

Research on Long-lasting Momentum Factor in Weekly Returns of the Chinese Stock Market

Haoze Li^{1,*}

¹*School of Finance, Southwestern University of Finance and Economics, Chengdu, 611130, China*

**Corresponding author. Email: 41904563@smail.swufe.edu.cn*

ABSTRACT

The momentum effect has always been a hot topic in the research of the stock market by domestic and foreign scholars. In 2008, Roberto found that in the American stock market, an inverse and long-lasting continuation in returns ensues from the well-documented brief reversal. Besides, evidence demonstrates that these sequent momentum profits are robust enough to neutralize the reversal and to engender a distinct momentum effect over the year following portfolio formation. This article had a worldwide influence and shock in the field of stock market research at that time. Based on the research results Roberto's, this paper explores whether there are short-term reversals and subsequent long-lasting momentum effects in the weekly return data of Chinese stock market from 2010 to 2018. The finding is that neither short-term reversal nor long-term momentum is significant in Chinese stock market, and in the aspect of stock returns, the size effect is a more explanatory variable.

Keywords: *A-share market, Reversal, Weekly return, Momentum*

1. INTRODUCTION

Scholars from all over the world have conducted a lot of studies on the momentum effect since Jegadeesh and Titman have concluded it existed in the American stock market in the 1990s. Grinblatt analyzed the mutual fund market in the United States. They found that more than 70 percent of the funds used momentum investing strategies to increase investment returns. Roberto found that by observing the weekly stock return data of the American stock market from 1983 to 2003, the next week reversal significantly happened to extreme-return stocks, while momentum was the more interpretative force in 1-week returns. Xu took the UK stock market as the research object and analyzed that the momentum effect was an important anomaly in the UK stock market. Rouwenhorst took the stock data of 12 European countries as samples to analyze and concluded that the stock markets of the above-mentioned countries all had a momentum effect, but the degree of return momentum was weaker than that of the United States[1-5].

In recent years, there have been some researches about it in Chinese stock market. Wang and Zhao took all A-shares in Shenzhen and Shanghai stock markets from 1993 to 2000 as samples and found that the momentum effect didn't exist in Chinese stock market, but there was an obvious reversal phenomenon. Zhu and Wang

believed that the selection of stock samples should include a complete fluctuation cycle, and there should be both bull and bear markets so that the analysis results would be more credible. Taking the stock data from 1995 to 2001, they concluded that the momentum effect of Chinese stock market was not prominent, and the existence of momentum profit was very short. Ning and Wang used risk-adjusted return evaluation, based on residual return ranking to investigate the monthly momentum or reversal in Chinese A-share market, and found that there was a significant residual reversal effect in the full sample stage, but no residual momentum effect[6-8].

Different scholars adopt different research methods and study the causes of momentum effect according to different research objects and research intervals. They mainly explain the causes of the momentum effect according to different research objects and get the conclusion that stocks of different industries and sizes often have different effects. It is worth noting that although the momentum effect is alike to the long-term momentum effect in the weekly return, there are still differences in the concept definition, the test method and the period. The conclusions of the above literature cannot be blindly applied to the test of the medium and long-term momentum factor in the weekly return in this paper.

Based on its research method of Roberto's as well as making appropriate innovations to test the existence of short-term reversal factor and long-lasting momentum factor, this paper shed light on short-term reversals and subsequent long-lasting momentum effects in the weekly return data of China's stock market and explored the relation between momentum and stock characteristics, size, measured by the market value of firms. It's tilt to see whether the return momentum can be a new testing ground in stock market factors, so this paper selected size as an example. Conversely, it is intended to verify if the stock characteristics, such as size, which are often exploited to look into how anomalies are influenced by variation trading costs, information environments, and investor sophistication which can be enlightened to the return momentum[3].

Time-series regression approach of Black's is used. Weekly returns on stocks are carried out the regression on the returns to an arbitrage portfolio of stocks in the highest decile and lowest decile of the prior week's return. Additionally, for the holding period, this paper refer to Fama and French, where stocks are divided into small and big groups according to the size, in case that it can figure out which factor matters the most in stocks' weekly returns[9,10].

The main results are easy to summarize. For China's stock market from 2010 to 2018, the short-term reversal effect in weekly returns is relatively small, and the t-test value of short-term reversal is not significant, so the reversal can be ignored. As for the research on the long-term momentum factor, both extreme and non-extreme portfolios have achieved significant negative returns in 4-52 weeks, which is contrary to the assumption of the long-term momentum factor. Therefore, the long-term momentum factor in the Chinese stock market is not significant.

The rest of this paper is organized as the following. Section 2 elaborates data and methods. Section 3 talks over the performance of weekly portfolios longing winner stocks and shorting loser stocks, examining the existence of weekly momentum. Section 4 examines the explanatory power of various variables to exclude the impact of long-lasting momentum. Section 5 examines the changes of momentum in 1-week returns in different stock sizes. Section 6 concludes.

2. DATA AND METHODS

For weekly return data of China's stock market, this article quotes data for stocks listed on CSMAR database, which is renowned for data completeness. In terms of the selection of time interval, we selected data from 2010 to 2018, for the launching ceremony of share price index futures in 2010 marks the further improvement of the stock market structure, therefore, weekly return data after 2010 is much more convincing. In addition, since

CSMAR merely updated the weekly return data for the 25th week of 2020, and data in 2019 is occupied when calculating the subsequent performance of portfolios formed in 2018, we finally decided to use the return data from 2010 to 2018. Additionally, there were two bull and bear markets between 2010 and 2018. From December 4, 2012 to February 18, 2013, the market index growth rate reached 24%. From March 12, 2014 to June 12, 2015, the growth rate of the market index reached an astonishing 162% in 15 months. Meanwhile, there were significant bear markets from June 2015 to January 2016 and January 2018 to July 2018. Therefore, the measurement interval fully spans both bull and bear markets, resulting in a more convincing test of the momentum effect. What's more, stocks priced below three yuan at the end of formation week t are excluded(to avoid extremely poorly liquid stocks).

Through weekly returns, this paper ranks all stocks in week t on the basis of that week's return and sorts them into 10 groups based on their weekly returns, "winners" is composed of the stocks in the highest decile, and "losers" is composed of the stocks in the lowest decile. Winner and loser portfolios are equally weighted across all component stocks. Moreover, this paper structures a portfolio longing the winner portfolio and shorting the loser portfolio. It is reported that negative profits indicate a reversal and the positive reflect the momentum. Consequently, the essay follows this judgment standard. In order to see what the winner-minus-loser portfolio performs in holding periods longer than 1 week, the calendar-time method which is advocated firstly by Fama and Mitchell and Stafford are exploited. This method refrains from overlapping returns and the related strongly positive serial correlation in returns while considering feasible formation periods[11,12].

Importantly, this method overlaps portfolios instead of returns. Take week t as an example, this paper selects stocks in the highest decile, labeling them "winners 1", thereafter, this paper picks stocks in the lowest decile named "losers 1". Since a zero-investment arbitrage portfolio is formed, this paper traces the performance of this portfolio in week $t+1$ to week 52, as Roberto suggests. Similarly, at week $t+1$, this paper creates a brand-new arbitrage portfolio based on the stocks with the highest and lowest decile that week. Rolling forward to the next week, this paper wipes out of the old portfolio and puts the new portfolio in. After calculating the equally weighted profit of each calendar week of the sample period, this paper has an individual weekly calendar-time series of profits to represent the event window $t+1$ through $t+52$. Other event windows are looked into the same. This paper also calculates weekly CAPM and Fama-French three-factor alphas by the regression of the calendar-time series of winner-minus-loser profits on the appropriate factor premiums. For a holding period window, the portfolio's raw profit window is just the mean of the calendar-time series of profits. Since this

paper detects positive serial auto-correlation in the profit series, it calculates all test statistics using the consistent variance estimator of Gallant, aiming at testing the significant level of weekly return data in the holding period (t+1 to t+52)[13].

The concern about the usage of the calendar-time procedure is the underlying time variation in the portfolio's factor loading. The effect of time variation may arise when the formation of the portfolio alters each week. Here it sees the effect of dividing the portfolio by ten equal functions. The winner-minus-loser portfolios select 20% of available stocks each month purposely, and concerns are reconciled. After perfecting the method, this paper finally conducts regression tests on the arbitrage portfolio.

3. PERFORMANCE OF EXTREME WEEKLY PORTFOLIOS

This paper begins the program by valuing the performance of stocks with extreme weekly returns from week1 to week 52. This paper forms an extreme weekly portfolio based on the weekly performance of week 52, 2009. Since we have ranked all stocks in advance, we only need to construct extreme portfolios. In Roberto's paper, the authors documented the portfolio's average return over a period of 1 to 52 weeks, but this paper makes some adjustments in the method. It records the return performance of stocks from 1 to 3 weeks separately, to visually observe the existence of the momentum effect, which also facilitates itself to detect of the long-term performance of portfolios later[3].

Table 1. Profits to Weekly Extreme Portfolios

	Holding Period		
	Week 1	Week 2	Week 3
Raw	-0.14	0.15	0.08
	(-0.90)	(-1.11)	(-0.67)
CAPM	-0.32	0.23	0.09
	(-1.07)	(-1.24)	(-0.59)
Fama-French	-0.38	0.19	0.02
	(-1.27)	(-1.16)	(-0.61)

*The t-statistics are in parentheses and are robust to heteroskedasticity and autocorrelation. Profits are on basis points. Tables following are the same.

In Table 1, the reversal effect is weak. Reversal in the first week afterwards the formation is -0.14%. In week 2, the extreme weekly portfolio gets a positive return of 0.15%, small to be ignored. The average return of extreme portfolios continued to post positive gains in week 3, and returns were even smaller than that in the second week. T-test statistics of Table I are -0.90, 1.11, -0.67 respectively, marking that neither short-term reversal nor long-term momentum factor is significant.

Consistent with the empirical results of the prior, the insignificant reversal in returns decreases rapidly and is vanished in week 2. Additionally, although the average

return of extreme weekly returns changes from negative to positive gains, since all t- statistics are below 2, we cannot conclude that the momentum effect exists.

To further prove our conclusion, this paper explores the performance of the arbitrage portfolio in the long run, namely the overall return performance of weeks 4-52 and weeks 1-52 weeks. If the aggregate return of the arbitrage portfolio in holding periods, especially the average return in weeks 4-52 is greater than 0, we can accept the hypothesis that the momentum effect exists and offset the initial reversal. The tested results are provided in Table 2.

Table 2. Profits to Weekly Extreme Portfolios

	Holding Period	
	Weeks 4-52	Weeks 1-52
Raw	-0.3	0.02
	(-18.37)	(1.62)
CAPM	-0.25	0.03
	(-15.49)	(-1.24)
Fama-French	-0.32	0.03
	(-17.76)	(1.16)

Contrary to the hypothesis, the average return of the arbitrage portfolio from week 4 to 52 is negative with a particularly significant t-statistic, which directly repudiates the existence of long-term momentum effect. Table 2 also reveals the profits in weeks $[t + 1, t + 52]$ are not negative in all performance metrics, nevertheless, the value is insignificant as well, indicating that throughout the test period, the winner portfolio is not significantly higher than the loser portfolio in return, further confirming that the long-term momentum effect of weekly returns does not exist in the stock market.

This article is an innovation on the discovery of Roberto's paper. Unlike American stock market, there is no significant weekly return long-term momentum effect for the arbitrage portfolio in the Chinese stock market. To

provide further evidence that the momentum effect does not exist, this research examines the profits of the less-extreme winner-minus-loser portfolios. Table 3 reveals the performance of less- extreme portfolio in week 1, week 2 and week 1 to 52. It forms a (10-1) portfolio longing the highest decile of stocks (winners) and shorting the lowest decile (losers) and a (9-2), (8-3), a (7-4), and a (6-5) portfolio correspondingly.

Consistent with the hypotheses, although portfolios (9-2) and (8-3) show a weak reverse in week 1 and the profits in less extreme portfolios are positive across weeks 1-52, like those of Table 1, it cannot witness a long-lasting momentum in week 2 and subsequent weeks, for neither t-statistics in week 2 nor week 1-52 are significant.

Table 3. Profits to Less-Extreme Portfolios

	Holding Period		
	Week 1	Week 2	Weeks 1-52
10-1	-0.14 (-0.90)	0.15 (1.11)	0.02 (1.62)
9-2	-0.20 (-2.31)	0.08 (0.83)	0.02 (1.84)
8-3	-0.17 (-1.95)	0.07 (0.81)	0.01 (0.93)
7-4	0.07 (-1.16)	0.03 (0.57)	0.01 (0.71)
6-5	-0.08 (-1.42)	-0.03 (-0.52)	0.00 (0.58)

In short, there is some evidence from Table 1, 2 and 3 that in Chinese stock market, the long-lasting momentum is insignificant in all arbitrage portfolios whose change of long-term return is not apparent and whose t-test statistics are not obvious. In order to provide sufficient evidence for the results, it needs to demonstrate that the weak positive returns of all arbitrage portfolios are not driven by long-term momentum factors. Therefore, we focus the analyses in the next section on the cross-section of return over $[t+1, t+52]$ to figure out the explanatory power of various variables.

4. EXPLANATORY POWER OF WEEKLY RETURNS

As Roberto and Eric (Eric, 2008) claim, if the long-lasting momentum in weekly returns exists in stock market, it has an obvious effect over the full year. Consequently, in order to perfect our results, it needs to examine the explanatory power of variables[3].

Table 4. Cross-sectional Regressions of Holding Period

Holding Period	Explanatory Variables			
	Rt	R[t-26, t-1]	ln(B/M)	ln(size)
r[t+1, t+52]	0.07 (1.12)	0.04 (0.90)	0.24 (1.78)	1.43 (4.45)

Table 4 provides the raw profits from cross-sectional regressions of the holding period. This research regresses

possible explanatory variables. In the first column, the regression result of Rt, the profit is minor (0.07) with a

not distinctive t value (1.12). This reduces a contrary fruit to the claim, that is, the long-run momentum in weekly returns almost disappears in the stock market. Then, we turn our attention to the column 2 and column 3, comparing the profits and t value of them. Like the conclusion above, the results of the Chinese stock market and the article are mutual ambivalent: cumulative returns and the book-to-market value don't interpret along the holding period, though the book-to-market value are little higher than return over [t-1, t-26] in raw profits (excess about 0.20) and t value (1.78 in ln(B/M), 0.90 in return over [t-1, t-26]). As for size, measured as ln(size) in regression, it puts up an apparent role (t=4.48) and a relatively impressive profit (1.43). The consequence authenticates that SMB factor is stronger than HML factor in Chinese stock market.

In short, the results of cross-sectional regression display again that, in Chinese market, no matter long-run or short-run, momentum is weak, and size has more effects in stock returns than book-to-market ratio.

4. NEW TESTING GROUND FOR MOMENTUM

The most essential contribution of the finding of the momentum may be that there is almost no momentum performing in the Chinese stock market, as the literature currently suggests. In this part, this paper makes a thorough inquiry in the momentum in order to see the relation between momentum and size, the robustness of the testing result and discuss the possible reasons for the disappeared momentum.

4.1. Relation between momentum and size

This section examines how in 1-week returns varying in size. The stock characteristics, like size measured by market value, are influenced by variations trading costs,

information environments, and investor sophistication resulting in returns anomalies in the reality. Hence, it is reasonable to infer an underlying connection between them. It selects size because in Table 4 size manifests a more apparent role in the interpretation of the stock returns. Though it focuses more on the momentum, for integrity it continues to afford the profits for the winner-minus-loser portfolios over weeks 1, 2, and 3.

Here is how. Afterwards segmenting handy stocks into deciles each week on the basis of their returns over week t, this paper further segments the stocks in the highest and lowest decile portfolios on the basis of market values at the prior June ending. The median size of Shanghai exchanged market A stocks from the prior June are used to categorize the stocks. Small-stock portfolio are composed of under the median value of size; Large-stock portfolio are composed of stocks above the median value of size. The tested results are provided in Table 5.

Panel A is the performances of the big-size stock portfolio in different time periods. There exists a reversal in raw return over the week [t+4, t+52], it is ostensible that long-momentum makes sense, because in the last column, the raw return over a week [t+1, t+52] is negative with a minor t value (0.98). It illustrates the conclusion above that the long-run momentum is nearly disappeared and size effect exerts a part in the Chinese stock market. It can reach a similar conclusion. It shows the reversal as well, and during the overall period, long momentum does not continue, which states the momentum in stock market of China is an imaginary thing, and the size factor dominates the stock returns. CAPM and Fama-French are not tabulated for the same findings. The findings possibly attribute to smaller stocks being more difficult in value estimation, as well as having less sophisticated investors (especially institutional investors), being riskier for market arbitragers and a poorer information environment.

Table 5. Profits of Weekly Extreme Portfolios across Stock Characteristics

Panel A: Big Size				
Holding Period				
Week 1	Week 2	Week 3	Week 4-52	Week 1-52
-0.27	0.15	0.2	-0.46	0.02
(-1.63)	-1.01	-1.39	(-18.82)	-0.98
Panel B: Small Size				
Holding Period				
Week 1	Week 2	Week 3	Week 4-52	Week 1-52
-0.51	-0.1	-0.31	0.16	-0.04
(-3.94)	(-0.89)	(-3.38)	(11.24)	(-3.25)

* Returns are formed from the midpoints of the quoted bid and ask prices at each day's close.

To sum up, in Chinese stock market, it is just plausible to see the signs of momentum, but in substance, as what has shown in Table 4, the size effect sets an ineligible effect in explanation to the stock returns.

4.2. The robustness considerations

This paper examines the pre-formation performance of extreme-return stocks to resolve the problem which the model of expected stock returns is unspecified, that is, the

problem that the results in Table 1 are not belong to non-momentum in returns in week t but to an intrinsic property failing to be captured in chosen stocks.

As Roberto and Eric (Eric, 2008) claim, if the long-lasting momentum in weekly returns exists in the stock market, it has an obvious effect over the full year. Consequently, in order to perfect the results, it needs to examine the explanatory power of variables[3].

Table 6. Pre-formation Profits to Weekly Extreme Portfolios

	Holding Period			
	Week [-52, -4]	Week -3	Week -2	Week -1
Raw	0.04	-0.99	-0.34	-0.67
	(1.03)	(-1.24)	(-0.90)	(-1.87)
CAPM	0.06	-0.78	0.51	-0.8
	(1.77)	(-1.05)	(-0.71)	(-1.45)
Fama-French	0.21	-0.67	0.02	-0.3
	(1.60)	(-1.51)	(0.82)	(-1.66)

Table 6 reveals the performances of the extreme-return winner-minus-loser portfolio in different pre-formation windows. None from week t-52 to week t-1 display profits related to the momentum. Therefore, the vanishment of momentum profits in the 52-week post-formation window are not belong to a continuous error specification of expected returns. CAPM and Fama-French are not tabulated for the same findings. Noticeably, there is no distinctive reversal happening when comparing Table I with Table VI which suggests the momentum is almost weeny in Chinese stock returns.

4.3. Discussion of the possible reasons of the disappeared momentum.

No matter momentum is short-run or long-run, it connects with the investors' overreactions or deferreactions, though, in the Chinese stock market, for its unique system, investment strategies based on momentum show a commonplace performance, especially in the stock market adjustment period which is typical in Chinese stock market. Moreover, it is obvious to find that the initiation of the market fluctuations is accompanied by the intervention and policy guidance of the supervisory authorities. The end of the trend is not the result of the market's own adjustment but the government's-imposed intervention. Besides, considering transaction cost, relocating stocks weekly has such a huge transaction cost that there is no excess

return at all. For an investor who takes momentum strategies, his retracing in stocks is no doubt a mass, facing to this situation, investors, especially those with juvenile investing experience, are reluctant to arbitrage on momentum. Finally, some investors (including institutional investors) in China's stock market are engaged in staking, and a considerable number of stocks are artificially manipulated. Moreover, provided that a stock is artificially manipulated by the banker, then he is prone to adopt the "anti-technical analysis" method of operation, which eliminates the momentum effect that the stock should have under normal circumstances.

5. CONCLUSION

Portfolios buying last week's winner stocks and shorting last week's loser stocks do not earn apparent considerable profits over the next 52 weeks. The reversal which is consistent with 1-weekly-momentum is also fragile. Specifically, this paper prolongs the holding period to a year and finds what short-run momentum displays in Chinese stock market, long-run momentum is almost disappeared and the robustness test of the pre-formation period firms it again. Some possible reasons are given: special system design, the structure of investors, the original drawbacks of momentum strategies, transaction costs. However, it also needs to pay attention that from 2020, the period when financial markets were steadfast, the mentality of investors and

policies had changed in some extent as a consequence of the crisis from COVID-19, so investigations of these possible reasons will be productive in the future.

Except to the discovery of short-run and longer-run momentum ensuing from weekly returns, this paper finds that SMB factor plays a more explanatory role in stock returns than HML factor of the Fama-French three factor model. Given that stock characteristics perhaps have the underlying connection with momentum, this paper hypothesizes the excess return of long-run momentum may be absorbed by the size effect, and it needs deeper research as well.

In short, there is no distinctness between short-run and long-run momentum in the Chinese stock market, and in the aspect of stock returns, size effect is an interpretative power. The conclusions of this paper recount the momentum factor in weekly returns of the regular Chinese stock market which have not been explored in detail before, and which can be referred by some researches focusing on the Chinese stock market effected by the pandemics in the near future.

REFERENCES

- [1] N. Jegadeesh & S. Titman, Returns to buying winners and selling losers: implications for stock market efficiency. *Journal of Finance*, vol.48, no.1, 1993, pp.65-91. DOI:10.2307/2328882
- [2] M. Grinblatt, Titman, S. Titman & R. Wermers, Momentum Investment Strategies, Portfolio Performance, and Herding: A Study of Mutual Fund Behavior. *American Economic Review*, vol.85, 1995, pp.1088-1105
- [3] Jr. , C. G. R & E. K. Kelley, The long-lasting momentum in weekly returns. *The Journal of Finance*, vol.63, no.1, 2008. DOI: 10.1111/j.1540-6261.2008.01320.x
- [4] L. Xu, Business Strategy and the Role of Engineering Product Data Management. *Journal of financial economics*, vol.23,1999, pp.445-468.
- [5] K. G. Rouwenhorst, International momentum strategies. *Journal of Finance*, 1998. DOI: 10.1111/0022-1082.95722
- [6] W. & Zhao. , Predicting stock price movements from past returns. *Financial Review*, vol.5, 2001, pp.23-39.
- [7] W. & Zhu. , The momentum effect of China's stock market. *Journal of Portfolio Management*, vol.5, 2003, pp.54-63.
- [8] W. & Ning. , The momentum or reversal effect of the monthly data of China's A-share market. *Financial Review*, vol.4, 2012, pp.33-41.
- [9] M. C. Jensen, Black. F, & M. S. Scholes, The capital asset pricing model: some empirical tests. *Social Science Electronic Publishing*, 1972. DOI: 10.1073/pnas.94.8.4229
- [10] E. F. Fama, K. R. French, Common risk factors in the returns on stocks and bonds. *Journal of Financial Economics*, vol.33, no.1, 1993, pp.3-56.
- [11] E. F. Fama, Market efficiency, long-term returns, and behavioral finance. *Journal of Financial Economics*, 1998. DOI: 10.1016/S0304-405X(98)00026-9
- [12] Mitchell, M. L. Mitchell & E. Stafford, Managerial decision-making and long term stock price performance. *Journal of Business*, vol.73, no.3, 2000, pp.287-329. DOI: 10.1086/209645
- [13] C. L. Tsai & A. R. Gallant, Nonlinear statistical models. *Journal of Business and Economic Stats*, vol.6, no.405, 1987, pp.518. DOI: 10.2307/1391473