Momentum Effects in China:
A Review of the Literature and an Empirical Explanation of
Prevailing Controversies.

Yunlin Yang
Rangsit University, Thailand

Bartosz Gebka
Newcastle University Business School, UK

Robert Hudson[*]
Hull University Business School, UK

Abstract

In this paper, we firstly review and analyse the existing empirical studies on momentum and contrarian strategies in China. By accounting for differences in study design, we are able to identify common findings in a diverse and seemingly contradictory body of existing empirical evidence. Overall, in monthly returns there appear to exist medium- and longer-term reversals in the pre-2001 period and short-term reversals and longer-term momentum effects thereafter. We further conduct an empirical analysis of monthly data on Chinese A shares, varying one factor in the research design at a time (sample period, equally- or value-weighed portfolios, skipping a period between portfolio formation and holding periods, and exclusion of post-IPO observations). This allows us to pinpoint directly how each of these factors affects momentum profits and why studies using different designs might have arrived at different conclusions. We find substantial time-variation in profits to momentum strategies. Additionally, we observe small stocks to exhibit stronger reversals than their larger counterparts, a large fraction of portfolio returns to occur in the first month after formation, and evidence of post-IPO price drifts. Overall, this study reconciles and explains inconsistent evidence on the existence of momentum and contrarian effects in China.

Keywords: Chinese stock market; Momentum; Return Reversals; Market Efficiency; Behavioural Finance.

JEL Classification: G11, G14, O16, P34

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[*] Corresponding author

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Abstract

The contribution of this paper is to enable solid conclusions to be drawn about the existence of momentum effects in China as the current evidence is unsatisfactory. We review and analyse the existing empirical studies on momentum and contrarian strategies in China and show that many of the findings in these studies appear inconsistent, if not actually contradictory. To clarify this confused situation we initially identify common findings in the diverse and seemingly contradictory body of existing empirical evidence. Subsequently, we systematically assess how the design of empirical studies affects the results of investigations in this area. We do this by conducting an empirical analysis of monthly data on Chinese A shares, varying one factor in the research design at a time (sample period, equally or value-weighed portfolios, skipping a period between portfolio formation and holding periods, and exclusion of post-IPO observations). This allows us to pinpoint directly how each of these factors affects momentum profits and thus when these profits are likely to be observed. It also indicates why studies using different designs might have arrived at seemingly inconsistent conclusions. Overall, we draw a number of conclusions: there appear to exist medium- and longer-term reversals in the pre-2001 period and short-term reversals and longer-term momentum effects thereafter; there is substantial time-variation in the profits to momentum strategies; small stocks exhibit stronger reversals than their larger counterparts; a large fraction of portfolio returns occur in the first month after formation; there is evidence of post-IPO price drifts. In summary, this study reconciles and explains the inconsistent evidence on the existence of momentum and contrarian effects in China allowing clear conclusions to be drawn.

1. Introduction

Jegadeesh and Titman (1993) demonstrated that US stocks with higher past returns outperform stocks with lower past returns over a medium-term horizon, a phenomenon which they termed the momentum effect. Since being first reported, momentum effects have attracted a considerable amount of interest from academics and have proven to be rather persistent and challenging to explain, so much so that Fama (1998) concluded that momentum remains an "open puzzle". The momentum effect is controversial as it contradicts one of the cornerstones of the modern finance theory, the Efficient Market Hypothesis (Fama, 1970), which postulates that, in a weakly-efficient market, it should be impossible to systematically predict future price movements based on historical data.

Numerous studies have demonstrated momentum to be a widespread phenomenon, which also exists in international stock markets (Park and Kim, 2014; Rouwenhorst, 1998) including emerging countries (Rouwenhorst, 1999), in worldwide markets (Bhojraj and Swaminathan, 2006), in a range of industries (Moskowitz and Grinblatt 1999), and also in commodities and currency markets (Erb and Harvey, 2006; Okunev and White, 2003). Based on a discussion of the opposite effect, the contrarian effect as unveiled by DeBondt and Thaler (1985), it could be questioned whether momentum effects in portfolio returns are indeed driven by autocorrelations in individual stocks' returns, which could indicate market inefficiency, or merely due to existence of lead-lag effects or cross-sectional differences in mean returns (following a decomposition proposed by Lo and McKinley, 1990). The latter is a rational risk-based explanation and implies that momentum profits compensate for extra risk because winner stocks are more risky than loser stocks (e.g., Ahn et al., 2003; Bansal et al., 2005; Berk et al., 1999; Conrad and Kaul, 1998; Johnson, 2002; Liu and Zhang, 2008; Sagi and Seasholes, 2007). However, Griffin et al. (2003) find no evidence that

macroeconomic risk can explain momentum and cast doubt on risk based explanations of momentum in general.

Momentum profits have frequently been posited to result from investors' irrational behaviour. For instance, Barberis et al. (1998) demonstrate that representativeness and conservatism biases can generate momentum effects; Daniel et al. (1998) explain momentum effects as a result of self-attribution and overconfidence biases among investors; Hong and Stein (1999) show momentum to arise from interactions among boundedly rational heterogeneous agents; and Grinblatt and Han (2002) attribute the existence of momentum to the disposition effect. Overall, as argued by Booth et al. (2016), rational explanations or firm characteristics do not fully reveal the reasons for the existence of momentum effects (e.g., Bandarchuk and Hilscher, 2013; Conrad and Kaul, 1998; Johnson, 2002; Sagi and Seasholes, 2007), which also appears to exist after accounting for transaction costs (Korajczyk and Sadka, 2004; Lehmann, 1990; Lesmond et al., 2004). These authors argue that evidence on over/underreaction in asset prices (Antoniou et al., 2013; Barberis et al., 1998; Chan et al., 1996; Daniel et al., 1998; De Bondt and Thaler, 1985, 1987; Frazzini, 2006; Grinblatt and Han, 2005; Hong et al., 2000; Hong and Stein, 1999) is more supportive of the irrationality-based explanations of momentum.

Given its almost universal nature and investor irrationality as a likely reason for its existence, one would expect the momentum phenomenon to be especially strong and persistent in a market dominated by inexperienced, less than fully financially literate, predominantly individual investors who have preciously few alternative uses for their savings and where official gambling is strictly limited, potentially attracting stock market "investors" looking for the thrills of short term gains (and losses) rather than sound long-term investment opportunities[1]. An example of such an environment is the Chinese market for A-type stocks,

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[1] The characteristics of investors in the Chinese stock market are outlined in Wang et al. (2006).

which was historically closed to foreign investors and which is still dominated by domestic individuals.[2] However, empirical studies on China yield anything but a clear and consistent picture, with conflicting results regarding the existence and predominance of momentum vs. contrarian effects in stock prices. This weak and inconsistent result is a surprise given the abovementioned considerations and stands in contrast to that in other comparable emerging markets such as India where momentum effects are exhibited quite strongly (Narayan et al., 2014; Narayan et al., 2017b). The result could, however, be driven by the fact that existing studies on China are very heterogeneous in many respects, including the sample period investigated, data frequency, stock exchanges and stock types (A and B stocks) considered, portfolio formation methods, inclusion of post-IPO observations, and other filters employed on the data. Alternatively, it may be that the Chinese stock market is much less inefficient than one would expect *a priori*: in analogy to Fama's (1998) argument that if "anomalies split randomly between underreaction and overreaction, they are consistent with market efficiency", one could argue that a split of results between momentum and contrarian (and none) effects in China could indicate that market's efficiency.

The contribution of this paper is to enable solid conclusions to be drawn about the existence of momentum effects in China which is currently not possible given the unsatisfactory existing evidence. To clarify this confused situation, we firstly review and analyse the existing empirical studies on momentum and contrarian strategies in China. We contribute to the literature by identifying common findings in this diverse and seemingly contradictory body of evidence. We show that, when monthly returns are considered, there appear to exist medium- and longer-term reversals in the pre-2001 period and short-term reversals and longer-term momentum effects thereafter.

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[2] Reforms in 2001 (2002) relaxed restrictions for some domestic (foreign) investors to trade in B-type (A-type) stocks (Gebka, 2009), but trading in A-type (B-type) shares is still dominated by domestic (foreign) investors. Ng and Wu (2007) demonstrate the existence of behavioural patterns in trading by Chinese individual investors, e.g., they are largely contrarians, although the wealthiest ones tend to engage in momentum trading when buying stocks.

Subsequently, we systematically assess how the design of empirical studies affects the results of investigations in this area. We also see that study design features such as data frequency, the stock exchanges and stock types (A and B stocks) considered, portfolio formation methods, inclusion of post-IPO observations, and other filters employed on the data also appear to affect the results. However, as prior studies differ in more than one respect, it is not possible to perfectly disentangle the effects of all those factors and to precisely identify how each of them affects momentum/contrarian profits.

This takes us to the second, empirical part of this paper, which is to empirically investigate how changes in each individual aspect of research studies (sample period, equally- or value-weighed portfolios, skipping a period between portfolio formation and holding periods, and an exclusion of post-IPO observations) affects momentum/contrarian profits. The subsample analysis confirms our conclusions from the literature analysis about the time-varying nature of momentum returns. Further results indicate that specific features of study design in momentum studies frequently do matter, as we find, e.g., small stocks to exhibit stronger reversals than their larger counterparts, a large fraction of portfolio returns to be driven by returns in the first month after formation, and evidence of post-IPO price drifts. Our empirical results for different combinations of those study design features mostly correspond with those reported in the relevant and comparable existing studies, indicating that the inconsistency in the momentum/reversal results reported in the literature is largely driven by differences in the methods applied, rather than them being a statistical artefact resulting from the Chinese market being free of the inefficiencies those strategies are designed to exploit.

2. Literature review

2.1. *Major features of momentum studies*

The literature on momentum in China adopts a variety of approaches, rendering the resulting findings difficult to compare. These studies differ in terms of the sample period investigated, data frequency, the stock exchanges and stock types (A and B stocks) considered, either jointly or separately where applicable, the stated methodology, portfolio formation methods and horizons, inclusion of post-IPO data, and other filters employed on the data. Table 1 summarises the relevant literature[3].

Most papers analyse the early period of the Chinese stock market history, defined here as ending around year 2001: from 14 papers reviewed here, seven investigate exclusively this early sample period, while another two (Pan et al., 2013; Zhou et al., 2010) analyse the early period as one of their subsamples. In contrast, only two papers (same as cited above) report results on the profitability of momentum strategies in China in the immediate post-2001 era, with another two (Cheema and Nartea, 2014, Chen et al., 2015) analysing late sub-periods starting in 2007/8. In addition, only seven papers provide evidence on a longer period, encompassing the 1990s and the post-2000 era. Hence, the evidence on the pre-2001 period is much richer than for the whole and especially for the post-2001 period. If momentum/ contrarian profits are largely time-invariant, one would be justified in relying on those studies utilising longer sample periods; if, however, momentum profits vary over time, a more likely scenario, an approach using sub-samples or a more sophisticated analysis allowing for this time variation in returns would be preferred.

Most studies employ data with monthly frequency, in line with seminal papers by De Bond and Thaler (1985) on contrarian strategies and Jegadeesh and Titman (1993) on momentum strategies. Whereas 12 papers provide evidence on momentum profits using monthly data, with three among them conducting analysis on weekly and monthly data

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[3] Given the methodology of our analysis we have concentrated on studies using only Chinese stocks but for completeness we mention that some recent studies have included some Chinese stocks in studies of momentum amongst much larger sets of stocks (Narayan, 2017; Narayan et al., 2017a). Another interesting study looks at the relationship between technology investment and *stock market* momentum in 77 countries. China is classified as a high patenting, emerging market a category showing high returns (Narayan, 2017).

separately (Chen et al., 2010; Chen et al., 2015; Pan et al., 2013), only one study (Wu, 2011) uses daily and one exclusively weekly (Kang et al., 2002) observations. The underlying assumption appears to be that momentum and/or contrarian effects are of a sufficiently long-term character to be captured by monthly data. In addition, the most common choice appears to be to investigate jointly A-type stocks listed on both the Shanghai (SHSE) and Shenzhen (SZSE) stock exchanges, although some studies provide results separately for SHSE and SZSE (Wu, 2011, Wang and Chin, 2004), investigate the Shanghai exchange only (Cheema and Nartea, 2014; Naughton et al., 2008), or provide evidence for B-type stocks as well (Zhou et al., 2010). Some studies are not explicit as to which exchange was considered (Griffin et al., 2003, Gupta et al., 2010). Separating A and B shares is largely justified as, firstly, effectively only A shares are available to the domestic investors, whereas foreign investors trade almost exclusively in B shares, hence these two share types are not substitutable and in reality only A shares can be thought of as the Chinese domestic market; secondly, trading in B shares is only a small fraction of that in A shares; and thirdly, several firms issued both A and B shares, hence, analysing them jointly can create problems of double-counting firms, etc. Separating the SHSE from the SZSE could be justified based on the fact that firms listed on the SZSE have different characteristics (are on average smaller, are not former State Owned Enterprises (SOEs), are in specific industries etc.), however, leaving out one of these locations would miss out a substantial part of the Chinese market, as the markets are comparable in size. In addition, one can control for firm characteristics in a more formal and efficient way than by splitting SHSE - from SZSE-listed firms, for instance by splitting all stocks (SHSE and SHSE) into subgroups according to the preferred features (size, industry, ownership structure, etc.).

There are several methodological variations present in the literature on momentum in China, although most studies refer explicitly to Jedageesh and Titman (1993) as their basis

for the portfolio formation method. Identification of a winner and a loser portfolio appears to vary substantially, the most common approach being to form five equally-sized portfolios (seven studies), with further four studies forming ten portfolios, and the remaining studies adopting still different approaches. The number of portfolios is clearly important as a higher number of portfolios implies that the highest (winner) and the lowest (loser) one will contain more extreme observations/stocks, but fewer of them. Hence, a higher number of portfolios will tend to result in more pronounced results if the momentum or contrarian strategy works (see, e.g., Gupta et al., 2013, for international, including Chinese, evidence), but returns on small portfolios will be measured with a lower level of efficiency and those portfolios will be more likely affected by idiosyncratic risk. Furthermore, most studies (11) investigate equally-weighted (EW) portfolios, whereas only a few also analyse value-weighted (VW) portfolios which minimise the potential bias on portfolio returns induced by the presence of numerous but small stocks.

Empirical studies further differ in relation to the length of the portfolio formation (J) and holding (K) periods. A formation period of up to 6 months is employed in six studies whereas a period of up to 12 months has been adopted in another five studies. The shortest maximum formation period is one week (five studies), and the longest is 36 months (Zhou et al., 2010). As for the holding period K, six months is adopted as the maximum length in five studies and extended to up to 12 months in another six studies; overall, holding periods range from one day (Wu, 2011) to 48 months (Naughton et al., 2008). Clearly, this heterogeneity in holding and formation period lengths renders many results difficult to compare and should be expected to generate a mix of conclusions regarding the existence of momentum and reversal effects in stock prices in China. For instance, the choice of a formation period can affect whether a transitory or a more persistent trend in prices is being detected, with consequences for its future behaviour (continuation or reversal) and its magnitude. In addition, the length of

the holding period will affect the final findings, as certain effects (continuations or reversals) may only be observable over sufficiently short or long horizons, but optimal lengths of those horizons are not known *a priori*.

The literature on momentum/reversal has long recognised that empirical results can be affected by the bid-ask spread, price pressure, and lagged price reactions (Jegadeesh and Titman, 1993). Hence, it recommends leaving a time gap between the end of the formation and the start of the holding period. Again, studies on the Chinese market largely vary in the extent to which this recommendation is implemented. The most popular approach is to skip one month (eight papers), but five of the reviewed papers do not leave out any gap between formation and holding periods. Kang et al. (2002) skip one day, and Chen et al. (2012) skip one week as a robustness check for weekly data. Cheema and Nartea (2014) skip one period (a week or a month) of the formation period. As issues of bid-ask spread, price pressure, and lagged price reactions can affect Chinese stocks to a considerable extent, skipping would appear advisable; however, skipping as much as one month could result in the analysis failing to capture short term price effects, a phenomenon likely to be of relevance in such a volatile market where many individual, inexperienced traders may suffer from psychological biases and are likely driven by short-term profit and loss considerations. It might be impossible to determine *a priori* an optimal skipping period, hence caution should be taken when interpreting empirical results, especially where no robustness checks, as is the case with most of the literature here, have been conducted on the impact of the skipping period length.

Yet another feature of the Chinese stock market is that IPOs are typically extremely underpriced (e.g., Su and Brookfield, 2013), resulting in substantial post-IPO price drifts. Hence, to avoid an apparent overestimation of returns for those portfolios which contain newly listed stocks, several studies advocate excluding a certain number of post-IPO observations from the analysis. Four of the revived papers exclude as much as six months of

price observations after an IPO, with another one (Kang et al., 2002) excluding one week of such data. On the other hand, three studies appear to include all post-IPO prices, with another six remaining silent on their treatment of this issue. Whether one agrees with post-IPO exclusion or not (after all, an investor following a momentum or contrarian strategy would have the opportunity to invest in newly listed firms as much as in those established ones, potentially benefiting from the initial price drift), the approach varies across papers and could generate substantial differences in returns.

In addition, the reviewed studies also differ in a number of other filters which are being applied to the data. For instance, several papers explicitly state that certain types of securities, such as banks, closed-end funds, real estate companies, investment companies, ADRs, etc., have been excluded from their analysis (Cheema and Nartea, 2014; Griffin et al., 2008; Gupta et al., 2010, 2013; Wang, 2004; Wang and Chin, 2004; Zhou et al., 2010). Others include all securities, while some papers exclude stocks first listed in the later part of their sample (Kang et al., 2002), first form portfolios after a third of their sample time has passed (Wu, 2011), exclude those stocks whose prices hit the 10% limit in the previous trading day (Pan et al., 2013), exclude "penny stocks" (Cheema and Nartea, 2014), or impose a minimum number of observations in the formation period for a security to be included (Li et al., 2010). Furthermore, most studies remain silent on whether they account for the potential survivorship bias by including delisted stocks, with some exceptions (e.g., Griffin et al., 2003, Gupta et al, 2010, 2013). Needless to say, variations across studies in terms of survivorship bias and of the types of securities included in the analysis make direct comparisons of their results rather difficult.

2.2. Comparison of results

As momentum effects could vary over time, our first aspect of analysis is the sample period investigated. We begin with studies focusing on the early part of the Chinese stock market's

modern history, from its inception in 1990-1 to around year 2001. To start with, analysing monthly returns is the most popular approach. Most studies in this category report significant reversals in prices, mostly in the medium and longer term (Griffin et al., 2003, except for the first 6 months of the holding period; Wang, 2004; Wang and Chin, 2004, for high-volume portfolios only; Zhou et al, 2010). Contrary to these studies, Pan et al. (2013) finds no significant effects, however, this study differs from those cited above in that it does not exclude a one-month skipping period. On the other hand, Gupta et al. (2010, 2013) report significant price continuations, except in small stocks where they find reversals; their sample period, however, is much shorter than those of the other papers and ends in 1997. These authors also do not specify which share type(s) and stock exchange is considered, and stock prices are in USD rather than in the local currency. Therefore, the difference in results could be revealing the prevalence of momentum effects in the very early years of the Chinese stock market or be driven by the currency market or a particular stock type or exchange. As for higher frequency returns, Kang et al. (2002) uses weekly data and finds short term contrarian (up to 12-16 weeks) but medium-term momentum (16-26 weeks) profits, but these results are not supported for weekly data by those obtained by Pan et al. (2013) who only find momentum for J, K of 2-3 weeks[4] and reversals for the 1-1 week strategy, maybe because post-IPO prices are excluded for six months from their study, compared to just a one week exclusion in Kang et al. (2002). This could indicate that short-term price trends following IPOs are a significant driver of momentum/reversal effects. Wu (2011) employs daily data while not excluding post-IPO observations and reports contrarian effects lasting between one day and one week, but momentum effects for 9-12 months holding periods for SHSE stocks only. This indicates that the post-IPO price drift may be an important factor behind medium-

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[4] In this paper we adopt the notation that J represents the past period used to form portfolios and K the subsequent holding period.

term momentum effects. Overall, however, most studies on the pre-2001 period use monthly data and find significant reversals in prices in the medium and longer term.

In contrast to the first decade of stock market development in China, only two papers (Pan et al, 2013; Zhou et al, 2010) analyse the profitability of momentum strategies in the post-2001 era, however, their samples end in 2008 and 2009, respectively. Both find significant reversals for up to 6 months, although Zhou et al. (2010), who allow for much longer holding periods, report significant momentum profits in the longer run (18-36 months holding periods for A shares and 9-36 months for B shares). Short time reversals and long term momentum are rather at odds with what the literature reported for the pre-2001 period, as reviewed above.

In addition, two recent papers analyse momentum profits since the outbreak of the 2007-8 financial crisis. Cheema and Nartea (2014) investigate the 2007-13 subperiod and Chen et al. (2015) examine the 2008-13 subperiod. For monthly data, the former paper reports significant reversals up to K=12, but the latter finds returns to be insignificant. However, Chen et al. (2015) find significant reversals in weekly data, for horizons up to three weeks.

Lastly, several studies conduct their analysis on longer sample periods, which include observations from the pre- and post-2001 subsamples. Given our conclusion above that these periods show contrasting results when it comes to the prevalence of momentum and reversal effects, one can anticipate that studies incorporating both sub-periods to a varying extent will vary with respect of their overall findings, depending on how much of the pre- vs post-2001 data has been utilised. This is indeed what we find: whereas Naughton et al. (2008) report a pronounced pattern of momentum effects over a wide range of formation and holding periods of 1 to 48 months, and Cheema and Nartea (2014) find significant momentum effects up to 12 months, Zhou et al. (2010) report significant reversals for A shares at various holding

periods from 3 to 36 months. Chen et al. (2012) and Pan et al. (2013) find only a few incidents of rather short–term (generally, 1-3 months) reversals in weekly and monthly data (as do Chen et al., 2015, for weekly data). In contrast, Li et al. (2010) finds no significant effects when using non-risk-adjusted returns, but short-term reversals for CAPM-adjusted returns, and Chen et al. (2015) do not find any significant momentum effects in monthly data up to 12 months of the holding period. Pan et al. (2013) further add to the confusion by reporting that, when the interval ranking method is used to identify past winners and losers, numerous instances of significant momentum profits can be found in up to 52 weeks of the holding period.

Overall, the available body of empirical evidence on China provides mixed results, but some conclusions can be drawn. Firstly, the sample period investigated appears to be important, as in the first decade of modern Chinese stock market history significant reversals in prices in mostly medium and longer-term were found. In contrast, post-2001 studies, albeit less numerous, indicate the opposite result, i.e., shorter-term reversals and longer-term momentum effects (although the latter might have disappeared following the outbreak of the 2007-8 financial crisis). Secondly, features such as data frequency, the stock exchanges and stock types (A and B stocks) considered, portfolio formation methods, the inclusion of post-IPO observations, and other filters employed on the data appear to affect the results as well. However, precise statements as to how exactly the momentum/contrarian profits are affected by each of these features separately are not possible, as studies typically differ in more than one respect, rendering direct comparison difficult if not impossible.

3. Data and Methodology

For our empirical investigation, monthly data of A-shares on the Shanghai Stock Exchange (SHSE) and the Shenzhen Stock Exchange (SZSE) is collected from DataStream for the period January 1991-December 2012 (bonds, warrants and funds were not considered). More

recent observations are not included as this period is not analysed in the reviewed literature, hence its inclusion would impede comparability of results. The data type used is the total return index of the last available trading day in each month. Monthly data is the frequency used most often in the momentum literature on Chinese and other markets, hence using monthly data makes our results more comparable with those reported in the existing literature. Another reason for using monthly data is that higher frequency data is likely to include more noise, and more frequent trading resulting from the use of weekly data means much higher transaction costs than those generated by a monthly trading strategy.

The method used to compute returns from each momentum portfolio is broadly based on that of Jegadeesh and Titman (1993). In each month, sample securities are ranked in ascending order by their past J-month (J=1, 2, 3…, 24) accumulated returns, and divided into five groups according to the quintile return values. This is a slight deviation from Jegadeesh and Titman (1993) as these authors form decile portfolios. However, most of the research on the Chinese stock market uses the quintile method, hence we employ the same approach to insure the comparability of our findings. Secondly, especially before 1995, the number of total listed stocks is small, hence forming decile portfolios would result in each containing too few stocks. After ranking stocks based on the past J-month cumulated returns and dividing them into quintile portfolios, stocks are held for a period of K months (K=1, 2, 3, …, 24) in each strategy, which results in 576 strategies in total. The portfolio with the highest past returns during the formation period J is called the 'winner' portfolio and the one with lowest returns is called the 'loser' portfolio. Zero-cost momentum portfolios are then created by going long in the winner portfolio and shorting the loser portfolio.

This procedure is repeated every month, hence, in any given month t, the momentum strategy as a whole holds a series of portfolios which were selected in the current month and as well as in the previous K-1 months. A J-K equally-weighted strategy is conducted by

attaching equal weights to stocks in each quantile portfolio at formation time. A value-weighted strategy attaches weights to securities based on their market value as compared to the total market value in the respective quintile portfolio (to ensure that weights add up to one).

4. Empirical Results and Discussion

4.1. The whole sample period: 1991 to 2012

For equally-weighted strategies, we find significant evidence of mean reversals in the Chinese stock market between 1991 and 2012 (Table 2 reports detailed results on monthly returns whereas Figures 1 and 3 summarise their relevant features). Returns to all but one of the equally-weighted strategies are negative, which suggests that past losers outperformed past winners over time, regardless of the formation and holding period length. Within all 576 equally-weighted strategies, 318 yield statistically significant negative profits at a significance level of at least 10%. Firstly, shown in the top left corner of Figure 1, there are a few profitable strategies for short formation and holding periods, generally for J, K=1 to 6, with the one-month formation strategy also yielding positive contrarian profits for longer holding periods (K up to 8 months as well as between 15 and 24 months). Secondly, for strategies with longer formation and holding periods (J, K over 12 months, located in the bottom right part of Figure 1), almost all profits are significant and negative. In addition, significant contrarian profits are also observed for strategies with shorter formation periods (J between 6 and 12 months) when the corresponding holding periods are long (K from 13 to 24) and J+K is at least 24, as well for numerous strategies with a long formation period of more than 12 months and a shorter holding period of up to 12 months. These findings highlight the necessity of investigating longer formation and holding period: 11 out of 14 studies reviewed here limit their holding periods to 12 months or less, hence failing to observe a potentially substantial mass of significant results.

As for the magnitudes of these profits, Figure 3 (where the negatives of the obtained returns, annualised and in percentage points, are presented for ease of exposition) reveals that contrarian profits are the highest for very short holding and formation periods, they decrease gradually as J and K increase, but start raising again when formation and holding periods are at around 12 months. Lastly, there is a slight dip in profitability as one moves to the most lengthy formation and holding combinations (towards J, K=24). The strongest (annualised) return is recorded for the 2-1 contrarian strategy, of 18.11%, while the lowest contrarian profit (which is the only incidence of price momentum rather than reversal here) is a negative 2.39% for the 7-6 strategy. The average reversal return across all 576 strategies is 5.97%, with strategies based on longer formation periods J earning up to almost four times as much as those based on shorter formation periods (on average, regardless of holding period K). On the other hand, contrarian profits are not overly sensitive to the choice of the holding period K, with a noticeable exception of those strategies using very short (K=1 or 2) holding periods. In fact, strategies with K=1 earn on average the most, 10.55%, and only one (for J=12) performs worse than the average across all combinations of J and K.

Next, returns to value-weighted strategies are estimated (results reported in Table 3 and depicted in Figures 2 and 4). A value-weighted strategy reduces the emphasis on small stocks. To the extent that the prices of small stocks are likely to be less efficient than those of large stocks[5] this strategy is likely to reduce departures from an efficient market (i.e. the likelihood of contrarian or momentum profits). The extensive contrarian profits found in equally-weighted strategies largely disappear when portfolios are composed by weighting based on the market value of each stock: the number of significant returns is reduced from 318 to 74 out of 576 strategies. In addition, most of the significant results are only significant at the 10% rather than the 5% level. These findings are broadly in line with what one would

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[5] Small stock prices are likely to be less efficient for a variety of reasons including greater trading costs, lower levels of trading, lower levels of news being released and lower analyst coverage.

expect theoretically. However, the general pattern of contrarian profits remains similar to that observed among the equally-weighted strategies: profitable contrarian strategies are observed in the top left and the bottom right corners (Figure 2). For short formation periods contrarian strategies only make profits when the formation period is no longer than three and the holding period is no longer than two months, and for formation period longer than 14 months contrarian strategies only yield profits when the holding period is longer than 12 months.[6] Performance also slumps for the longest formation and holding periods. The magnitude of those contrarian profits, tend to be lower on average (3.67%, compared to 5.97% for equally-weighted portfolios). As a result, there are more instances of negative contrarian (positive momentum) profits: 91 out of 576, as compared to just one for equally-weighted portfolios. Portfolios with long formation periods J still perform better than their short formation period counterparts, with this difference being more pronounced than in case of equal weighting. However, longer holding periods also appear to yield higher (double the size) contrarian profits than shorter ones, but strategies with holding periods of K=1 month still outperform other options, on average: they yield annualised 6.54% on average, with the highest returns of 13.46% for J=2. Overall, however, the pattern of profitability is very similar to that for equally-weighted portfolios, with contrarian profits being the highest for very short holding and formation periods, decreasing gradually as J and K increase, starting to raise again when formation and holding periods are at around 12 months, and with a slight dip in profitability as one moves to the most lengthy formation and holding combinations (towards J, K=24).

4.2. Subsample Analysis

In order to analyse the potentially time-varying nature of momentum/contrarian effects, the sample period has been divided into five sub-periods: 1993-1996, 1997-2000, 2001-2004,

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[6] The only exceptions are 17-2 and 18-1.

2005-2008, and 2009-2012[7]. In each sub-period, momentum strategies of buying past winners

and selling past losers have also been implemented for up to 12-12 months as to ensure that

enough observations were available in each strategy within each now relatively short five-

years sub-period, we did not test strategies longer than 12-12 months. In each sub-period

there were 144 portfolios for equally-weighted and value-weighted strategies, respectively,

which generated 1440 portfolios in total. For each return, firstly a standard t-test was applied

to test whether results were statistically significant; additionally, to deal with the potential

small sample issue, non-parametric Wilcoxon signed rank tests were employed. We also

tested whether the return of each strategy in a single sub-period is significantly different from

the corresponding strategy in the whole sample period, again using both a t-test and a

nonparametric Wilcoxon signed rank test.

There are not strong theoretical grounds to expect specific patterns of returns among

the different sub-periods. If the market was uniformly efficient both momentum and reversal

effects would be insignificant in all periods. One might possible see a move to greater

efficiency over time as the market developed. Alternatively, changing but not necessarily

increasing levels of efficiency would be consistent with the adaptive market hypothesis (Lo,

2004). The results for the sub-period equally-weighted momentum strategies from 1993 to

2012 can be summarized as follows.[8] None of the strategies in the sub-period 1993 to 1996 is

significant, and for the sub-period 1997 to 2000, only two strategies out of 144 are significant

when using the parametric t-test (none and 18, respectively, when applying the non-

parametric test). However, when we examine sub-periods 2005 to 2008 and 2009 to 2012,

there are multiple significant and negative returns from momentum strategies: 41 significant

negative returns in the former and 21 in the later sub-period (47 and 21, respectively, when

applying the non-parametric test). For comparison, for the whole sample period we found 18

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[7] The reason for the beginning of the period being 1993 rather than 1991 is that two years of data are used for sorting the stocks.
[8] The results for sub-periods are not reported to conserve space but available from authors on request.

(out of 144) strategies to yield significant negative returns. These findings suggest that contrarian profits observed in the whole sample period are mostly driven by results in sub-periods 2005-2008 and 2009-2012. Another interesting finding is that for the sub-period 2001 to 2004, most of the significant strategies yield positive returns (in 48 cases, whereas in two cases significant profits are negative). Using non-parametric tests yields a similar number of significant cases (40). Hence, the 2001-2004 sub-period is the only time when momentum strategy appears to generate significant positive profits in China.[9]

In summary, in sub-sample periods of 2005-2008 and 2009-2012 momentum strategies generated negative returns, indicating that momentum effects do not exist in these two sub-periods, but contrarian trading can yield significant profits. When looking at the equally-weighted strategies, significant contrarian returns usually appear in holding periods of up to 10 months when the formation period is of one month. When the formation period becomes longer, the persistency of profits declines (fewer post-formation months with significant returns), and when it is longer than 4 months, contrarian profits only exist when holding periods are no longer than 3 months. For the sub-sample period of 2001-2004, significant momentum usually occurs when formation periods are longer than three months, and for holding periods near 12 months (6-12 months for most strategies); thus, longer-term momentum exists for the sub-sample period of 2001-2004. These findings correspond well with our analysis of the literature where short term reversals and longer term momentum effects were reported post-2001. On theoretical grounds our results seem most in accord with the Adaptive Market Hypothesis (Lo, 2004).

In addition, value-weighted strategies in each sub-sample period have been tested. In general, the main findings still hold when portfolio weights are adjusted by market value.

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[9] The difference in pre- vs. post-2001 results corresponds well with stock market reforms in years 2001-2 which allowed trading by some domestic (foreign) investors in B (A) shares and have been demonstrated elsewhere to have an effect on the way the Chinese stock markets operate (e.g., Gebka, 2009). The end of this period is demarcated by the implementation of the split share market reform in 2005, which allowed previously non-tradable shares to be traded in (Lee, 2015).

Returns in sub-periods 1993 to 1996 and 1997 to 2000 are similar to those shown for equally-weighted strategies: we find one strategy to be significant in the first sub-period (as compared to none for equally-weighted portfolios), and no significant results for the second sub-period (two for equally-weighted portfolios). However, for the sub-sample 2001 to 2004, there are 100 momentum strategies making significantly positive returns for value-weighted strategies (89 when a non-parametric test is used), around double as many as for equally-weighted portfolios. This suggests that momentum profits in the period 2001-2004 were driven to a large extent by large stocks. For sub-sample periods 2005 to 2008 and 2009 to 2012, we observe 43 and seven strategies which yield negative returns for value-weighted portfolios, respectively (35 and six when non-parametric tests are used), figures which are comparable to those obtained for equally-weighted portfolios. Hence, the contrarian profits in the later era of the Chinese market history do not seem to be mostly driven by stocks of any particular size. Compared to equally-weighted portfolios, post-2004 contrarian profits also seem to be short-lived, especially for strategies with longer formation periods, while the 2001-2004 momentum profits are also predominant for longer holding periods, especially when formation periods are short.

In summary, the results of both equal-weighted and value-weighted momentum strategies suggest that for the sub-sample 2001-2004, momentum exists in the Chinese stock market, while for the 2005-2008 and 2009-2012 sub-sample, contrarian effects exist. For the early stages of Chinese market development (1993-2000), no significant results were found.

Our findings of no significant returns before 2001 are in line with the study of Pan et al. (2013) which also finds no significant effects. Our methodology is quite comparable to that study in that both use monthly returns and do not exclude a one-month skipping period. However, other papers on the early period which skip one month after formation report significant reversals in prices, mostly in the medium and longer-term (Griffin et al., 2003,

except for the first 6 months of the holding period; Wang, 2004; Wang and Chin, 2004, for high-volume portfolios only; Zhou et al., 2010). In addition, our results are in contrast to Gupta et al. (2010, 2013) who skip one month after formation and, for the period 1993-97, report significant price continuations, except in small stocks where they find reversals (for the J, K=6m strategy). That study, however, does not specify which stock type and exchange is considered, and stock prices are in USD rather than in the local currency. Our findings of no effects before 2001 and momentum effects in the 2001-4 period are also in line with those in Naughton et al. (2008). They used data from 1995-2005 and found momentum for the strategies they tested. Thus, momentum found by Naughton et al. (2008) could be driven by the sub-sample of 2001-2004.

Two papers (Pan et al, 2013; Zhou et al, 2010) analyse the profitability of momentum strategies in the post-2001 era. Both find significant reversals for up to 6 months, which is in line with our findings for the 2005-2008 and 2009-2012 sub-periods. Pan et al. (2013) reports short-term effects in the 2002-2009 era. Zhou et al. (2010), who analyse the period from March 2001 to June 2008 and allow for much longer holding periods, report significant reversals for J=K=6 months, but find momentum profits in the longer run (18-36 months holding periods for A shares and 9-36 months for B shares). Those findings are in line with our results.

Why would year 2001 demarcate a structural change in momentum profits in China? We firstly notice that there was a series of institutional reforms implemented during that time which would have affected the working of the Chinese economy and its stock markets. For instance, as noted in footnote 9, stock market reforms in years 2001-2 allowed trading by some domestic (foreign) investors in B (A) shares and have been demonstrated elsewhere to have an effect on the way the Chinese stock markets operate (e.g., Gebka, 2009). In addition, starting in 2001, a substantial fraction of state owned enterprises (SOE) have been privatised

or underwent other restructuring measures (corporatization, bankruptcy, mergers), resulting in a rapid decline of SOE numbers (by over 42%) between 2001 and 2004 (Brandt et al., 2008). Furthermore, on 11 December 2001 China became a member of the WTO, which resulted in reductions in trade and investment barriers and would have increased competitive pressure on Chinese companies.

Secondly, when we look at the aggregate stock market characteristics, the sub-period starting in 2001 appears to have unique empirical features.[10] To start with, the Chinese stock market peaked around the end of 2000 (both the price and the return index show this characteristic), in line with the worldwide trend driven by the dotcom bubble and its subsequent collapse. Turnover, both by value and volume, started an exponential rise around the year 2001 as well, and the total market capitalisation also increased dramatically around that date, and its subsequent growth has been much faster than in the pre-2001 period. A similar change in the trend behaviour of the dividend yield can also be observed around 2001. In addition, market-wide measures of aggregate profitability, such as EBITDA and shareholder equity, also experienced a dramatic change in trend behaviour from 2001 onwards, which was not entirely due to just bigger companies being listed, on average, as the return on equity (ROE) also experienced a change in behaviour towards an upward trend during the same time.

Given the range and heterogeneity of these changes, it may not possible to derive a precise prediction of how momentum profits would have been affected by these changes, however, our result of a structural break in momentum profits in year 2001 corresponds well with the preponderance of economic and financial reforms and with changes in aggregate financial data during that time.

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[10] We employed the Datastream's China A stock market index to represent the Chinese stock market, in a window of time containing 5 years of monthly observations before and after the start of 2001 (results not reported but available on request).

4.3. Effects of Study Design on Results

Our sample consists of A-type equities and we initially did not skip any days between portfolio formation and holding periods, nor did we exclude post-IPO data. In theoretical terms, skipping days would reduce any market microstructure effects in the data. It would also, however, reduce any of the effects of interest (momentum or reversals) that were exhibited shortly after the formation of portfolios. It is not altogether clear what one would expect the overall effect of skipping days to be. In China IPOs have generally tended to be very undervalued with stocks having an IPO tending to drift upwards after the IPO date. Thus excluding IPOs would tend to reduce momentum effects although not necessarily to a large extent as stocks from IPOs would not form a substantial proportion of the overall portfolio. As studies on Chinese markets differ in respect of data selection and study design, leading to heterogeneous findings, we are interested in how these differences in approach affect findings on momentum effects. Firstly, we observe that Chen et al. (2012) and Pan et al. (2013) investigate a similar time period, between 1995 and 2009, and the study of Zhou et al. (2010) is also similar in analysing data from the 1993-2008 period. Hence, differences in these studies' reported outcomes could be deduced to be due to differences in their study design. We restrict our sample to 1995-2009 and compare the resulting four sets of findings.[11] Firstly, when the whole 1995-2009 period is considered, all three of the aforementioned studies find significant reversals for short formation and holding periods, which is similar to our findings (although we also find significant reversals for longer formation periods). This similarity is observed despite the fact that these studies use different portfolio formation approaches, some (Chen et al., 2012, and our study) do not exclude post-IPOs data and do not skip one month between formation and holding, and impose other heterogeneous filters on inclusion of stocks into the sample. Hence, these short term reversals appear to be rather

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[11] Results for selected holding (J) and formation (K) periods are reported in Table A1 in the appendix. The complete set of results is available upon request.

robust and not driven by IPOs, returns in the first month after portfolio formation, or specific stocks. These findings are not inconsistent with what one would expect on theoretical grounds.

Secondly, when we compare the results in the sub-periods pre- and post- 2001, with those of Pan et al. (2013), the results are qualitatively identical: there are no significant profits in the earlier sub-period but significant reversals for shorter formation and holding periods in the 2002-2009 era. This is in line with our sub-period analysis described in the previous subsection and indicates that momentum from 2001-4 was dominated by subsequent return reversals in the sample. As Pan et al. (2013) excluded post-IPO data and stocks which hit the 10% regulatory price limit, and we did not, our approaches were slightly different, and yet the results are in line with each other. Again, this suggests robustness of the finding that contrarian effects in China do not appear to be driven by post-IPO anomalies and extreme movements in individual stocks.

Thirdly, we investigate whether those profits are driven by stocks of a particular size by comparing results from equally-weighted and value-weighted strategies for our sample in the 1995-2009 period. Here, we observe fewer and lower significant negative returns for the value-weighted strategy, similarly to the full sample results (1993-2012), suggesting that return reversals are concentrated in smaller stocks, and this effect is not confined to the early (1993-1994) or late (2010-12) sub-periods.

Lastly, as comparisons across diverse studies, as above, have the disadvantage of not being able to examine only one feature of the study design at a time, we amend our 1995-2009 sample in two ways. Firstly, we keep everything as in the initial approach but exclude the first (post-IPO) six months of data for all affected stocks. The results, as compared with the baseline scenario, are not dramatically different, as the observed significant return reversals are reported for roughly the same formation and holding periods. However, those

returns computed under exclusion of post-IPO data show slightly stronger reversal patterns. This suggests that there is some price drift following the first listing of companies in China. Secondly, allowing for one month of inactivity between the end of the formation period and the start of the holding period does seem to have weakened return reversals considerably, with almost all but one result becoming insignificant. In contrast, Zhou et al (2010) did find some short term reversals even when skipping one month, however, their study differs from ours in other respects as well, e.g., by excluding stocks from certain industries and in the way momentum portfolios are formed. Hence, return reversals can be mostly confined to the period immediately following portfolio formation unless one employs alternative methods of portfolio formation or focuses on specific industries.

5.   Summary and Conclusions

In this study, we thoroughly analyse the existing empirical literature on momentum effects in China as well as conduct a comprehensive empirical analysis of that stock market. Our contribution is to enable solid conclusions to be drawn about the existence of momentum effects in China. Our motivation stems from the observation that there seems to be disagreement between previous empirical studies of the existence of momentum effects in China.   In addition, a substantial body of theoretical and empirical literature indicates that momentum effects are driven by the irrationality of investors. One would expect these effects should be very pronounced in Chinese A-type shares, as the bulk of their trading volume is generated by local individual investors who would be more prone to behavioural biases and irrational decision making than their more sophisticated institutional, especially overseas, counterparts. However, the literature on momentum in China reports empirical results which do not support this expectation. As discussed above, different studies report contradicting results, and the overall picture is that of rather weak price reversals rather than momentum

effects. Therefore, we set on to investigate why the existing literature fails to give a clear picture of momentum in China.

Firstly, we analyse the existing empirical evidence and attempt to disentangle different study design features which vary across the literature and could be generating the observed inconsistencies in results. We are able to observe that the sample period varies across studies, and those investigating monthly data in the pre-2001 period tend to find medium and long term reversals, whereas studies which analyse the subsequent period typically report short-term reversals and long term momentum. Hence, some systematic patterns can be observed when one accounts for the sample period analysed. However, empirical studies differ in more than one respect, with other features being data frequency, the stock exchanges and stock types considered, portfolio formation methods, inclusion of post-IPO observations, and other filters employed on the data, and it is impossible to clearly identify the impact of each of those aspects on momentum profits from the extent literature.

Hence, in the second step, we conduct an empirical analysis of monthly data on Chinese A shares, with variations in one factor at a time (sample period, equally- or value-weighed portfolios, skipping a period between portfolio formation and holding periods, and exclusion of post-IPO observations). This allows us to pinpoint directly how each of these factors affects momentum profits and why studies using different designs might have arrived at different conclusions. We find small stocks to exhibit stronger reversals than their larger counterparts, a large fraction of portfolio returns to be driven by returns in the first month after formation, and evidence of post-IPO price drifts. These findings allow us to better understand the drivers of momentum profits in China and thus explain the inconsistencies between finings reported in the literature on that topic. They tend to support the notion that price movements in the Chinese market, as many other markets, are not random in character and, hence, the Chinese stock market suffers from a level of informational inefficiency.

Lastly, the time-varying nature of momentum profits documented here is also in line with the Adaptive Market Hypothesis by Lo (2004), which postulates that, as market conditions and investor cohort change over time, so will the extent of information utilisation by markets; the level of market efficiency will wax and wane over time, just as observed in this study. This implies that stock market investors should treat any historical patterns in data with caution, as any strategy designed to exploit those patterns may turn unprofitable when trends from the past cease to continue into the future.

Our work is limited to the extent that we have not attempted to understand the underlying causes of the effects we observe. This is likely to be a major task given the extensive literature attempting to understand the causes of the momentum effect in the US and other developed markets. There are numerous avenues for future investigation here including the effect on momentum/reversals of different market states, winning/losing stocks, market and macroeconomic risks, the properties of individual companies and the particular features of the market in China such as the existence of short sale restrictions.

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Appendix
Table A1: Average Returns of Momentum Strategies Based on Different Sample Periods and Different Filters Applied to the Sample Data

Strategy J-K	Equally-Weighted 1995-2009	Equally-Weighted 1995-2001	Equally-Weighted 2002-2009	Value-weighted 1995-2009	Exclude first 6-months post IPOs	Skipping 1 month
1-1	-0.0078**	0.0022	-0.0174***	-0.0030	-0.0087**	-0.0109***
	(-2.18)	(0.47)	(-3.32)	(-0.69)	(-2.47)	(-3.03)
1-2	-0.0094***	-0.0056	-0.0125***	-0.0064**	-0.0099***	-0.0040
	(-3.16)	(-1.18)	(-3.33)	(-1.72)	(-3.34)	(-1.57)
1-3	-0.0052**	-0.0014	-0.0082**	-0.0026	-0.0055**	-0.0024
	(-2.17)	(-0.37)	(-2.61)	(-0.84)	(-2.29)	(-1.19)
1-6	-0.0019	0.0004	-0.0038	-0.0012	-0.0020	-0.0004
	(-1.24)	(0.19)	(-1.62)	(-0.56)	(-1.25)	(-0.29)
1-9	-0.0017	-0.0011	-0.0021	-0.0013	-0.0016	-0.0007
	(-1.26)	(-0.59)	(-1.08)	(-0.74)	(-1.23)	(-0.57)
1-12	-0.0006	-0.0003	-0.0013	0.0006	-0.0006	-0.0002
	(-0.56)	(-0.17)	(-0.67)	(0.43)	(-0.55)	(-0.20)
2-1	-0.0135***	-0.0086	-0.0179***	-0.0101**	-0.0148***	-0.0060
	(-3.17)	(-1.26)	(-3.32)	(-1.98)	(-3.44)	(-1.60)
2-2	-0.0094***	-0.0066	-0.0112**	-0.0068	-0.0100***	-0.0016
	(-2.62)	(-1.12)	(-2.48)	(-1.53)	(-2.75)	(-0.50)
2-3	-0.0054*	-0.0024	-0.0075*	-0.0026	-0.0057*	-0.0018
	(-1.77)	(-0.52)	(-1.79)	(-0.68)	(-1.86)	(-0.68)
3-1	-0.0097**	-0.0035	-0.0145	-0.0056	-0.0099**	-0.0036
	(-2.25)	(-0.53)	(-2.57)**	(-1.11)	(-2.29)	(-0.93)
3-2	-0.0067*	-0.0035	-0.0089*	-0.0029	-0.0068*	-0.0017
	(-1.72)	(-0.58)	(-1.69)	(-0.61)	(-1.71)	(-0.50)
3-3	-0.0047	-0.0010	-0.0071	-0.0009	-0.0046	-0.0002
	(-1.32)	(-0.20)	(-1.42)	(-0.22)	(-1.27)	(-0.08)
3-6	-0.0006	0.0019	-0.0023	0.0004	-0.0005	0.0009
	(-0.25)	(0.57)	(-0.59)	(0.14)	(-0.21)	(0.37)
3-9	-0.0004	0.0001	-0.0009	0.0023	-0.0003	0.0013
	(-0.17)	(0.04)	(-0.27)	(0.88)	(-0.13)	(0.63)
3-12	-0.0002	0.0001	-0.0003	0.0022	-0.0002	0.0001
	(-0.08)	(0.02)	(-0.10)	(0.91)	(-0.10)	(0.05)
6-1	-0.0066	-0.0015	-0.0100	-0.0045	-0.0022	-0.0045
	(-1.55)	(-0.26)	(-1.60)	(-1.13)	(-0.58)	(-0.88)
6-3	-0.0017	0.0021	-0.0041	-0.0025	-0.0015	0.0012
	(-0.44)	(0.39)	(-0.72)	(-0.55)	(-0.39)	(0.34)
6-6	0.0003	0.0012	-0.0004	0.0008	0.0005	0.0019
	(0.09)	(0.27)	(-0.08)	(0.20)	(0.14)	(0.58)
6-9	0.0000	-0.0006	0.0005	0.0019	0.0001	0.0003
	(0.00)	(-0.15)	(0.10)	(0.55)	(0.02)	(0.10)

6-12	-0.0011	-0.0023	-0.0013	0.0004	-0.0010	-0.0011
	(-0.37)	(-0.60)	(-0.28)	(0.14)	(-0.36)	(-0.40)
9-1	-0.0073*	-0.0052	-0.0090	-0.0048	-0.0090*	-0.0023
	(-1.69)	(-0.82)	(-1.40)	(-0.95)	(-1.66)	(-0.56)
9-3	-0.0021	-0.0009	-0.0034	-0.0001	-0.0020	0.0014
	(-0.52)	(-0.16)	(-0.55)	(-0.03)	(-0.51)	(0.36)
9-6	-0.0009	-0.0018	-0.0003	0.0015	-0.0010	-0.0005
	(-0.24)	(-0.37)	(-0.05)	(0.36)	(-0.26)	(-0.15)
9-9	-0.0021	-0.0047	-0.0019	0.0007	-0.0021	-0.0020
	(-0.60)	(-1.01)	(-0.32)	(-0.81)	(-0.61)	(-0.57)
9-12	-0.0030	-0.0066	-0.0025	-0.0012	-0.0031	-0.0026
	(-0.32)	(-1.52)	(-0.44)	(-0.32)	(-0.94)	(-0.81)
12-1	-0.0047	-0.0026	-0.0073	-0.0018	-0.0045	-0.0039
	(-1.00)	(-0.40)	(-1.01)	(-0.36)	(-0.97)	(-0.87)
12-3	-0.0030	-0.0027	-0.0036	-0.0016	-0.0038	-0.0025
	(-0.70)	(-0.44)	(-0.52)	(-0.35)	(-0.85)	(-0.60)
12-6	-0.0032	-0.0053	-0.0035	-0.0018	-0.0045	-0.0033
	(-0.77)	(-0.92)	(-0.53)	(-0.41)	(-1.10)	(-0.83)
12-9	-0.0039	-0.0080	-0.0034	-0.0028	-0.0051	-0.0036
	(-1.00)	(-1.50)	(-0.52)	(-0.67)	(-1.35)	(-0.94)
12-12	-0.0040	-0.0085	-0.0046	-0.0026	-0.0058	-0.0040
	(-1.08)	(-1.65)	(-0.72)	(-0.66)	(-1.62)	(-1.11)

Note: Average momentum returns are computed using monthly data for the period January 1991 – December 2012, unless indicated otherwise, using the approach of Jegadeesh and Titman (1993), with J months of formation and K months of portfolio holding periods. Figures in parentheses are t-values. *, **, *** denotes significance at the 10%, 5% and 1% level, respectively. All strategies are equally-weighted except for those in column 4.

Figure 1: An overview of momentum profits from equally-weighted portfolios.

J/K	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
1	—	—	—	—	—	—		—							—	—	—	—	—	—	—	—	—	—
2	—	—	—	—																				
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12												—	—		—	—	—	—	—	—	—	—	—	—
13	—										—	—	—	—	—	—	—	—	—	—	—	—	—	—
14	—	—								—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
15	—	—							—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
16	—	—	—		—			—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
17	—	—		—			—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
18	—	—	—			—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
19	—	—			—	—	—		—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
20	—	—	—	—	—	—		—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
21	—	—	—	—			—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
22	—	—	—			—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
23	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
24	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Note: J denotes the formation and K the holding period length. − (+) denotes significant negative (positive) returns.

Figure 2: An overview of momentum profits from value-weighted portfolios.

J/K	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
1	—	—																						
2	—																								
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17		—											—	—	—				—		—	—	—
18	—																	—	—	—	—	—	—	—
19																		—	—	—	—	—	—	—
20																		—	—		—	—		—
21																—	—	—	—	—	—	—		
22															—	—	—	—	—	—	—	—		
23														—	—	—	—	—	—	—	—			
24														—	—	—	—	—	—	—				

Note: J denotes the formation and K the holding period length. − (+) denotes significant negative (positive) returns.

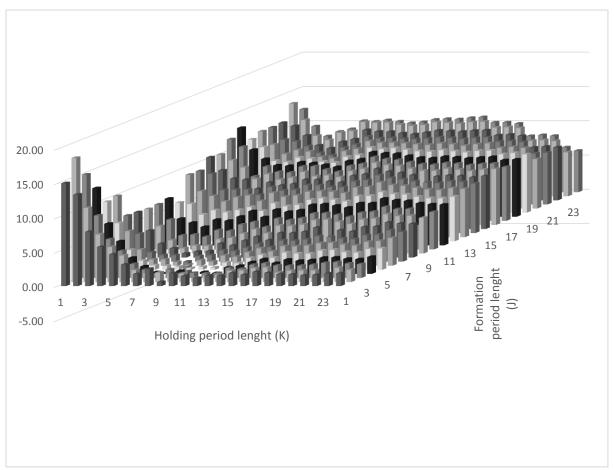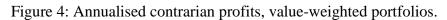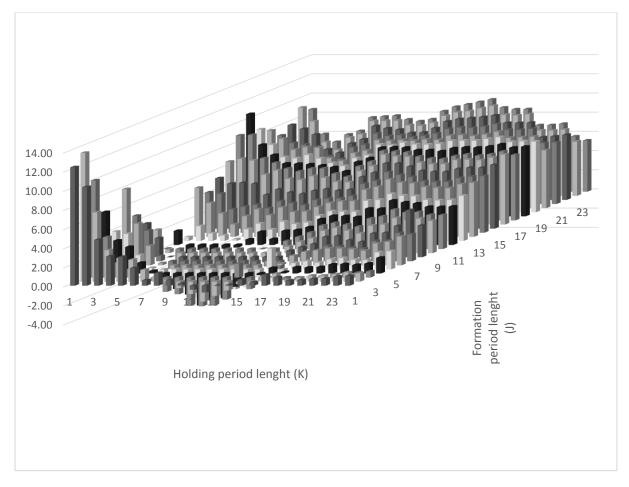Figure 3: Annualised contrarian profits, equally-weighted portfolios.

Figure 4: Annualised contrarian profits, value-weighted portfolios.

Table 1: A Summary of the literature on momentum effects on Chinese stock markets

Paper	Sample Period	Data Frequency	Exchange/ Share type	Methodology	Ranking, Methods	Formation(J)-Holding(K), skipping gap (S)	Post-IPO omission	Other filters	Core Findings	Further findings
Kang et al. (2002)	Jan/93-Jan/00	Weekly	SH, SZ jointly A	Lo and MacKinlay (1990) Jegadeesh and Titman (1995);	Five equal-size quintile portfolios, EW and VW	J, K=1, 2, 4, 8, 12, 16, 20, 26 w S=1 day	1 w	Exclude stocks firstly listed in or after 1995	EW: Sig. short-term contrarian (1-1, 2-8, 2-16, 4-4, 4-8, 4-12, 8-1, 8-2, 8-4, 8-8, 8-12, 8-16, 12-4, 12-8 weeks) Sig. medium-term momentum (12-26, 16-20, 16-26, 20-16, 20-20, 20-26, 26-12, 26-20, 26-26 weeks) VW: weaker sig. short-term contrarian than EW (1-1, 2-16, 4-8, 8-1, 8-4, 8-8, 8-16, 12-4, 12-8 weeks) stronger sig. medium-term momentum (12-26, 16-20, 16-26, 20-16, 20-20, 20-26, 26-12, 26-16, 26-20, 26-26 weeks)	Results robust to skipping 1 week except for 1-1 strategy. Profits not due to differences in beta risk between winners and losers. overreaction to firm-specific information is the single most important source of short-term contrarian profits; the negative cross-correlations contribute to momentum profits.
Griffin et al. (2003)	June/94 - Dec/2000	Monthly	Not stated	Not stated	Top (winner) and bottom (loser) 20% of stock returns, EW	J=K=6m, S=1m	Not stated	Real estate trusts and investment companies are excluded. Delisted stocks are included.	Insignificant profits for K=6, t-$t+5$ holding period; Sig. reversals for holding periods: $t+6$-$t+11$, $t+12$-$t+17$, $t+18$-$t+23$, increase in magnitude over distance from formation period t.	
Wang (2004)	Jul/94-Dec/00	Monthly	SH,SZ jointly A	Rouwenhorst (1998): monthly rebalancing; JT (1993)	Five equal-size quintile portfolios, EW	J,K=3, 6, 9, 12, 18, 24 m S=1 m	6 m	Excluded banks, close-end funds, real estate, investment companies, stocks with	Sig. medium- and long-term reversals (3-24, 6-18, 6-24, 9-12, 9-18 , 9-24, 12-9, 12-12, 12-18, 12-24, 18-3, 18-6, 18-9, 18-12, 18-18, 18-24, 24-3, 24-6, 24-9, 24-12, 24-18, 24-24 months);	Results not due to bid-ask spreads Results driven by more risky losers (small cap, high BM ratios) betas do not appear to be

								less than 12 months of data in the formation period; stocks must have accounting data;			associated with average stock returns. No sig. results from test based on returns adjusted by FF three-factor model.
Wang and Chin (2004)	Jul/94-Dec/00	Monthly	SH SZ jointly and separat elly, A shares	JT (1993), Lee and Swaminathan (2000)	Five portfolios, independe nt sorts on past returns and past trading volume.	J, K =3, 6, 9, 12m, S=1m	Stocks listed no more than 6 months prior to the formati on Period exclude d	Exclude banks, close-end funds, real estate, and investment companies.	Reversals' in 9-3, 9-6 high volume portfolio. Risk-adjusted returns (four factor model): momentum in 3-3, 3-6, 3-9, 3-12 6-3, 6-9, 6-12, 9-6, 9-9, 9-12, 12-3, 12-6, 12-9, 12-12 low-volume portfolios, 6-9, 6-12 high-volume portfolios	Risk-adjusted returns for SH only: momentum for low-volume portfolios for all J, K except J=K=12. Risk-adjusted returns for SZ only: momentum for low-volume portfolios for all J, K except J=K=3. Risk-adjusted returns for large stocks: momentum for low-volume portfolios for all J, K.
Naughton et al. (2008)	1995-2005	Monthly	SH only, A	JT (1993) Lee and Swaminathan (2000)	Five equal-size quintile portfolios, EW; Three groups based on volume	J=1,3,6,9,1 2 m K=1,3,6,9, 12,24,36,4 8m S=0	N/A	N/A	Sig. and clear pattern of momentum (all strategies were sig.);	No strong links between past trading volume and momentum returns. Momentum returns decline over holding horizon.
Gupta et al. (2010)	Jan/93-Jul/97	Monthly	Not stated	JT (1993). All values converted to USD.	Three portfolios. An industry-neutral individual momentum strategy (loser and winner	J=K=6m, S=1m	Not explicit ly stated but text indicate s not exclude d.	REITs and ADRs excluded. Delisted stocks are included.	Significant momentum returns.	Significant momentum returns from industry momentum and 52-week high momentum strategies.

Study	Period	Freq	Market	Methodology	Portfolio	J/K	S	Sample	Results	Conclusions
					portfolios formed within the same industry)					
Zhou et al. (2010)	Jan/93-Jun/08; Pre/post Feb/2001	Monthly	SH, SZ jointly, A, B separately	Similar to LM (1990), JT (1993,1995)	Portfolio weighted based on stock return in formation period relative to EW market portfolio	J=K=1,3,6, 9,12,18,24, 36 m S=1m	6m	Excluded banks, close-end funds, real estate, investment companies	Full sample: A shares: reversals for J=K= 3, 12, 18, 24, 36); B shares: reversals for J=K=18, 24, 36; Pre-Feb2001: A shares: reversals for J=K=12, 18, 24, 36 m. B shares: reversals for J=K=12, 18, 24, 36 m. Sig. momentum profits for J=K=6m. Post-Feb2001: A shares: reversals for J=K=6, sig. momentum profits for J=K=18, 24, 36m. B shares: reversals for J=K=3, sig. momentum profits for J=K=9, 12, 18, 24, 36m.	For all trading horizons that yield significant returns, time series predictability dominates the cross-sectional variation component.
Li et al. (2010)	Jan/94-Dec/07	Monthly	SH, SZ jointly A	JT (1993)	Deciles EW	J.K=1,3,6, 9,12 m S=0	N/A	Stocks must have 36 observations in the past 48 months prior to formation	Using raw (non-risk-adjusted) returns: no sig. results; Using CAMP for risk-adjustment: sig. short-term reversals (1-1, 1-3, 3-1, 3-3, 6-1, 6-3, 9-1 m)	
Wu (2011)	Dec.12, 1990 to Dec.31, 2001 (SH) July 3, 1991 to Dec.31, 2001	Daily	SH, SZ separately, A	JT(1993)	Deciles, EW	J=1 week, 1,3,6,9,12 m K=1 day, 1 week, 1,3,6,9,12 m; S=0	included	All available stocks included; Portfolios formed from 1/3 of the sample on (July 15, 1994).	"Little" evidences of pure momentum or contrarian profits: SH: Sig. contrarian (1w-1d, 1w-1w, 3m-1d, 9m-1d, 12m-1d), sig. momentum (1w-9m, 1w-12m, 1m-12m, 3m-9m, 3m-12m); SZ: 8 contrarian results (1w-	Combining mean reversion and momentum generates excess returns higher than those from both pure momentum and pure contrarian strategies. This result not fully driven by beta risk, bid-ask spreads, transaction costs,

	(SZ)								1w, 3m-1d, 3m-1w, 3m-1m, 6m-1d, 9m-1d, 9m-1w, 12m-1d))	or the number of portfolios.
Chen et al. (2012)	Monthly data: Jan/95-Dec/09; Weekly data: Jan/95-Apr/10	Weekly And monthly	SH SZ jointly, A	JT (1993), DeBond and Thaler (1985, 1987), Cooper, Gutierrez, and Hameed, 2004 (market states)	Deciles EW	Monthly data: J=1,3,6 m K=1,3,6,9 m S=0 Weekly data: J=1,2,4,8,12, 16, 24 w K=1,2,4,8, 12, 16 w S=0,1	N/A	S=0, 1	Monthly data: reversals (1-1, 1-3, 3-1m); S=0 Weekly data: reversals (1-1, 1-8, 1-12, 1-16, 2-1, 2-8, 2-12, 4-1, 4-2, 4-8, 4-12, 4-16, 8-1, 8-2, 8-4, 8-8, 8-12, 12-1,12-2, 12-4, 12-8, 16-1,16-2,16-4, 24-1 ws); S=0	Weekly data, S=1wk: fewer sig. reversals (2-16, 4-2, 4-4, 4-8, 4-12, 4-16, all J=8, 12, 16, 24, K=1, 2, 4, 8, 12, 16 ws). Momentum (1-1, 1-2 ws)
Pan et al. (2013)	Jan/95-Dec/09	Monthly and weekly	SH SZ jointly, A	JT(1993).	Quintiles, Interval ranking; EW	J, K=1,2,3,4, 5,6,9,12 m J=1 to 10 w K=1,2,3,4, 5,10,16,26, 52 w S=0	First 6 months excluded	Exclude a-stock period which hit the 10% limit imposed by the regulation in the last trading day.	Monthly: reversals only (2-1, 2-2) in the full sample; 1995-2001: no significant profits; 2002-2009 sig. short-term reversals (1-1, 1-2, 1-3, 1-4, 1-5, 2-1, 3-1). Weekly: sig. short-term reversals for whole sample period (1-1, 1-2, 2-1, 5-1, 6-1, 7-1, 7-4, 7-5, 8-1, 8-2, 9-1, 9-2, 10-1); 1995-2001: one reversal (1-1), more momentum (2-2, 2-3, 3-2, 3-3 ws); 2002-2009: more numerous reversals (J=1 to 10, K=1 to 5, most for J+K<12).	For interval ranking: significant numerous momentum in the whole sample and both subsamples, momentum profits up to 52 weeks of the holding period, strongest when formation period and holding periods from 1 to 3 weeks.
Gupta et al. (2013)	Jan/93-Jul/97	Monthly	A shares	JT (1993). All values converted to USD.	Five portfolios, VW and EW	J=K=6m, S=1m	Not stated	real estate investment trusts, preferred and convertible	Significant momentum overall. Sig. reversals in small stocks and momentum in large stocks.	No substantial difference between CAR and BH returns; between USD and local currency returns; when extreme losers/ winners excluded.

								stocks, stocks with restricted voting rights are not included. Delisted stocks included		Momentum stronger for VW portfolios, when focus is on more extreme winners/losers (more portfolios), Momentum weaker when log rather than simple returns used with the CAR method; when no skipping,
Cheema and Nartea (2014)	Jan/95-June/13	Monthly	SHSE only, A shares	JT (1993)	Five portfolios, VW and EW	J=6 except month *t-1* (skip one month), K=3, 6, 9, 12m	Not stated	Exclude stocks with monthly returns greater than 100%, stocks with a share price below CNY5 at the portfolio formation date, financial institutions and closed-end funds.	Full sample period (1995-2013): Significant momentum except K=12 EW and K=3 VW. Subsample 1995-2006: Stronger significant momentum for all K. Subsample 2007-2013: Significant reversals for all K except K=9, 12 VW.	Jensen's alphas from a three factor model: Full sample and subsample 1995-2006: positive and significant, subsample 2007-2013: all negative, significant except K=9, 12 VW.
Chen et al. (2015)	Jan/94-Dec/13	Monthly and Weekly	SH and SZ jointly, A shares	JT (1993), also George and Hwang (2004) [GH] and Bhootra and Hur (2013) [BH].	Deciles, EW	J, K=1, 3, 6m, 1, 2, 3w; S=1 period	Not stated	Also include delisted stocks.	Monthly data: insignificant profits; Weekly data: Significant momentum for 1-1 strategy, significant reversals for 1-3, 2-2, 2-3, 3-1, 3-2, 3-3w. Weekly 2008-13 subperiod: Significant reversals except for 1-1 strategy. Sub-period 1994–2007: results not displayed but reported to be similar to those of whole sample period, with smaller contrarian profits.	Sig. FF five factor model alphas for weekly strategies with significant mean profits. No significant returns using GH or BH methods (except sig. reversals for 2008-13, BH, K=2,3, weekly data).

Note: "Exchange" specifies which of the two mainland Chinese stock markets, Shanghai Stock Exchange (SH) or Shenzhen Stock Exchange (SZ), or both, were covered by each study. "Share type" refers to A- type or B-type shares. "JT (1993)" denotes the Jegadeesh and Titmann (1993) paper. "EV" ("VW") indicates equally-weighted (value-weighted) portfolios. "Post-IPO omission" reports whether, and for how long, prices of stocks following their initial public offerings were excluded for an initial period of trading.

Table 2: Average monthly momentum profits, equally-weighted portfolios.

J/K	1	2	3	4	5	6	7	8	9	10	11	12
1	-0.0125**	-0.0111***	-0.0066***	-0.0048**	-0.0039**	-0.0026*	-0.0015	-0.0021*	-0.0005	-0.0016	-0.0012	-0.001
	(-3.24)	(-3.70)	(-2.95)	(-2.53)	(-2.49)	(-1.92)	(-1.20)	(-1.77)	(-0.35)	(-1.51)	(-1.27)	(-1.06)
2	-0.0151***	-0.0090***	-0.0058**	-0.0043*	-0.0032	-0.0015	-0.0011	-0.0012	-0.0011	-0.001	-0.0005	-0.0008
	(-3.53)	(-2.76)	(-2.07)	(-1.79)	(-1.60)	(-0.80)	(-0.66)	(-0.72)	(-0.70)	(-0.71)	(-0.36)	(-0.57)
3	-0.0126***	-0.0075**	-0.0047	-0.0033	-0.0017	-0.001	-0.0005	-0.001	-0.0006	-0.0006	-0.0006	-0.0006
	(-3.07)	(-2.16)	(-1.57)	(-1.26)	(-0.74)	(-0.47)	(-0.27)	(-0.54)	(-0.30)	(-0.34)	(-0.32)	(-0.34)
4	-0.0104**	-0.0061*	-0.004	-0.0019	-0.0009	-0.0002	-0.0002	-0.0004	0.0002	-0.0002	-0.0001	-0.0008
	(-2.53)	(-1.75)	(-1.31)	(-0.71)	(-0.36)	(-0.08)	(-0.09)	(-0.16)	(0.08)	(-0.11)	(-0.05)	(-0.40)
5	-0.0083**	-0.0057*	-0.0024	-0.0011	-0.0005	-0.0005	-0.0004	-0.0002	-0.0004	-0.0003	-0.0009	-0.0008
	(-2.16)	(-1.68)	(-0.78)	(-0.39)	(-0.20)	(-0.18)	(-0.15)	(-0.08)	(-0.16)	(-0.12)	(-0.40)	(-0.37)
6	-0.0085**	-0.0042	-0.002	-0.0008	-0.0008	-0.0004	-0.0001	-0.0007	-0.0005	-0.0012	-0.0011	-0.0016
	(-2.23)	(-1.24)	(-0.61)	(-0.25)	(-0.26)	(-0.16)	(-0.04)	(-0.25)	(-0.19)	(-0.49)	(-0.44)	(-0.68)
7	-0.0056	-0.0034	-0.0011	-0.0008	-0.0008	0.002	-0.0007	-0.0008	-0.0014	-0.0013	-0.0017	-0.0022
	(-1.46)	(-0.97)	(-0.34)	(-0.25)	(-0.25)	(0.54)	(-0.23)	(-0.27)	(-0.50)	(-0.48)	(-0.64)	(-0.84)
8	-0.0055	-0.0033	-0.0017	-0.0011	-0.0005	-0.0007	-0.0008	-0.0017	-0.0015	-0.0021	-0.0025	-0.0021
	(-1.40)	(-0.92)	(-0.50)	(-0.35)	(-0.15)	(-0.23)	(-0.25)	(-0.58)	(-0.51)	(-0.73)	(-0.91)	(-0.78)
9	-0.0054	-0.0033	-0.0016	-0.0006	-0.001	-0.0009	-0.0017	-0.0019	-0.0024	-0.0029	-0.0025	-0.0034
	(-1.44)	(-0.93)	(-0.47)	(-0.19)	(-0.29)	(-0.28)	(-0.55)	(-0.62)	(-0.80)	(-0.99)	(-0.86)	(-1.23)
10	-0.0055	-0.0036	-0.0017	-0.0018	-0.0015	-0.0023	-0.0022	-0.003	-0.0033	-0.0027	-0.0037	-0.0036
	(-1.43)	(-0.97)	(-0.47)	(-0.51)	(-0.44)	(-0.70)	(-0.68)	(-0.94)	(-1.04)	(-0.88)	(-1.27)	(-1.23)
11	-0.0057	-0.0032	-0.0027	-0.0022	-0.0031	-0.003	-0.0035	-0.0041	-0.0034	-0.0043	-0.0041	-0.0043
	(-1.45)	(-0.86)	(-0.75)	(-0.62)	(-0.90)	(-0.88)	(-1.04)	(-1.26)	(-1.06)	(-1.39)	(-1.33)	(-1.42)
12	-0.0047	-0.0045	-0.0032	-0.0038	-0.0035	-0.0038	-0.0042	-0.0037	-0.0046	-0.0043	-0.0044	-0.005
	(-1.20)	(-1.20)	(-0.88)	(-1.05)	(-0.99)	(-1.09)	(-1.20)	(-1.10)	(-1.43)	(-1.34)	(-1.42)	(-1.64)
13	-0.0076*	-0.0056	-0.005	-0.0043	-0.0048	-0.0051	-0.0044	-0.0054	-0.0049	-0.0051	-0.0055*	-0.0056*
	(-1.94)	(-1.46)	(-1.35)	(-1.18)	(-1.35)	(-1.43)	(-1.26)	(-1.61)	(-1.50)	(-1.57)	(-1.74)	(-1.78)
14	-0.0075*	-0.0072*	-0.0052	-0.0053	-0.0053	-0.0046	-0.0056	-0.0052	-0.0053	-0.0058*	-0.0058*	-0.0056*
	(-1.90)	(-1.88)	(-1.38)	(-1.41)	(-1.43)	(-1.29)	(-1.60)	(-1.51)	(-1.56)	(-1.76)	(-1.77)	(-1.73)
15	-0.0087**	-0.0071*	-0.0061	-0.006	-0.0049	-0.0056	-0.0053	-0.0055	-0.0060*	-0.0060*	-0.0056*	-0.0057*
	(-2.19)	(-1.82)	(-1.61)	(-1.59)	(-1.32)	(-1.58)	(-1.50)	(-1.58)	(-1.76)	(-1.78)	(-1.74)	(-1.71)
16	-0.0085**	-0.0078**	-0.0070*	-0.0056	-0.0062*	-0.0055	-0.0057	-0.0064*	-0.0059*	-0.0060*	-0.0058*	-0.0065*
	(-2.14)	(-2.00)	(-1.82)	(-1.47)	(-1.67)	(-1.52)	(-1.61)	(-1.83)	(-1.69)	(-1.75)	(-1.70)	(-1.96)
17	-0.0099**	-0.00890**	-0.0054	-0.0066*	-0.0059	-0.0058	-0.0066*	-0.0066*	-0.0062*	-0.0059*	-0.0067*	-0.0069**
	(-2.52)	(-2.30)	(-1.27)	(-1.74)	(-1.60)	(-1.60)	(-1.83)	(-1.86)	(-1.77)	(-1.71)	(-1.96)	(-2.04)
18	-0.0108***	-0.0081**	-0.0070*	-0.0062	-0.0062	-0.0066	-0.0065	-0.0063*	-0.0060*	-0.0068*	-0.0070**	-0.0078**
	(-2.61)	(-2.06)	(-1.80)	(-1.64)	(-1.65)	(-1.79)	(-1.77)	(-1.74)	(-1.68)	(-1.92)	(-1.99)	(-2.28)
19	-0.0089**	-0.0079**	-0.0063	-0.0061	-0.0067*	-0.0066*	-0.0062*	-0.0061	-0.0068*	-0.0070*	-0.0079**	-0.0077**
	(-2.18)	(-1.99)	(-1.62)	(-1.60)	(-1.78)	(-1.76)	(-1.68)	(-1.65)	(-1.88)	(-1.95)	(-2.25)	(-2.21)
20	-0.0094**	-0.0078*	-0.0067*	-0.0071*	-0.0069*	-0.0063*	-0.0061	-0.0070*	-0.0072*	-0.0082**	-0.0080**	-0.0080**
	(-2.29)	(-1.95)	(-1.70)	(-1.85)	(-1.80)	(-1.65)	(-1.61)	(-1.88)	(-1.96)	(-2.26)	(-2.22)	(-2.23)
21	-0.0093**	-0.0078*	-0.0076*	-0.0071*	-0.0062	-0.006	-0.0069*	-0.0073*	-0.0082**	-0.0080**	-0.0081**	-0.0079**
	(-2.27)	(-1.97)	(-1.96)	(-1.81)	(-1.61)	(-1.54)	(-1.82)	(-1.92)	(-2.22)	(-2.17)	(-2.19)	(-2.18)
22	-0.0094**	-0.0090**	-0.0079**	-0.0067*	-0.0063	-0.0071	-0.0074*	-0.0085**	-0.0083**	-0.0083**	-0.0081**	-0.0080**
	(-2.30)	(-2.27)	(-1.99)	(-1.70)	(-1.61)	(-1.84)	(-1.92)	(-2.26)	(-2.22)	(-2.22)	(-2.19)	(-2.16)
23	-0.0113***	-0.0093**	-0.0073**	-0.0068*	-0.0077*	-0.0079**	-0.0090**	-0.0089**	-0.0090**	-0.0087**	-0.0086**	-0.0086**
	(-2.69)	(-2.29)	(-1.83)	(-1.71)	(-1.97)	(-2.02)	(-2.35)	(-2.34)	(-2.35)	(-2.30)	(-2.26)	(-2.28)
24	-0.0101**	-0.0080**	-0.0068*	-0.0073**	-0.0077*	-0.0086**	-0.0086**	-0.0087**	-0.0086**	-0.0084**	-0.0085**	-0.0088**
	(-2.45)	(-1.99)	(-1.70)	(-1.85)	(-1.93)	(-2.22)	(-2.20)	(-2.25)	(-2.21)	(-2.17)	(-2.19)	(-2.26)

Table 2 continued

J/K	13	14	15	16	17	18	19	20	21	22	23	24
1	-0.0013	-0.0013	-0.0016*	-0.0014*	-0.0017**	-0.0016**	-0.0014*	-0.0014*	-0.0013*	-0.0014*	-0.0016**	-0.0016**
	(-1.39)	(-1.45)	(-1.86)	(-1.68)	(-2.15)	(-2.00)	(-1.85)	(-1.86)	(-1.73)	(-1.90)	(-2.15)	(-2.20)
2	-0.0009	-0.0014	-0.0014	-0.0017	-0.0018	-0.0012	-0.0014	-0.0014	-0.0014	-0.0006	-0.0017	-0.0015
	(-0.67)	(-1.10)	(-1.14)	(-1.40)	(-1.51)	(-1.02)	(-1.22)	(-1.26)	(-1.30)	(-0.49)	(-1.61)	(-1.41)
3	-0.0012	-0.0011	-0.0016	-0.0018	-0.0015	-0.0015	-0.0015	-0.0016	-0.0018	-0.0019	-0.0018	-0.0017
	(-0.74)	(-0.69)	(-1.02)	(-1.17)	(-1.02)	(-1.00)	(-1.02)	(-1.13)	(-1.31)	(-1.40)	(-1.29)	(-1.24)
4	-0.001	-0.0014	-0.0018	-0.0013	-0.0017	-0.0016	-0.0017	-0.002	-0.002	-0.0018	-0.0018	-0.0021
	(-0.50)	(-0.75)	(-0.97)	(-0.74)	(-1.00)	(-0.93)	(-0.99)	(-1.19)	(-1.22)	(-1.14)	(-1.11)	(-1.33)
5	-0.0014	-0.0018	-0.0015	-0.0021	-0.002	-0.002	-0.0023	-0.0024	-0.0022	-0.0021	-0.0025	-0.0026
	(-0.67)	(-0.86)	(-0.72)	(-1.07)	(-1.02)	(-1.03)	(-1.24)	(-1.30)	(-1.18)	(-1.15)	(-1.42)	(-1.47)
6	-0.0021	-0.0017	-0.0024	-0.0023	-0.0025	-0.0027	-0.0028	-0.0026	-0.0025	-0.0029	-0.003	-0.0034*
	(-0.90)	(-0.77)	(-1.08)	(-1.08)	(-1.15)	(-1.30)	(-1.34)	(-1.26)	(-1.21)	(-1.47)	(-1.53)	(-1.75)
7	-0.0018	-0.0026	-0.0025	-0.0027	-0.0031	-0.003	-0.0028	-0.0027	-0.0032	-0.0033	-0.0038*	-0.0036*
	(-0.71)	(-1.08)	(-1.08)	(-1.17)	(-1.36)	(-1.33)	(-1.27)	(-1.23)	(-1.50)	(-1.55)	(-1.82)	(-1.74)
8	-0.003	-0.003	-0.0031	-0.0037	-0.0018	-0.0033	-0.0032	-0.0037	-0.0038	-0.0043*	-0.0041*	-0.0041*
	(-1.15)	(-1.16)	(-1.25)	(-1.48)	(-0.67)	(-1.39)	(-1.33)	(-1.61)	(-1.64)	(-1.90)	(-1.85)	(-1.86)
9	-0.0033	-0.0035	-0.0041	-0.0041	-0.0039	-0.0036	-0.0041*	-0.0042*	-0.0048**	-0.0045*	-0.0046*	-0.0043*
	(-1.24)	(-1.32)	(-1.55)	(-1.59)	(-1.51)	(-1.41)	(-1.68)	(-1.74)	(-2.00)	(-1.93)	(-1.96)	(-1.89)
10	-0.0038	-0.0044	-0.0044	-0.0042	-0.0039	-0.0044*	-0.005*	-0.0052**	-0.0049*	-0.0049**	-0.003	-0.0045*
	(-1.34)	(-1.57)	(-1.60)	(-1.55)	(-1.47)	(-1.71)	(-1.77)	(-2.05)	(-1.97)	(-1.99)	(-1.11)	(-1.89)
11	-0.0049*	-0.0050*	-0.0048*	-0.0046	-0.0051*	-0.0051*	-0.0057**	-0.0055**	-0.0054**	-0.0051**	-0.0050*	-0.0049*
	(-1.67)	(-1.72)	(-1.68)	(-1.61)	(-1.86)	(-1.87)	(-2.12)	(-2.08)	(-2.07)	(-1.99)	(-1.96)	(-1.95)
12	-0.0052*	-0.0051*	-0.0049	-0.0055*	-0.0055*	-0.0060**	-0.0057**	-0.0057**	-0.0054**	-0.0052*	-0.0052*	-0.0054**
	(-1.72)	(-1.69)	(-1.63)	(-1.90)	(-1.93)	(-2.14)	(-2.08)	(-2.08)	(-2.01)	(-1.96)	(-1.96)	(-2.04)
13	-0.0055*	-0.0053*	-0.0060**	-0.0061**	-0.0066**	-0.0063**	-0.0062**	-0.0060**	-0.0058**	-0.0057**	-0.0060**	-0.0059**
	(-1.78)	(-1.74)	(-2.01)	(-2.06)	(-2.30)	(-2.21)	(-2.20)	(-2.16)	(-2.10)	(-2.08)	(-2.17)	(-2.16)
14	-0.0056*	-0.0063**	-0.0064**	-0.0070**	-0.0067**	-0.0065**	-0.0063**	-0.0061**	-0.0061**	-0.0063**	-0.0062**	-0.0060**
	(-1.74)	(-2.02)	(-2.08)	(-2.33)	(-2.24)	(-2.20)	(-2.16)	(-2.13)	(-2.11)	(-2.19)	(-2.17)	(-2.11)
15	-0.0064**	-0.0066**	-0.0073**	-0.0070**	-0.0068**	-0.0065**	-0.0049	-0.0064**	-0.0065**	-0.0064**	-0.0063**	-0.0064**
	(-2.01)	(-2.07)	(-2.34)	(-2.26)	(-2.23)	(-2.17)	(-1.52)	(-2.14)	(-2.19)	(-2.17)	(-2.13)	(-2.20)
16	-0.0068**	-0.0075**	-0.0073**	-0.0071**	-0.0068**	-0.0066**	-0.0066**	-0.0068**	-0.0067**	-0.0065**	-0.0067**	-0.0068**
	(-2.05)	(-2.33)	(-2.27)	(-2.26)	(-2.19)	(-2.12)	(-2.14)	(-2.23)	(-2.20)	(-2.15)	(-2.23)	(-2.26)
17	-0.0077**	-0.0075**	-0.00739**	-0.0071**	-0.0069**	-0.0068**	-0.0070**	-0.0069**	-0.0068**	-0.0069**	-0.0070**	-0.0065**
	(-2.34)	(-2.28)	(-2.27)	(-2.21)	(-2.15)	(-2.14)	(-2.22)	(-2.21)	(-2.15)	(-2.21)	(-2.24)	(-2.13)
18	-0.0077**	-0.0076**	-0.0074**	-0.0072**	-0.0071**	-0.0073**	-0.0072**	-0.0071**	-0.0072**	-0.0072**	-0.0069**	-0.0069**
	(-2.27)	(-2.27)	(-2.21)	(-2.16)	(-2.15)	(-2.21)	(-2.20)	(-2.18)	(-2.22)	(-2.25)	(-2.15)	(-2.21)
19	-0.0078**	-0.0076**	-0.0075**	-0.0074**	-0.0076**	-0.0074**	-0.0073**	-0.0075**	-0.0075**	-0.0071**	-0.0072**	-0.0071**
	(-2.26)	(-2.22)	(-2.18)	(-2.17)	(-2.24)	(-2.20)	(-2.18)	(-2.24)	(-2.27)	(-2.16)	(-2.22)	(-2.18)
20	-0.0079**	-0.0078**	-0.0077**	-0.0079**	-0.0078**	-0.0076**	-0.0078**	-0.0079**	-0.0074**	-0.0075**	-0.0073**	-0.0060*
	-2.24	(-2.22)	(-2.20)	(-2.25)	(-2.23)	(-2.19)	(-2.26)	(-2.31)	(-2.17)	(-2.23)	(-2.19)	(-1.93)
21	-0.0079**	-0.0080**	-0.0081**	-0.0081**	-0.0079**	-0.0081**	-0.0081**	-0.0076**	-0.0077**	-0.0076**	-0.0062*	-0.0063*
	(-2.18)	(-2.20)	(-2.25)	(-2.23)	(-2.20)	(-2.26)	(-2.28)	(-2.17)	(-2.21)	(-2.18)	(-1.92)	(-1.97)
22	-0.0082**	-0.0085**	-0.0084**	-0.0083**	-0.0085	-0.0085**	-0.0079*	-0.0080**	-0.0078**	-0.0064*	-0.0065**	-0.0064**
	(-2.21)	(-2.28)	(-2.27)	(-2.25)	(-2.30)	(-2.32)	(-2.19)	(-2.23)	(-2.19)	(-1.94)	(-1.99)	(-1.99)
23	-0.0090**	-0.0089**	-0.0088**	-0.0090**	-0.0091**	-0.0083**	-0.0084**	-0.0083**	-0.0067**	-0.0068**	-0.0067**	-0.0053*
	(-2.38)	(-2.36)	(-2.33)	(-2.39)	(-2.42)	(-2.26)	(-2.29)	(-2.26)	(-2.00)	(-2.05)	(-2.03)	(-1.76)
24	-0.0089**	-0.0088**	-0.0090**	-0.0091**	-0.0085**	-0.0085**	-0.0083**	-0.0068*	-0.0069**	-0.0068**	-0.0054**	-0.005
	(-2.29)	(-2.27)	(-2.33)	(-2.36)	(-2.23)	(-2.25)	(-2.21)	(-1.96)	(-2.01)	(-2.01)	(-1.74)	(-1.63)

Note: Average momentum returns are computed using monthly data for the period January 1991 – December 2012 using the approach of Jegadeesh and Titman (1993), with J months of formation and K months of portfolio holding periods. Figures in parentheses are t-values. *, **, *** denotes significance at the 10%, 5% and 1% level, respectively.

Table 3: Average monthly momentum profits, value-weighted portfolios.

J/K	1	2	3	4	5	6	7	8	9	10	11	12
1	-0.0103**	-0.0086**	-0.004	-0.0026	-0.0025	-0.0015	-0.0005	-0.0011	-0.0005	-0.0002	0.0003	0.0006
	(-2.20)	(-2.51)	(-1.49)	(-1.10)	(-1.24)	(-0.89)	(-0.30)	(-0.74)	(-0.35)	(-0.14)	(0.27)	(0.49)
2	-0.0112**	-0.006	-0.0027	-0.0021	-0.0019	-0.001	-0.0004	-0.0002	0.0006	0.0011	0.0017	0.0012
	(-2.35)	(-1.56)	(-0.82)	(-0.70)	(-0.77)	(-0.47)	(-0.22)	(-0.08)	(0.31)	(0.61)	(1.02)	(0.75)
3	-0.0085*	-0.0035	-0.0013	-0.0007	0.0000	0.0003	0.0013	0.0015	0.0025	0.0025	0.0024	0.0019
	(-1.84)	(-0.86)	(-0.36)	(-0.24)	(0.01)	(0.12)	(0.50)	(0.62)	(1.07)	(1.15)	(1.16)	(0.94)
4	-0.0054	-0.0029	-0.0023	-0.0009	-0.0002	0.0007	0.0013	0.0018	0.0028	0.0024	0.0022	0.0012
	(-1.13)	(-0.68)	(-0.63)	(-0.28)	(-0.07)	(0.24)	(0.48)	(0.69)	(1.08)	(0.95)	(0.90)	(0.50)
5	-0.0033	-0.0031	-0.0012	-0.0001	0.0005	0.0012	0.0016	0.0024	0.0024	0.0024	0.0017	0.0016
	(-0.72)	(-0.78)	(-0.35)	(-0.04)	(0.17)	(0.37)	(0.54)	(0.84)	(0.84)	(0.87)	(0.67)	(0.61)
6	-0.0066	-0.0036	-0.0017	-0.0002	0.0003	0.0011	0.0017	0.0017	0.002	0.0014	0.0015	0.0005
	(-1.50)	(-0.93)	(-0.45)	(-0.05)	(0.09)	(0.31)	(0.52)	(0.52)	(0.64)	(0.47)	(0.53)	(0.19)
7	-0.004	-0.0027	-0.0004	0.0007	0.0009	0.002	0.0019	0.0022	0.0017	0.0019	0.0014	0.0004
	(-0.90)	(-0.64)	(-0.11)	(0.17)	(0.24)	(0.54)	(0.54)	(0.64)	(0.52)	(0.60)	(0.46)	(0.15)
8	-0.0029	-0.0017	0.0000	0.0012	0.0021	0.0019	0.0021	0.0016	0.0019	0.0012	0.0004	0.0006
	(-0.64)	(-0.39)	(0.00)	(0.31)	(0.54)	(0.50)	(0.59)	(0.47)	(0.58)	(0.37)	(0.14)	(0.19)
9	-0.002	-0.0003	0.0013	0.0025	0.0021	0.0019	0.0016	0.0017	0.0011	0.0004	0.0006	-0.0006
	(-0.46)	(-0.07)	(0.31)	(0.63)	(0.55)	(0.52)	(0.45)	(0.49)	(0.33)	(0.11)	(0.18)	(-0.18)
10	0.0000	0.001	0.0024	0.0021	0.0019	0.0013	0.0014	0.0005	0.0000	0.0004	-0.0007	-0.0011
	(-0.01)	(0.23)	(0.60)	(0.53)	(0.50)	(0.35)	(0.38)	(0.13)	(0.01)	(0.12)	(-0.21)	(-0.33)
11	-0.0012	0.0007	0.0004	0.0007	0.0003	0.0002	-0.0005	-0.0011	-0.0005	-0.0012	-0.0013	-0.0015
	(-0.27)	(0.17)	(0.11)	(0.18)	(0.08)	(0.06)	(-0.13)	(-0.31)	(-0.14)	(-0.35)	(-0.38)	(-0.46)
12	-0.0003	-0.0013	-0.0006	-0.0005	-0.0001	-0.001	-0.0015	-0.001	-0.0017	-0.0015	-0.0016	-0.0022
	(-0.08)	(-0.31)	(-0.16)	(-0.12)	(-0.03)	(-0.26)	(-0.39)	(-0.27)	(-0.47)	(-0.41)	(-0.46)	(-0.65)
13	-0.0043	-0.0029	-0.002	-0.0011	-0.0018	-0.0024	-0.0019	-0.0025	-0.0022	-0.0022	-0.0026	-0.0029
	(-0.98)	(-0.70)	(-0.50)	(-0.27)	(-0.46)	(-0.62)	(-0.49)	(-0.69)	(-0.60)	(-0.62)	(-0.74)	(-0.85)
14	-0.0035	-0.0034	-0.002	-0.0023	-0.0024	-0.0021	-0.0027	-0.0026	-0.0024	-0.0028	-0.0029	-0.003
	(-0.81)	(-0.81)	(-0.49)	(-0.55)	(-0.60)	(-0.54)	(-0.72)	(-0.69)	(-0.65)	(-0.78)	(-0.82)	(-0.84)
15	-0.0044	-0.0039	-0.004	-0.0039	-0.0029	-0.0034	-0.8131	-0.793	-0.8833	-0.9334	-0.9133	-0.9434
	(-0.98)	(-0.91)	(-0.95)	(-0.94)	(-0.72)	(-0.82)	(-0.81)	(-0.79)	(-0.88)	(-0.93)	(-0.91)	(-0.94)
16	-0.0055	-0.0057	-0.0056	-0.0043	-0.0047	-0.004	-0.0039	-0.0042	-0.0041	-0.0037	-0.0037	-0.0046
	(-1.23)	(-1.35)	(-1.33)	(-1.04)	(-1.16)	(-1.00)	(-0.99)	(-1.10)	(-1.08)	(-1.00)	(-1.00)	(-1.31)
17	-0.0074	-0.0074*	-0.0054	-0.005	-0.0045	-0.0043	-0.0045	-0.0045	-0.0041	-0.0038	-0.0047	-0.0051
	(-1.65)	(-1.70)	(-1.27)	(-1.20)	(-1.10)	(-1.06)	(-1.14)	(-1.16)	(-1.06)	(-1.00)	(-1.28)	(-1.40)
18	-0.0089*	-0.0062	-0.0053	-0.0046	-0.0046	-0.0045	-0.0044	-0.0043	-0.0039	-0.0047	-0.005	-0.0059
	(-1.89)	(-1.42)	(-1.24)	(-1.10)	(-1.11)	(-1.12)	(-1.11)	(-1.09)	(-1.01)	(-1.25)	(-1.34)	(-1.61)
19	-0.0072	-0.0059	-0.0048	-0.0047	-0.005	-0.0047	-0.0043	-0.004	-0.0047	-0.005	-0.0059	-0.0058
	(-1.57)	(-1.35)	(-1.13)	(-1.13)	(-1.22)	(-1.16)	(-1.07)	(-1.01)	(-1.21)	(-1.29)	(-1.55)	(-1.54)
20	-0.0067	-0.006	-0.0051	-0.0053	-0.0052	-0.0043	-0.0041	-0.0048	-0.005	-0.0059	-0.0058	-0.0059
	(-1.49)	(-1.38)	(-1.18)	(-1.25)	(-1.24)	(-1.04)	(-0.99)	(-1.18)	(-1.24)	(-1.48)	(-1.47)	(-1.50)
21	-0.0059	-0.0053	-0.0052	-0.005	-0.0041	-0.0039	-0.0049	-0.0051	-0.0061	-0.0059	-0.006	-0.0058
	(-1.31)	(-1.19)	(-1.18)	(-1.15)	(-0.96)	(-0.91)	(-1.17)	(-1.23)	(-1.48)	(-1.43)	(-1.46)	(-1.43)
22	-0.0065	-0.0062	-0.0057	-0.0044	-0.0041	-0.0049	-0.0052	-0.0064	-0.0062	-0.0061	-0.0058	-0.0058
	(-1.43)	(-1.39)	(-1.29)	(-1.01)	(-0.93)	(-1.15)	(-1.24)	(-1.53)	(-1.49)	(-1.47)	(-1.41)	(-1.43)
23	-0.0077	-0.0065	-0.0047	-0.004	-0.0051	-0.0053	-0.0065	-0.0065	-0.0065	-0.0061	-0.0061	-0.0063
	(-1.63)	(-1.44)	(-1.05)	(-0.89)	(-1.16)	(-1.23)	(-1.53)	(-1.53)	(-1.54)	(-1.46)	(-1.45)	(-1.51)
24	-0.0071	-0.005	-0.0043	-0.005	-0.0053	-0.0064	-0.0065	-0.0066	-0.0063	-0.0061	-0.0063	-0.007
	(-1.59)	(-1.14)	(-0.97)	(-1.13)	(-1.20)	(-1.49)	(-1.51)	(-1.53)	(-1.47)	(-1.43)	(-1.47)	(-1.63)

J/K	13	14	15	16	17	18	19	20	21	22	23	24
1	0.0000	-0.0001	-0.0005	-0.0003	-0.001	-0.0007	-0.0004	-0.0005	-0.0006	-0.0006	-0.0008	-0.0009
	(-0.01)	(-0.05)	(-0.49)	(-0.28)	(-0.93)	(-0.73)	(-0.43)	(-0.51)	(-0.62)	(-0.67)	(-0.87)	(-0.98)
2	0.0008	0.0002	0.0002	-0.0004	-0.0007	-0.0001	-0.0003	-0.0005	-0.0005	-0.0006	-0.0008	-0.0007
	(-0.48)	(-0.13)	(-0.10)	(-0.28)	(-0.48)	(-0.10)	(-0.25)	(-0.39)	(-0.39)	(-0.49)	(-0.62)	(-0.56)
3	-0.0012	0.001	0.0003	-0.0001	0.0002	0.0002	-0.0001	-0.0001	-0.0003	-0.0004	-0.0004	-0.0005
	(-0.74)	(-0.53)	(-0.15)	(-0.05)	(-0.12)	(-0.13)	(-0.03)	(-0.08)	(-0.17)	(-0.25)	(-0.26)	(-0.32)
4	0.0007	0.0001	-0.0005	-0.0001	-0.0005	-0.0005	-0.0006	-0.0008	-0.0008	-0.0007	-0.0009	-0.0014
	(-0.33)	(-0.06)	(-0.23)	(-0.06)	(-0.27)	(-0.26)	(-0.28)	(-0.41)	(-0.43)	(-0.39)	(-0.45)	(-0.75)
5	0.0007	-0.0018	0.0002	-0.0005	-0.0007	-0.0006	-0.0009	-0.001	-0.0008	-0.0008	-0.0015	-0.0016
	(-0.27)	(-0.86)	(-0.10)	(-0.24)	(-0.32)	(-0.27)	(-0.40)	(-0.46)	(-0.40)	(-0.39)	(-0.73)	(-0.78)
6	-0.0004	-0.0001	-0.0008	-0.0012	-0.0013	-0.0015	-0.0015	-0.0014	-0.0013	-0.0019	-0.0021	-0.0025
	(-0.14)	(-0.06)	(-0.33)	(-0.47)	(-0.53)	(-0.60)	(-0.61)	(-0.60)	(-0.55)	(-0.85)	(-0.92)	(-1.14)
7	0.0007	-0.0003	-0.0007	-0.0009	-0.0013	-0.0013	-0.0012	-0.0011	-0.0018	-0.0018	-0.0025	-0.0024
	(-0.24)	(-0.12)	(-0.24)	(-0.35)	(-0.51)	(-0.50)	(-0.47)	(-0.44)	(-0.72)	(-0.74)	(-1.02)	(-0.99)
8	-0.0006	-0.0009	-0.0011	-0.0018	-0.0018	-0.0015	-0.0013	-0.0021	-0.0021	-0.0027	-0.0041	-0.0028
	(-0.19)	(-0.30)	(-0.40)	(-0.63)	(-0.67)	(-0.55)	(-0.49)	(-0.80)	(-0.83)	(-1.09)	(-1.86)	(-1.12)
9	-0.001	-0.0013	-0.002	-0.0022	-0.002	-0.0017	-0.0024	-0.0025	-0.0031	-0.0029	-0.003	-0.0028
	(-0.32)	(-0.43)	(-0.66)	(-0.76)	(-0.69)	(-0.61)	(-0.88)	(-0.93)	(-1.16)	(-1.11)	(-1.15)	(-1.10)
10	-0.0014	-0.002	-0.0023	-0.0021	-0.002	-0.0027	-0.0028	-0.0034	-0.0032	-0.0032	-0.003	-0.003
	(-0.46)	(-0.66)	(-0.74)	(-0.71)	(-0.66)	(-0.93)	(-1.00)	(-1.24)	(-1.17)	(-1.18)	(-1.11)	(-1.11)
11	-0.0022	-0.0025	-0.0025	-0.0024	-0.0032	-0.0031	-0.0039	-0.0037	-0.0036	-0.0033	-0.0033	-0.0033
	(-0.68)	(-0.78)	(-0.79)	(-0.77)	(-1.05)	(-1.05)	(-1.32)	(-1.28)	(-1.26)	(-1.18)	(-1.17)	(-1.20)
12	-0.0026	-0.0025	-0.0025	-0.0035	-0.0036	-0.0041	-0.0039	-0.0039	-0.0036	-0.0035	-0.0036	-0.0039
	(-0.77)	(-0.77)	(-0.78)	(-1.12)	(-1.15)	(-1.34)	(-1.30)	(-1.30)	(-1.20)	(-1.19)	(-1.20)	(-1.33)
13	-0.0031	-0.0031	-0.0041	-0.0043	-0.005	-0.0047	-0.0046	-0.0043	-0.0043	-0.0042	-0.0046	-0.0047
	(-0.91)	(-0.93)	(-1.27)	(-1.36)	(-1.59)	(-1.52)	(-1.51)	(-1.43)	(-1.41)	(-1.40)	(-1.52)	(-1.57)
14	-0.0032	-0.0042	-0.0045	-0.0053	-0.005	-0.0048	-0.0045	-0.0044	-0.0044	-0.0047	-0.0049	-0.0049
	(-0.91)	(-1.26)	(-1.35)	(-1.61)	(-1.55)	(-1.51)	(-1.42)	(-1.40)	(-1.41)	(-1.52)	(-1.56)	(-1.58)
15	-0.0045	-0.0048	-0.0057*	-0.0057*	-0.0054	-0.005	-0.0049	-0.0049	-0.0052	-0.0053	-0.0053	-0.0055*
	(-1.29)	(-1.41)	(-1.68)	(-1.68)	(-1.62)	(-1.54)	(-1.52)	(-1.52)	(-1.61)	(-1.64)	(-1.65)	(-1.74)
16	-0.0051	-0.0061*	-0.0059*	-0.0059*	-0.0054	-0.0052	-0.0053	-0.0056*	-0.0056*	-0.0056*	-0.0058*	-0.0061*
	(-1.44)	(-1.75)	(-1.72)	(-1.73)	(-1.61)	(-1.57)	(-1.58)	(-1.69)	(-1.71)	(-1.69)	(-1.77)	(-1.86)
17	-0.0060*	-0.0060*	-0.0059*	-0.0055	-0.0054	-0.0053	-0.0056	-0.0057*	-0.0056	-0.0057*	-0.0060*	-0.0057*
	(-1.69)	(-1.69)	(-1.68)	(-1.60)	(-1.56)	(-1.55)	(-1.63)	(-1.68)	(-1.65)	(-1.69)	(-1.76)	(-1.69)
18	-0.006	-0.006	-0.0057	-0.0057	-0.0056	-0.0059*	-0.0060*	-0.0060*	-0.0060*	-0.0062*	-0.0060*	-0.0060*
	(-1.63)	(-1.64)	(-1.60)	(-1.60)	(-1.58)	(-1.66)	(-1.69)	(-1.69)	(-1.73)	(-1.78)	(-1.72)	(-1.76)
19	-0.0061	-0.0059	-0.0059	-0.0059	-0.0062*	-0.0062*	-0.0062*	-0.0064*	-0.0065*	-0.0061*	-0.0062*	-0.0061*
	(-1.61)	(-1.59)	(-1.59)	(-1.61)	(-1.69)	(-1.70)	(-1.70)	(-1.75)	(-1.80)	(-1.70)	(-1.72)	(-1.72)
20	-0.0058	-0.0059	-0.0059	-0.0063	-0.0063*	-0.0063	-0.0064*	-0.0066*	-0.0061	-0.0062*	-0.0062*	-0.005
	(-1.50)	(-1.53)	(-1.53)	(-1.64)	(-1.66)	(-1.64)	(-1.68)	(-1.75)	(-1.63)	(-1.65)	(-1.66)	(-1.43)
21	-0.0059	-0.0061	-0.0065	-0.0066*	-0.0066*	-0.0067*	-0.0069*	-0.0064*	-0.0064*	-0.0065*	-0.0053	-0.0053
	(-1.47)	(-1.52)	(-1.63)	(-1.67)	(-1.66)	(-1.70)	(-1.76)	(-1.65)	(-1.66)	(-1.68)	(-1.44)	(-1.46)
22	-0.0062	-0.0068*	-0.0070*	-0.0071*	-0.0072*	-0.0073*	-0.0066*	-0.0067*	-0.0067*	-0.0054	-0.0055	-0.0057
	(-1.52)	(-1.67)	(-1.73)	(-1.76)	(-1.79)	(-1.83)	(-1.70)	(-1.70)	(-1.70)	(-1.46)	(-1.48)	(-1.53)
23	-0.0069*	-0.0072*	-0.0073*	-0.0076*	-0.0078*	-0.0070*	-0.0070*	-0.0071*	-0.0057	-0.0057	-0.0057	-0.0047
	(-1.66)	(-1.74)	(-1.77)	(-1.83)	(-1.88)	(-1.73)	(-1.71)	(-1.74)	(-1.48)	(-1.48)	(-1.50)	(-1.28)
24	-0.0074*	-0.0076*	-0.0078	-0.0080*	-0.0073*	-0.0071*	-0.0072*	-0.0058	-0.0058	-0.0059	-0.0048	-0.0044
	(-1.73)	(-1.78)	(-1.84)	(-1.89)	(-1.75)	(-1.72)	(-1.73)	(-1.47)	(-1.47)	(-1.51)	(-1.28)	(-1.20)

Note: Average momentum returns are computed using monthly data for the period January 1991 – December 2012 using the approach of Jegadeesh and Titman (1993), with J months of formation and K months of portfolio holding periods. Figures in parentheses are t-values. *, **, *** denotes significance at the 10%, 5% and 1% level, respectively