

Excess volatility and momentum effect in the cross-section of stock returns

Yuming Wang and Jinpeng Ma

Yuming Wang: Ph.D., School of Finance at Shanghai University of Finance and Economics (SUFU) and Department of Financial Audit, National Audit Office, Shanghai, PR China. Email: 2007210397@mail.shufe.edu.cn

Jinpeng Ma (Corresponding Author): Economics, Rutgers University-Camden, NJ 08102

Email: jinpeng@crab.rutgers.edu

Abstract

In this note we document interactive relations between the excess volatility and the momentum effect in the cross-section of stock returns over the sample periods of 1963-1989, 1990-2010 and 1963-2010, along the line explored lately in Wang and Ma (2014). The nature of interactive relations between the two appears to be very complicated. For example, the most profitable strategy is to buy the loser portfolio with the greatest excess volatility and sell the loser or winner portfolio with the least excess volatility for all the three periods. But there are profitable strategies of buying a winner portfolio and selling a loser portfolio. The contrarian strategy of buying the loser portfolio with the greatest excess volatility and selling any winner portfolio is always profitable for all three periods.

JEL classification: G11; G12; G14

Keywords: Excess volatility; Momentum effect, Cross-section of stock returns

1. Introduction

In this note we report our empirical results between the excess volatility and the momentum strategies (Jegadeesh and Titman, 1993, 1995, 2001) in the cross-section of stock returns over the sample periods of 1963-1989, 1990-2010 and 1963-2010. The excess volatility and the momentum strategies follow from Wang and Ma (2014) and are not introduced in detail here. Instead we just report the results and provide some explanations why the interactive nature of the two may be complicated.

Moskowitz (2003) emphasizes the important impact of the second moment of returns on the classical financial anomalies. The profitability of many investment portfolios formed based on the classical financial anomalies can be in large advanced by taking into account the impact of the second moment of returns. Since the excess volatility examined in Wang and Ma (2014) is related to the second moment of returns, it is natural to question how the momentum effect, one of the most striking anomalies in the literature, may be affected by the excess volatility.

Indeed, the nature of interactive relations between the two appears to be very sophisticated, as revealed by our results. For example, the most profitable strategy is to buy the loser portfolio with the greatest excess volatility and sell the loser portfolio with the least excess volatility. But this is not the only profitable strategy. There are many profitable strategies of buying a winner portfolio and selling a loser portfolio. However, the contrarian strategy of buying the loser portfolio with the greatest excess volatility and selling any winner portfolio also makes a substantial profit. This answers a question when a contrarian strategy should be employed. This is consistent with Lehmann (1990) and Lo and MacKinlay (1990) who have shown that a profitable contrarian strategy must be designed with subtle skills. Our results apply to all three sample periods of 1963-1989, 1990-2010 and 1963-2010. Therefore, they are not limited to specific time periods.

2. Methodology

A formal definition of excess volatility can be found in Wang and Ma (2014). To examine how the excess volatility may affect the momentum effect, we form our new momentum portfolios by taking into account the excess volatility effect as follows. At the beginning of each month t , we sort all the NYSE/AMEX/NASDAQ common stocks (share code 10 or 11) into ten deciles based

on their cumulative returns over a formation period of 6 months. Then, each momentum decile is further grouped into ten other deciles based on individual variance difference of 22-day logarithmic returns (VD(22)) with a formation period of 6 months. All the investment portfolios are formed at the beginning of each month by equally including all the stocks ranked in the same past return decile and the same VD(22) decile in any of the latest 6 ranking months. Thus, the loser portfolio is the portfolio with the smallest cumulative return over the 6-month formation period. L1 is the smallest VD(22) decile within the loser portfolio, L2 is the second smallest VD(22) decile within the loser portfolio, ..., L10 is the largest VD(22) decile within the loser portfolio. The winner portfolios, W1, W2,..., W10, are obtained in a similar fashion.

3. Results

We report our empirical results in Table 1. Our results are consistent in large with the finding in Bhootra (2011) who has shown that the sample selection methodologies employed in the momentum literature such as a \$5 price screen can significantly increase the level of momentum profits. As shown in Table 1, over the sample period of 1963-2010, without implementing any sample selection methodology, the momentum portfolio W-L yields an average monthly return of 0.26%, with a significantly negative VD of -2.21%. With small and penny stock filters employed in Jegadeesh and Titman (2001), the average monthly return of the momentum portfolio W'-L' is as high as 1.05%, with an insignificant VD of -0.04%. We also find that the average monthly return of the momentum portfolio W''-L'' without implementing any sample selection methodology can be advanced from 0.26% to 0.93% after eliminating the impact of excess volatility (i.e. the chosen winner and loser both have excess volatility close to zero). These results suggest that the advance in the performance of the momentum portfolio with the small and penny stock filters can be largely captured by the excess volatility.

Some interesting new findings have been summarized in Fig.1-3. As shown in Fig.1 and 2, the interactive nature between the excess volatility and the winner and loser portfolios are completely different. The average monthly returns of the loser portfolios are basically “convex” from L1 to L10 while they are “concave” for the winner portfolios from W1 to W10, with some minor “kinked” points near W4 and L4. We do not know the mechanism why such kinked points have been formed, especially for the winner portfolios. Note that these kinked points are the portfolios with the excess volatility close to zero. Therefore, they should be considered as

portfolios that are very close to an efficient market portfolio with the random walk property (variance ratio close to one) according to Lo and MacKinlay (1988). In that sense, the kinked nature may be related to the efficiency demand of the market.

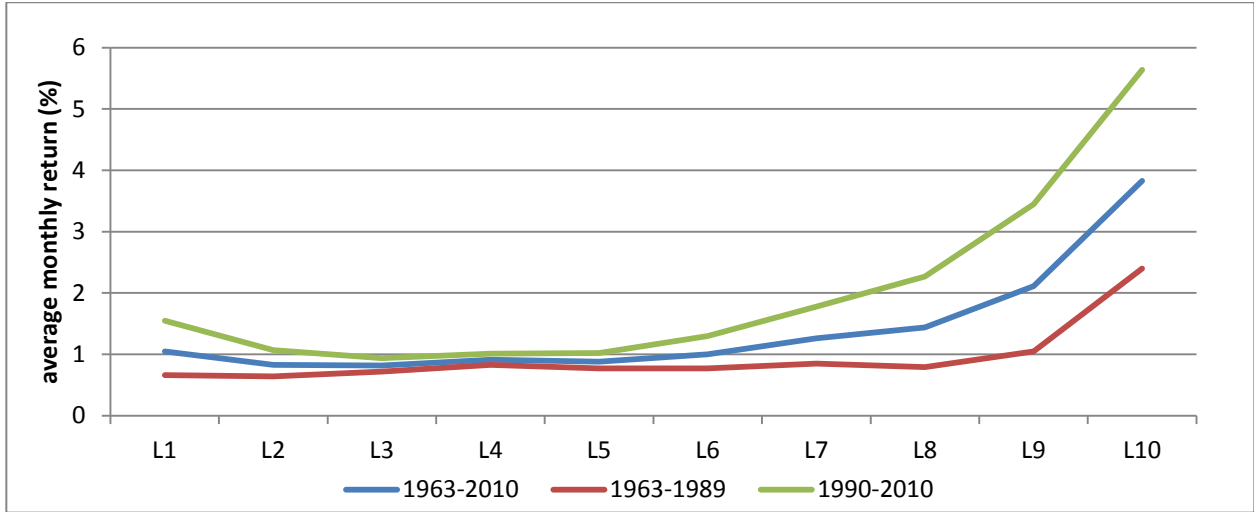


Fig.1. The average monthly returns (%) of the ten loser portfolios with portfolio L1 the least excess volatility and portfolio L10 the greatest excess volatility over three sample periods of 1963-1989, 1990-2010 and 1963-2010. As shown in the graph, it is very profitable to buy portfolio L10 and sell portfolio L1.

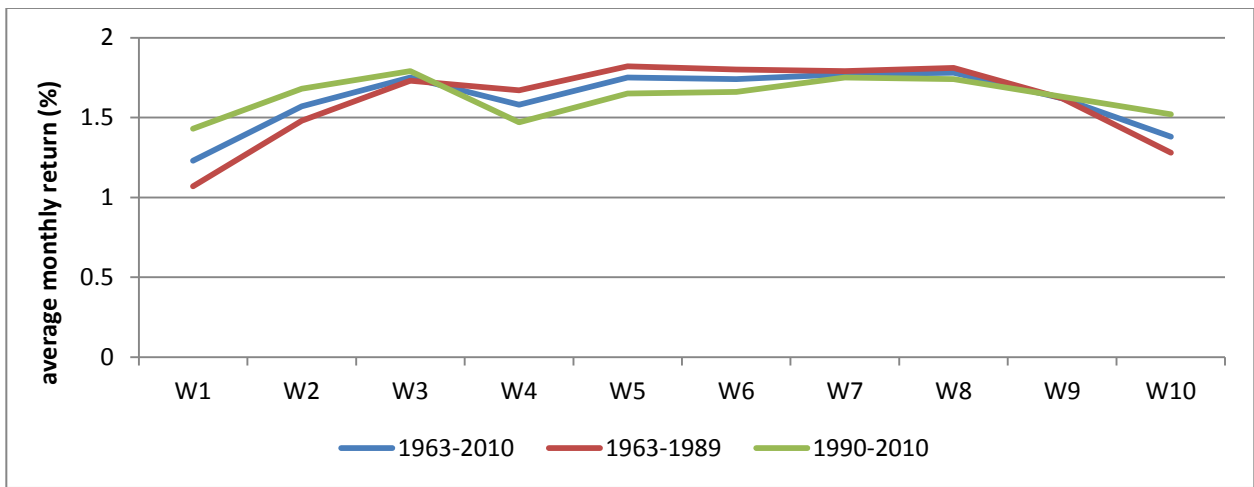
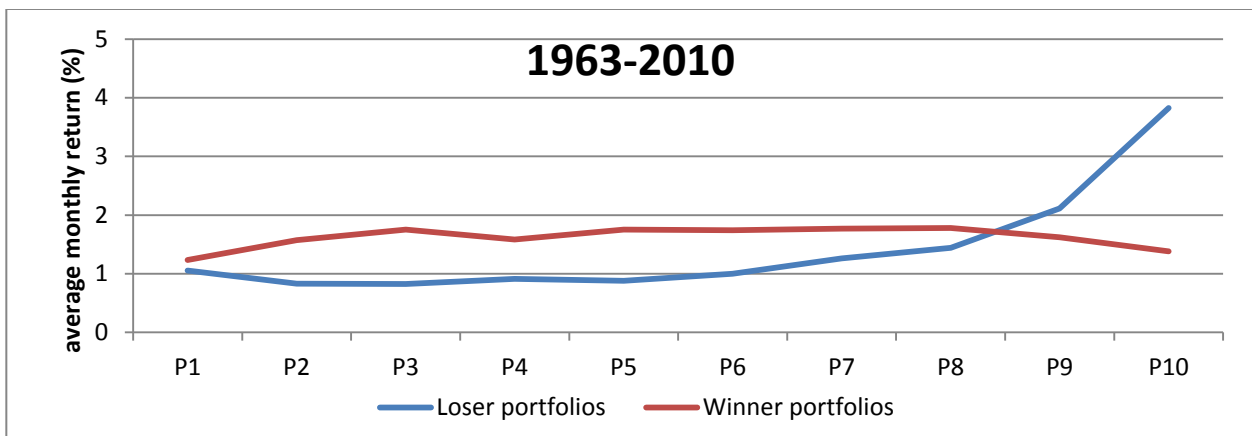


Fig.2. The average monthly returns (%) of the ten winner portfolios with portfolio W1 the least excess volatility and portfolio W10 the greatest excess volatility over three sample periods of 1963-1989, 1990-2010 and 1963-2010. Unlike loser portfolios, there is very limited profit to buy portfolio W10 and sell portfolio W1. Interestingly, it is profitable to buy portfolio W3 and sell portfolio W1. It is unknown why a kinked point is formed at portfolios W4.

To answer the question when a contrarian strategy should be used and what a contrarian strategy should buy and sell (Lehmann, 1990, and Lo and MacKinlay, 1990), we put the winner and loser portfolios together in Fig.3. It is clearly seen from these three figures that buying the loser portfolio with the greatest excess volatility and selling a winner portfolio with any excess volatility will provide a substantial return, for all three sample periods.

Specifically, over the sample period of 1963-2010, the average monthly return of L10, with a cumulative past return of -48% over the 6-month formation period, is as high as 3.83%. In contrast, the average monthly return of W8, which has a cumulative past return of 82% over the 6-month formation period, is 1.78%, much lower than 3.83%. Thus, there are different fortunes of these two portfolios in the near future. The past “winner” becomes a “loser”, and vice versa. A possible explanation for this phenomenon may be that the much higher excess volatility, 20.32%, of portfolio L10 tends to improve the profitability of past losers. Moreover, the lower past return, -0.48%, of portfolio L10 can strengthen the excess volatility effect.

But it is quite naïve to use a contrarian strategy purely due to the fact that a portfolio is in the loser group. On the contrary, there exist many profitable strategies that buy a winner portfolio and sell a loser portfolio, as revealed in Fig.3.



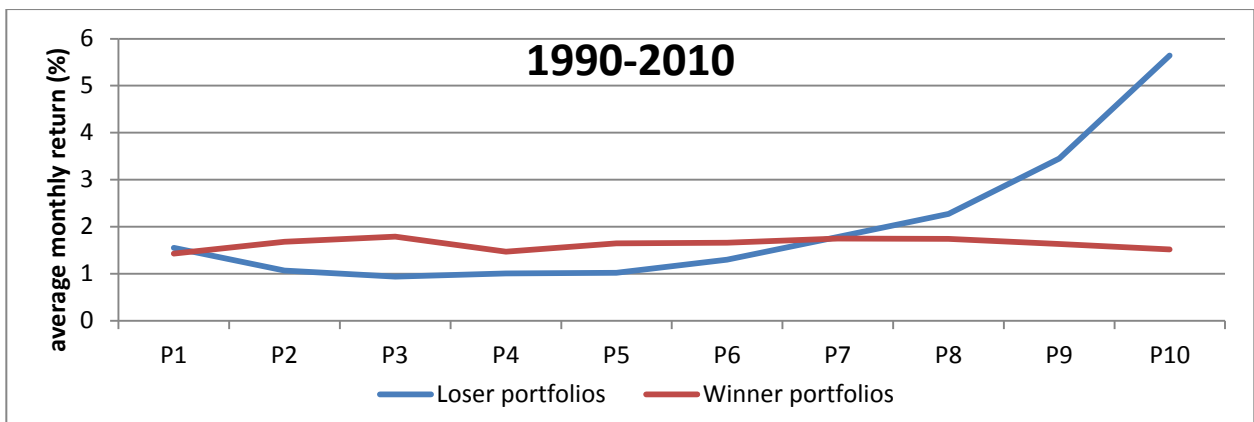
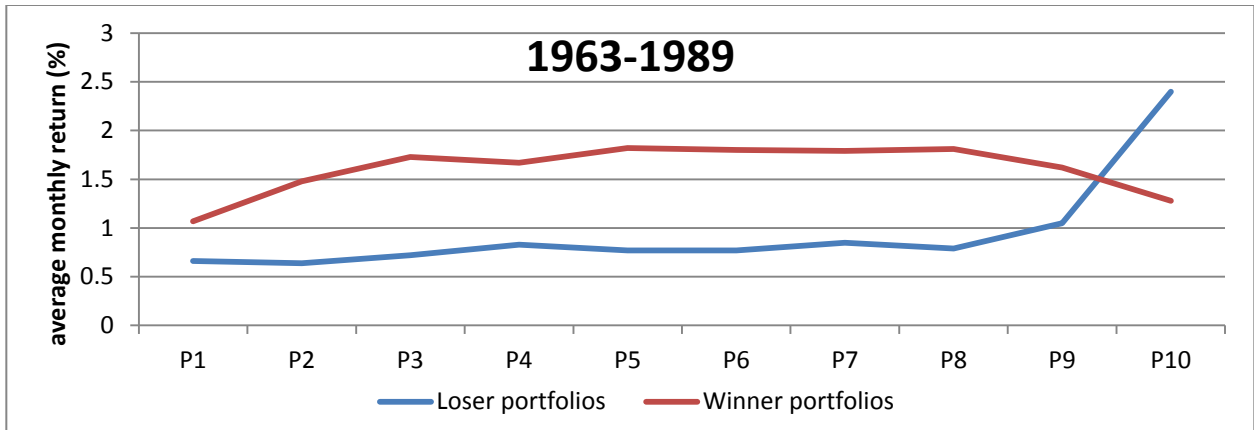


Fig.3. These three figures answer the question when a contrarian strategy should be used and what a contrarian strategy should buy and sell. Buying the loser portfolio with the greatest excess volatility and selling a winner portfolio with any excess volatility will provide a substantial return, for all three sample periods. The greatest profit is made by buying L10 and selling W1. But a contrarian strategy is subtle. It is quite naïve to use a contrarian strategy purely due to the fact that a portfolio is in the loser group.

4. A possible explanation for the sophisticated nature

The interactive nature between the momentum effect and the excess volatility is complicated. Excess volatility may affect the momentum effect in at least two ways. First, excess volatility creates additional risk that may induce some momentum investors to exit earlier or prevent some momentum investors from engaging new positions, since the past return adjusted by the excess volatility may become less attractive to some momentum investors. Thus, the continuation of a winner's or loser's return can be weakened or strengthened by excess volatility. Second, stocks with excess volatility tend to have superior returns in the holding period. Excess volatility may have positive impacts on the profitability of both the winner and the loser portfolios. It is unclear how excess volatility may impact the momentum effect without analyzing a specific situation.

On the other hand, the momentum effect also influences the excess volatility effect in at least two ways. First, higher past returns may compensate, to some extent, for the additional risk taken by rational investors. Such an effect may provide risk-averse investors the incentive to hold their positions longer than otherwise. Since more investors would like to stay in the stock market, higher past returns can have negative impacts on the profitability of the excess volatility investment portfolios we have examined in Table 1. Second, since the past winners or losers tend to continue in the future for some stocks over certain horizons, the magnitude of past returns may have positive or negative influences on the profitability of the excess volatility investment portfolios. It is unclear how past returns may affect the excess volatility investment portfolios without analyzing a specific situation. These two interact with one another in a complicated manner as shown in Fig. 1-3 and Table 1. We admit that our explanation here is very incomplete. A theory or more convincing explanation should be developed in a future study.

5. Conclusion

In this note we have investigated empirically the impact of the excess volatility on the momentum strategies. Our main finding can be seen as two aspects and the paper also raises some interesting questions. First, the nature how the excess volatility may affect the winner and loser portfolios is quite different from each other. This raises an interesting question in theory why investors behave so differently against the excess volatility with a winner portfolio and a loser portfolio (Fig.1 and 2). Second, with the help of the excess volatility, we can easily identify a profitable contrarian strategy. But momentum strategies appear to win for majority portfolios as revealed in Fig.3. The question is why it is the loser portfolio with the greatest excess volatility that eventually wins over all other portfolios in both the winner and the loser groups. Who are the buyers and the sellers of such a portfolio? Are they the institutional or individual investors? Are they rational or irrational (Bondt and Thaler, 1985)? If the existence of such a portfolio is related to the inefficiency of the market, why is it so persistent over time?

There are many other directions one can explore further. For example, a market portfolio is unknown in practice. Therefore, researchers use a market index such as S&P500 as a proxy in the investigation of CAPM. Our study may provide a better proxy. The portfolio around L3 or W4 has a variance difference VD close to zero. Thus, its variance ratio is close to 1. According to Lo and MacKinlay (1988), such a portfolio should be considered as an efficient portfolio. So it should be interesting to use the portfolio around P4 with VD close to zero as a proxy for the market portfolio to re-investigate the effectiveness of CAPM and other models.

Table 1 Excess volatility and the momentum effect

This table reports the empirical results on the excess volatility and the momentum effects. At the beginning of each month t , we sort all the NYSE/AMEX/NASDAQ common stocks (share code 10 or 11) into ten deciles based on their cumulative returns (CR) over a formation period of 6 months. Then, each momentum decile is further grouped into ten other deciles based on individual variance difference of 22-day logarithmic returns (VD(22)), with a formation period of 6 months. All the investment portfolios are constructed at the beginning of each month by equally including all the stocks ranked in the same past return decile and the same VD(22) decile in any of the latest 6 ranking months. The loser portfolio is the portfolio with the smallest cumulative return over the formation period. L1 is the smallest VD(22) decile within the loser portfolio, L2 is the second smallest VD(22) decile within the loser portfolio, ..., L10 is the largest VD(22) decile within the loser portfolio. The winner portfolio is the portfolio with the largest cumulative return over the formation period. The winner portfolios, W1, W2,..., W10, are obtained in a similar fashion. The W-L momentum portfolio is formed by buying the winners and selling the losers every month without implementing any sample selection methodology. The momentum portfolio W'-L' is formed by buying the winners and selling the losers every month with small (the market value of which ranked into the smallest market value decile of NYSE stocks) and penny stock (the stock price of which is less than \$5) filters. The portfolio W''-L'' is formed by monthly buying the winner portfolio and selling the loser portfolio, both VDs of which are close to zero. The L10-L1 (W10-W1) portfolio is formed by buying L10 (W10) and selling L1 (W1) every month. Both the average monthly return (AR) and VD are reported in percentage.

Period	1963-2010				1963-1989				1990-2010			
Portfolio	AR	t-stat	VD	CR	AR	t-stat	VD	CR	AR	t-stat	VD	CR
L1	1.05	2.31	-5.31	-0.46	0.66	1.40	-3.46	-0.39	1.55	1.84	-7.65	-0.55
L2	0.83	2.00	-1.24	-0.41	0.64	1.45	-0.92	-0.35	1.07	1.41	-1.65	-0.49
L3	0.82	2.08	-0.19	-0.40	0.72	1.73	-0.28	-0.33	0.94	1.31	-0.07	-0.47
L4	0.91	2.29	0.51	-0.39	0.83	1.98	0.12	-0.33	1.01	1.39	1.00	-0.47
L5	0.88	2.22	1.16	-0.40	0.77	1.79	0.48	-0.33	1.02	1.43	2.02	-0.47
L6	1.00	2.39	1.91	-0.41	0.77	1.71	0.87	-0.34	1.30	1.71	3.21	-0.49
L7	1.26	2.88	2.90	-0.42	0.85	1.80	1.39	-0.35	1.78	2.25	4.81	-0.50
L8	1.44	3.09	4.43	-0.43	0.79	1.54	2.15	-0.37	2.27	2.72	7.29	-0.51
L9	2.11	3.93	7.34	-0.45	1.05	1.87	3.57	-0.38	3.45	3.51	12.09	-0.54
L10	3.83	6.09	20.32	-0.48	2.40	3.54	9.79	-0.40	5.64	4.99	33.61	-0.57
W1	1.23	3.37	-5.78	1.26	1.07	2.49	-5.01	1.07	1.43	2.29	-6.75	1.50
W2	1.57	5.06	-1.55	0.89	1.48	3.81	-1.57	0.78	1.68	3.35	-1.52	1.02
W3	1.75	6.16	-0.67	0.79	1.73	4.66	-0.81	0.70	1.79	4.03	-0.49	0.90
W4	1.58	5.84	-0.19	0.73	1.67	4.69	-0.40	0.66	1.47	3.52	0.08	0.83
W5	1.75	6.52	0.16	0.72	1.82	5.21	-0.11	0.64	1.65	3.98	0.50	0.82
W6	1.74	6.39	0.47	0.74	1.80	5.14	0.13	0.64	1.66	3.87	0.91	0.86
W7	1.77	6.13	0.85	0.76	1.79	4.88	0.38	0.65	1.75	3.78	1.43	0.90
W8	1.78	5.87	1.40	0.82	1.81	4.72	0.72	0.69	1.74	3.58	2.25	0.98
W9	1.62	5.11	2.48	0.89	1.62	4.00	1.33	0.75	1.63	3.21	3.93	1.07
W10	1.38	3.79	9.13	1.05	1.28	2.71	4.65	0.87	1.52	2.65	14.77	1.27
W-L	0.26	0.87	-2.21	1.07	0.67	2.48	-1.36	0.89	-0.26	-0.44	-3.29	1.29
W'-L'	1.05	4.45	-0.04	1.07	1.09	4.81	-0.19	0.89	1.00	2.22	0.14	1.29
W''-L''	0.93	2.98	0.35	1.12	0.99	3.47	-0.24	0.97	0.52	0.85	0.15	1.31
L10-L1	2.78	7.04	25.63	-0.02	1.74	4.40	13.24	-0.02	4.09	5.57	41.26	-0.02
W10-W1	0.16	0.88	14.91	-0.21	0.21	1.01	9.67	-0.19	0.08	0.28	21.52	-0.24

References

- Bhootha, A., 2011. Are momentum profits driven by the cross-sectional dispersion in expected stock returns? *Journal of Financial Markets* 14, 494-513.
- De Bondt, W.F.M., Thaler, R., 1985. Does the Stock Market Overreact? *Journal of Finance* 40, 793–805.
- Jegadeesh, N., Titman, S., 1993. Returns to buying winners and selling losers: Implications for stock market efficiency. *Journal of Finance* 48, 65-91.
- Jegadeesh, N., Titman, S., 1995. Short-horizon return reversals and the bid-ask spread. *Journal of Financial Intermediation* 4, 116–132.
- Jegadeesh, N., Titman, S., 2001. Profitability of momentum strategies: an evaluation of alternative explanations. *Journal of Finance* 56, 699-720.
- Lehmann, B.N., 1990. Fads, martingales, and market efficiency. *Quarterly Journal of Economics* 105, 1-28.
- Lo, A.W., MacKinlay, A.C., 1988. Stock market prices do not follow random walk: evidence from a simple specification test. *Review of Financial Studies* 1, 41–66.
- Lo, A.W., MacKinlay, A.C., 1990. When are contrarian profits due to stock market overreaction? *Review of Financial Studies* 3, 175-205.
- Moskowitz, T.J., 2003. An analysis of covariance risk and pricing anomalies. *Review of Financial Studies* 16, 417-457.
- Shiller, R.J., 1981. Do stock prices move too much to be justified by subsequent changes in dividends? *American Economic Review* 71, 421–436.
- Wang, Y., Ma, J., 2014. Excess volatility and the cross-section of stock returns. *North American Journal of Economics and Finance* 27, 1-16.