, making these strategies well superior

	E-L	E-LS	PE-L	PE-LS	S&P500	S&PM	MSMOM
Value-weighted mean	0.0211	0.0134	0.0236	0.0159	0.0072	0.0094	0.0087
Equal-weighted mean	0.0198	0.0128	0.0259	0.0188	0.0072	0.0094	0.0087
Standard error (NW)	0.0054	0.0034	0.0073	0.0063	0.0044	0.0051	0.0048
t-Statistic (NW)	3.6995	3.7406	3.5313	2.9684	1.6243	1.8353	1.8122
Minimum	-0.1575	-0.0948	-0.1713	-0.0892	-0.1680	-0.2174	-0.1551
Quartile 1	-0.0204	-0.0117	-0.0184	-0.0172	-0.0145	-0.0163	-0.0109
Median	0.0279	0.0102	0.0221	0.0127	0.0132	0.0156	0.0177
Quartile 3	0.0616	0.0407	0.0669	0.0442	0.0320	0.0425	0.0403
Maximum	0.1879	0.1490	0.3014	0.3827	0.1093	0.1487	0.1106
Share with return > 0	0.6371	0.6210	0.6210	0.6290	0.6532	0.6290	0.6210
Standard deviation	0.0629	0.0425	0.0808	0.0659	0.0421	0.0505	0.0460
Skewness	-0.2078	0.3385	0.5868	1.8864	-0.8274	-0.7838	-0.9724
Kurtosis	0.1113	0.3920	1.5714	7.4858	2.1078	2.7651	1.4342

Table 1: Return characteristics of monthly momentum strategies versus benchmarks.

to all benchmarks. On the same note, maximum drawdown drops from 0.3943 (E-L) to a level of 0.1859 (E-LS) and from 0.4025 (PE-L) to 0.2170 (PE-LS), which is a clear improvement relative to the benchmarks with values around 0.50. We summarize that the long-short variants show favorable tail risk characteristics compared to the original strategies and to their benchmarks.

	E-L	E-LS	PE-L	PE-LS	S&P500	S&PM	MSMOM
Historical VaR 1%	-0.1315	-0.0667	-0.1593	-0.0887	-0.1025	-0.1068	-0.1378
CF VaR 1%	-0.1362	-0.0771	-0.1457	-0.0698	-0.1257	-0.1574	-0.1298
Historical CVaR 1%	-0.1452	-0.0816	-0.1654	-0.0892	-0.1372	-0.1623	-0.1497
CF CVaR 1%	-0.1633	-0.0843	-0.1457	-0.0698	-0.1501	-0.1574	-0.1926
Historical VaR 5%	-0.0862	-0.0500	-0.0854	-0.0711	-0.0715	-0.0719	-0.0817
CF VaR 5%	-0.0868	-0.0523	-0.0900	-0.0397	-0.0693	-0.0811	-0.0773
Historical CVaR 5%	-0.1128	-0.0631	-0.1247	-0.0816	-0.0977	-0.1092	-0.1116
CF CVaR 5%	-0.1173	-0.0670	-0.1139	-0.1268	-0.1102	-0.1388	-0.1107
Minimum	-0.1575	-0.0948	-0.1713	-0.0892	-0.1680	-0.2174	-0.1551
Share with return ≤ 0	0.3629	0.3790	0.3790	0.3710	0.3468	0.3710	0.3790
Maximum drawdown	0.3943	0.1859	0.4025	0.2170	0.5095	0.4962	0.5172

Table 2: Monthly value at risk of monthly momentum strategies versus benchmarks.

Annualized risk-return characteristics: In table 3, we focus on annualized risk-return ratios, providing the return an investor obtains per unit of risk. All measures are based on EW returns. The Sharpe ratio is defined as excess return scaled by standard deviation. Both long-only variants exhibit the highest Sharpe ratios slightly above 1.00. Contrary to the VaR analysis, the short overlay has an adverse effect, leading to values close to 0.90 - the decline in mean excess return is higher than the risk reduction in terms of standard deviation. However, all variants exceed their benchmarks by far - the S&P500 Mid Cap 400 is the winner among the indices with a value of 0.50. This tendency is confirmed by the remaining risk-return metrics. The Sortino ratio scales the strategies' returns by their downside deviation. Its advantage lies in the lower partial moment metric in the denominator, which only measures downside deviations as actual risk (compared to favorable upward deviations). We see that the LS strategies now outperform the L strategies, caused by a higher decline in downside risk compared to the decline in mean return. The Upside Potential ratio is an enhancement of the Sortino ratio. Its numerator reflects upside deviations and its denominator downside deviations. Also in this case, the LS strategies outperform the L strategies, indicating a better relation of upside to downside movements. The Information ratio is recommended compared to the original Sharpe ratio. It is defined as the active premium, meaning the outperformance of an investment relative to an adequate benchmark scaled by its tracking error. In respect to this metric, the L strategies are clearly superior compared to the LS strategies and all benchmarks. This result is not surprising, given the fact that we have chosen the general market index as benchmark. Hence, the short overlays clearly produce higher tracking errors at lower return levels, resulting in lower information ratios. Finally, Omega is a probability-weighted gain-loss ratio, taking into account all higher moments. The LS strategies achieve very similar values and clearly outperform the L strategies and all benchmarks. In a nutshell, from a risk-return perspective, all strategy variants outperform their benchmarks. When considering classical volatility measures, the L strategies are superior to the LS strategies. With the introduction of lower partial moment metrics, this result reverses.

Drawdown measures: Table 4 reports advanced drawdown metrics. Sterling and Calmar ratio both scale annualized return by the absolute value of maximum drawdown. In case of the Sterling ratio, the latter is augmented by convention by an additional 10 percent excess risk buffer. Considering the Calmar ratio, we see that the annual return of the E-L strategy is roughly 60 percent of the magnitude of maximum drawdown. This value improves to approximately 82 percent in case of the E-LS strategy. The price-earnings momentum strategies yield even better results with ratios of 77 percent (PE-L) and 102 percent (PE-LS), respectively. All benchmarks are clearly inferior

	E-L	E-LS	PE-L	PE-LS	S&P500	S&PM	MSMOM
Return	0.2364	0.1523	0.3100	0.2219	0.0783	0.1023	0.0953
Excess return	0.2199	0.1369	0.2924	0.2054	0.0638	0.0874	0.0806
Active premium	0.1559	0.0718	0.2295	0.1413	-0.0022	0.0218	0.0148
Standard deviation	0.2181	0.1471	0.2798	0.2284	0.1458	0.1749	0.1595
Downside deviation	0.1250	0.0759	0.1382	0.0949	0.1013	0.1187	0.1120
Tracking error	0.1403	0.1933	0.2225	0.2588	0.0149	0.0524	0.0739
Sharpe ratio	1.0085	0.9310	1.0450	0.8995	0.4374	0.5001	0.5052
Sortino ratio	1.8910	2.0073	2.2438	2.3382	0.7730	0.8621	0.8512
Updside Potential ratio	3.5249	3.7269	3.8631	4.1177	2.3469	2.4650	2.4616
Information ratio	1.1112	0.3714	1.0312	0.5460	-0.1478	0.4161	0.2004
Omega	2.1694	2.1808	2.3879	2.3695	1.5706	1.6323	1.6089

Table 3: Annualized risk-return characteristics of monthly momentum strategies versus benchmarks.

with values below 21 percent. The Burke ratio is defined as annualized excess return scaled by the Euclidean norm of the drawdowns. This measure incorporates a total of d drawdowns, thereby putting more weight on the larger ones. Nevertheless, we see a similar picture as for Sterling and Calmar ratios: Earnings momentum strategies achieve higher returns relative to this drawdown risk metric compared to their benchmarks and LS strategies outperform L strategies. Pain index is the L1 norm of all drawdowns divided by the number of observations in the series, providing a mean drawdown per observation. Similarly, the Ulcer index is defined as "root-mean square measure of retracement" (Martin and McCann, 1989, p. 80), measuring the depth as well as duration of drawdowns. Across both metrics, the earnings momentum strategies exhibit lower average drawdown risk than their benchmarks, with the long-short strategies in the lead. Dividing the mean excess return by Pain or Ulcer index results in the Pain or Martin ratio, respectively. Once again, these metrics indicate an equal performance or even an outperformance of the long-short strategies relative to the long-only strategies, caused by strongly reduced drawdown risk.

Common risk factors: Finally, we are interested in the exposure of the strategies to common systematic sources of risk. In this respect, we perform three types of regressions. First, we use the standard Fama-French three-factor model (FF3), following Fama and French (1996). The latter captures exposure to the market, small minus big capitalization stocks (SMB) and high minus low book-to-market stocks (HML). Second, we enhance this model by a momentum factor similar to Carhart (1997) and a short-term reversal factor similar to Gatev et al. (2006). We call this

	E-L	E-LS	PE-L	PE-LS	S&P500	S&PM	MSMOM
Sterling ratio	0.4783	0.5328	0.6169	0.6998	0.1285	0.1717	0.1545
Calmar ratio	0.5996	0.8193	0.7702	1.0222	0.1538	0.2063	0.1844
Burke ratio	0.3419	0.4110	0.4848	0.5111	0.1284	0.1479	0.1324
Pain index	0.0502	0.0272	0.0509	0.0363	0.0899	0.0717	0.1027
Ulcer index	0.1048	0.0482	0.0985	0.0604	0.1710	0.1445	0.1911
Pain ratio	4.3790	5.0378	5.7474	5.6616	0.7090	1.2194	0.7848
Martin ratio	2.0977	2.8424	2.9698	3.4027	0.3729	0.6053	0.4215

Table 4: Drawdown measures of monthly momentum strategies versus benchmarks.

model Fama-French 3+2-factor model (FF3+2). Third, we use the newly developed Fama-French five-factor model, following Fama and French (2015). It is rooted in the three-factor model (FF5), enhanced by two additional factors, i.e., portfolios of stocks with robust minus weak profitability (RMW) and with conservative minus aggressive (CMA) investment behavior. All data related to these factor models is downloaded from Kenneth R. French's website[1]. Findings for the earnings momentum strategies are summarized in table 5 and for the price-earings momentum strategies in table 6. The left-hand side depicts the results for the long-only and the right-hand side for the long-short variant. Standard errors are depicted in parentheses.

Earnings momentum: Regarding the long-only E-L strategy, we see that around fifty percent of equal-weighted mean returns of 0.0198 can be attributed to systematic sources of risk. Depending on the model, the statistically significant alpha varies between 0.0092 and 0.0115 per month. We see that the long-only strategy loads on the market with a beta close to one. This finding comes at no surprise, given that the strategy holds on average 37 stocks per month, thereby closely reflecting the development of the market index. The SMB factor is also statistically significant with a coefficient close to 0.70 across all models, indicating that the strategy approximately loads on medium-sized companies. The HML factor is only significant at the five percent level and only for FF3. Its negative coefficient suggests exposure to "glamour" stocks with low book-to-market value. The momentum factor is statistically and economically insignificant, meaning that price momentum has no further contribution. The same applies to the short-term reversal factor. Interestingly enough, the recent Fama-French five factor model also does not offer any additional explanatory power, with statistically insignificant RMW and CMA factors. Regarding the long-short E-L strategy,

[1]We thank Kenneth R. French for providing all relevant data for these models on his website.

	E-L strategy			E-LS strategy		
	FF3	FF3+2	FF5	FF3	FF3+2	FF5
(Intercept)	0.0115***	0.0109**	0.0092*	0.0105**	0.0100**	0.0094*
	(0.0034)	(0.0034)	(0.0042)	(0.0034)	(0.0034)	(0.0043)
Market	1.0295***	1.1092***	1.0203***	0.0333	0.1107	0.0181
	(0.0891)	(0.0973)	(0.0916)	(0.0903)	(0.0988)	(0.0932)
SMB	0.6894***	0.6803***		0.8372***	0.8284***	
	(0.1632)	(0.1621)		(0.1655)	(0.1647)	
HML	−0.3729*	−0.2868		−0.4026**	−0.3189*	
	(0.1496)	(0.1544)		(0.1517)	(0.1568)	
Momentum		0.1401			0.1362	
		(0.0776)			(0.0788)	
Reversal		−0.1233			−0.1193	
		(0.1167)			(0.1185)	
SMB5			0.6901***			0.8338***
			(0.1626)			(0.1653)
HML5			−0.3897*			−0.4195*
			(0.1751)			(0.1781)
RMW5			2.0958			1.1713
			(2.1673)			(2.2037)
CMA5			−0.2527			−0.2821
			(0.2964)			(0.3014)
R^2	0.6608	0.6731	0.6657	0.2314	0.2569	0.2381
Adj. R^2	0.6523	0.6593	0.6515	0.2122	0.2254	0.2058
Num. obs.	124	124	124	124	124	124
RMSE	0.0371	0.0368	0.0372	0.0377	0.0373	0.0378

$^{***}p < 0.001$, $^{**}p < 0.01$, $^{*}p < 0.05$

Table 5: Exposure to systematic sources of risk earnings momentum strategies.

we observe the following changes. Equal-weighted mean returns of 0.0128 can basically not be explained by the models anymore, with statistically and economically significant alphas varying between 0.0094 and 0.0105 per month. Due to the short overlay, loading on the market virtually disappears. All other factors retain their statistical significance. Nevertheless, the R^2 deteriorates from levels exceeding 65 percent in case of the long-only strategy to levels around 25 percent in case of the long-short strategy. This finding indicates that the majority of explanatory power stems from exposure to the general market index.

Price-earnings momentum: Regarding the long-only PE-L strategy, we see that the majority of the equal-weighted mean return of 0.0259 cannot be explained by systematic sources of risk. Statistically and economically significant alphas vary between 0.0171 and 0.0198 - depending on the

	PE-L strategy			PE-LS strategy		
	FF3	FF3+2	FF5	FF3	FF3+2	FF5
(Intercept)	0.0171**	0.0179**	0.0198**	0.0162**	0.0170**	0.0199**
	(0.0054)	(0.0053)	(0.0068)	(0.0054)	(0.0054)	(0.0069)
Market	1.0480***	0.9275***	1.0161***	0.0518	−0.0710	0.0139
	(0.1423)	(0.1551)	(0.1471)	(0.1437)	(0.1566)	(0.1484)
SMB	0.9845***	1.0085***		1.1323***	1.1566***	
	(0.2607)	(0.2584)		(0.2633)	(0.2609)	
HML	−0.7089**	−0.8624***		−0.7386**	−0.8945***	
	(0.2390)	(0.2461)		(0.2414)	(0.2485)	
Momentum		−0.2607*			−0.2646*	
		(0.1236)			(0.1248)	
Reversal		0.1320			0.1359	
		(0.1859)			(0.1877)	
SMB5			0.9581***			1.1018***
			(0.2611)			(0.2634)
HML5			−0.6797*			−0.7095*
			(0.2813)			(0.2837)
RMW5			−1.9706			−2.8951
			(3.4807)			(3.5109)
CMA5			−0.4070			−0.4364
			(0.4760)			(0.4802)
R^2	0.4762	0.4974	0.4780	0.1982	0.2312	0.2030
Adj. R^2	0.4631	0.4762	0.4559	0.1782	0.1986	0.1692
Num. obs.	124	124	124	124	124	124
RMSE	0.0593	0.0586	0.0597	0.0599	0.0592	0.0602

$^{***}p < 0.001$, $^{**}p < 0.01$, $^{*}p < 0.05$

Table 6: Exposure to systematic sources of risk price-earnings momentum strategies.

model. The factor loadings and their significance levels are very similar to the E-L strategy, albeit with increasing magnitude on the SMB and HML factor. The latter indicates that this strategy shows stronger exposure to smaller firms with even lower book-to-market value. Focusing on companies with below-median distance to 52 week high leads to negative loadings on the momentum factor in the second model at the five percent significance level, showing that we successfully select medium-term losers. This effect is unique to the price-earnings momentum strategy - the previous approach in table 5 exhibits a positive loading on the momentum factor, albeit not significant. Yet again, we do not gain additional explanatory power through the short-term reversal, the RMW or the CMA factors in the enhanced models. Regarding the long-short E-L strategy, we observe similar changes as before. Exposure to the general market disappears, and all other factor loadings become higher in magnitude at similar level of significance. Again, the R^2 declines with the introduction of the short overlay. The statistically significant alpha ranges between 0.0162 and 0.0199 per month - depending on the model.

Market frictions: In this paragraph, we evaluate the robustness of the strategies in light of market frictions. Most notably, we consider (a) a one-day-waiting rule, (b) liquidity constraints and (c) trading costs of 50 bps. Table 7 depicts the EW returns of the strategies and the average number of positions per month. The asterisk denotes an active one-day-waiting rule after the signal and VOL denotes a minimum threshold of trading volume in thousands USD on the day of the signal. We see that the delay by one day only has a marginal effect on returns of approximately -15 bps across all strategies and liquidity thresholds. An exception are the PE-L and the PE-LS strategy at the maximum liquidity threshold with declines of approximately 40 bps. The salient point is that the strategy is fully robust to a delay in implementation and thus also feasible in case of slow execution. Upon demanding minimum liquidity thresholds, we see that minimum trading volumes on the day of the signal of USD 100 k and USD 1,000 k only have a marginal impact. Strategy performance and the number of positions basically do not change. However, demanding a minimum trading volume of USD 10,000 k leads to a reduction in mean returns of approximately 25 bps across all strategies and brings down the average number of positions by more than 40 percent. However, even after consideration of the most rigid liquidity threshold and the one-day-waiting rule, monthly equal-weighted returns are ranging between 0.0082 (E-LS*) and 0.0222 (PE-L), which are clearly robust to trading costs of 50 bps. Quintessentially, we conclude that the strategies are feasible in light of market frictions, posing a severe challenge to the semi-strong form of market efficiency.

5.2 Weekly rebalancing

In this subsection, we test if weekly rebalancing leads to improvements of the monthly earnings momentum strategies. As discussed in subsection 5.1, acting faster upon the arrival of new information may result in higher returns.

Equal-weighted monthly returns								
VOL	E-L	E-L*	E-LS	E-LS*	PE-L	PE-L*	PE-LS	PE-LS*
-	0.0198	0.0183	0.0128	0.0112	0.0259	0.0255	0.0188	0.0185
100	0.0204	0.0189	0.0134	0.0119	0.0272	0.0268	0.0202	0.0197
1,000	0.0200	0.0184	0.0130	0.0114	0.0264	0.0256	0.0194	0.0186
10,000	0.0162	0.0153	0.0091	0.0082	0.0262	0.0222	0.0191	0.0152

Average number of positions								
VOL	E-L	E-L*	E-LS	E-LS*	PE-L	PE-L*	PE-LS	PE-LS*
-	37.90	37.90	38.90	38.90	18.72	18.69	19.72	19.69
100	37.52	37.52	38.52	38.52	18.45	18.41	19.45	19.41
1,000	35.35	35.35	36.35	36.35	16.81	16.85	17.81	17.85
10,000	23.06	23.10	24.06	24.10	9.61	9.70	10.61	10.70

Table 7: Liquidity constraints of monthly momentum strategies.

Return characteristics: In table 8, we see that the equal-weighted mean of the E-L strategy lies at 0.50 percent, and that of the EP-L strategy at 0.57 percent per week. The corresponding returns of the long-short strategies are again lower at reduced levels of volatility. All returns are statistically significant with Newey-West t-statistics above 3. However, contrasting weekly returns with trading cost estimates of 50 bps of section 4.2, we see that the returns of the most profitable strategy diminish to 7 bps per week. The one-day-waiting rule and liquidity effects of the last paragraph would reduce returns below zero, rendering these strategies effectively unfeasible.

Interestingly enough, the delta between the EW mean returns of the long-only earnings momentum strategy versus the long-only price-earnings momentum strategy are less expressed than in the monthly case. Specifically, monthly rebalancing leads to mean returns of 1.98 versus 2.59 percent per month, i.e., an increase of 31 percent. Conversely, weekly rebalancing results in mean returns of 0.50 versus 0.57 percent per week, i.e., an increase of 14 percent. The latter is an indication that the post upward revision drift occurs faster for earnings-momentum stocks than for price-earnings momentum stocks. This performance gap may carefully be interpreted as evidence that price-earnings momentum stocks show stronger underreactions, that are only partially corrected within the first week.

	E-L	E-LS	EP-L	EP-LS	S&P500	S&PM	MSMOM
Value-weighted mean	0.0048	0.0035	0.0053	0.0040	0.0018	0.0023	0.0021
Equal-weighted mean	0.0050	0.0032	0.0057	0.0039	0.0018	0.0023	0.0021
Standard error (NW)	0.0014	0.0009	0.0017	0.0013	0.0010	0.0012	0.0011
t-Statistic (NW)	3.5558	3.5532	3.2605	3.0023	1.8067	1.9614	2.0133
Minimum	-0.1754	-0.1145	-0.1963	-0.1287	-0.1814	-0.1691	-0.1478
Quartile 1	-0.0130	-0.0092	-0.0171	-0.0134	-0.0097	-0.0119	-0.0102
Median	0.0072	0.0052	0.0067	0.0048	0.0026	0.0039	0.0042
Quartile 3	0.0264	0.0162	0.0294	0.0202	0.0146	0.0175	0.0164
Maximum	0.1297	0.0803	0.1770	0.1391	0.1209	0.1661	0.1010
Share with return > 0	0.5974	0.5826	0.5677	0.5751	0.5696	0.5751	0.5918
Standard deviation	0.0357	0.0226	0.0435	0.0314	0.0250	0.0297	0.0257
Skewness	-0.4701	-0.4905	-0.0729	0.2276	-0.5924	-0.3178	-0.6212
Kurtosis	2.1532	2.8008	2.4303	2.9180	7.4794	5.6475	3.6462

Table 8: Return characteristics of weekly momentum strategies versus benchmarks.

6. Conclusion

We have thoroughly analyzed the feasibility of earnings momentum strategies in the U.S. stock market. Specifically, we have tested the AAII implementation of an earnings momentum strategy in a long-only (E-L) and a long-short (E-LS) variant. Next, we have developed an enhanced strategy by intertwining earnings momentum with a form of price momentum, equally deployed as long-only (PE-L) and long-short (PE-LS) variant. All implementations are tested with monthly and weekly rebalancing frequencies. In general, we pursue a pragmatic approach that can easily be followed by nonsophisticated investors. In this regard, we have set our focal point on the actual feasibility of the strategies, i.e., if risk-adjusted excess returns can be achieved in light of market frictions, i.e., trading costs, liquidity constraints and microstructure effects.

First, for the monthly implementation of the earnings momentum strategy, we can confirm existing findings. AAII (2015) claim long-only raw returns of 23.3 percent p.a. from January 2005 to April 2015, which are very similar to the raw returns of the E-L strategy with 23.6 percent p.a. Differences can be mainly attributed to using return indices instead of unadjusted prices and the exclusion of some stocks - see section 3. Jacobs (2015) examines several different anomalies related to earnings surprises and finds three-factor alphas ranging between 0.77 and 1.32 percent. These findings are in line with our FF3 alphas of 1.06 percent for the E-LS strategy. Differences can be attributed to different sample periods, computation schemes, holding periods and the pragmatic

S&P500 short overlay. Overall, we conclude that earnings momentum strategies on the U.S. equity market exhibit statistically and economically significant alphas in the long-only and the long-short implementation.

Second, we report that these findings are robust to market frictions, i.e., trading costs, liquidity constraints and microstructure effects. In particular, a minimum trading volume of USD 1,000 k on the day of the signal and a one-day waiting rule lead to a decrease in monthly raw returns from 0.0198 to 0.0184 for the E-L and from 0.0128 to 0.0114 for the E-LS strategy. Clearly, these figures are robust compared to assumed trading costs of 50 bps per month.

Third, we devise an improved price-earnings momentum strategy, investing only in those earnings momentum stocks with below-median distance to their 52 week high. We find that this additional constraint improves raw returns from 0.0198 to 0.0259 per month for the PE-L strategy and from 0.0128 to 0.0188 for the PE-LS strategy. Again, common sources of systematic risk only partially explain these returns. Even though volatility levels increase for the price-earnings momentum strategies due to a decreasing number of positions per month, the overall risk-return effect is beneficial. The PE-L strategy exhibits higher Sharpe, Sortino and Upside Potential ratios than the E-L counterpart, indicating higher returns per unit of risk. A similar picture applies to relevant drawdown measures, rendering this strategy superior to classical earnings momentum. The introduction of a short overlay is again beneficial. Albeit reducing raw returns from 0.0259 to 0.0188 per month, especially lower partial moment risk-return measures and drawdown metrics become more favorable. Again, all returns are robust to systematic risk factors and in light of market frictions.

Fourth, the weekly implementations also produce statistically significant raw returns ranging between 0.0032 and 0.0057 percent per week. However, these results are not robust to market frictions. Already the assumed transaction costs of 50 bps per week render these implementations unfeasible, even prior to the consideration of liquidity constraints or of a one-day-waiting rule.

Overall, we conclude that all monthly strategies pose a serious challenge to the semi-strong form of market inefficiency. It will be interesting to see if the surge of online implementations, such as www.aaii.com, leads to a decrease in three-factor alpha over time. The latter is subject for further research.

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