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Do momentum strategies work? Australian evidence

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Abstract

Purpose – The purpose of this paper is to investigate the profitability of momentum investment strategy and the predictive power of trading volume for equities listed in the Australian Stock Exchange.

Design/methodology/approach – Following the Lee and Swaminathan's approach, portfolios on past returns and past trading volume is constructed. In this approach, all stocks are ranked independently on the basis of past returns and past trading volume. The stocks are then assigned to one of five portfolios based on past returns and one of three portfolios based on trading volume over the same period.

Findings – A strong momentum effect for the Australian market during the period 1988 through 2002 is observed. Further, momentum plays an important role in providing information about stocks. Past trading volume appears to predict both the magnitude and persistence of price momentum.

Research limitations/implications – Substantial momentum observed in monthly stock returns has investment implications. Abnormal returns vary from 0.3 to 7 per cent per month in the intermediate horizon.

Originality/value – This study provides an out of sample evidence by examining the relationship between "trading volume" (measured by the turnover ratio) and "momentum" strategies in an Australian setting.

Keywords Momentum, Stock returns, Equity capital, Investments, Australia

Paper type Research paper

1. Introduction

An enormous body of empirical research over the past 15-20 years has demonstrated evidence against the Capital Asset Pricing Model (CAPM) of Sharpe (1964). This evidence suggests that the cross-section of expected stock returns are not sufficiently explained by their beta, the systematic risk of CAPM. The results indicate that variables such as firm size (Banz, 1981), earnings yield (Basu, 1977), and momentum (Jegadeesh and Titman, 1993; Lee and Swaminathan, 2000) adequately explain the cross-section of average stock returns. This paper extends the methodology of Lee and Swaminathan (2000) to the Australian market. The motivation comes from the fact that the bulk of existing research relates to the USA and there is very little evidence from markets outside the USA.

In this paper, we provide out-of-sample evidence by investigating the momentum strategies for equities listed in the Australian Stock Exchange. In addition, our objective is also to provide academic researchers and investors with a greater breadth and depth of understanding of the anomalies discovered in the area of empirical

Managerial Finance
Vol. 33 No. 10, 2007
pp. 772-787

0307-4358
DOI 10.1108/03074350710779223

finance. Most research on the profitability of momentum strategies is based on US data, particularly for the NYSE stocks[1]. For instance, Jegadeesh and Titman (1993) report that strategies that buy past winners and sell past losers realize significant abnormal returns over the 1965-1989 period. Conrad and Kaul (1998) argue that momentum profits arise because of cross-sectional differences in expected returns rather than time-series return patterns. Jegadeesh and Titman (2001) find that the momentum profits in the 8 years subsequent to their 1993 period are similar to the profits in the earlier period. Thus, they argue that momentum profits cannot be due to data snooping biases.

Chan *et al.* (2000) examine the momentum effect based on individual stock market indices in 23 countries. They also find statistically significant evidence of momentum profits. However, Hameed and Kusnadi (2002) suggest that the factors that contribute to the momentum phenomenon in USA are not prevalent in the Asian Markets. It is a well-accepted fact that trading volume plays a minor role in conventional models of asset prices. However, recent research shows that past trading volume provides an important link between "momentum" and "value" strategies (Lee and Swaminathan, 2000; Connolly and Stivers, 2003). Several papers suggest that past trading volume may provide valuable information about a security.

For instance, Lamoureux and Lastrapes (1994) examine the ability of volume data to shed light on the source of persistence in stock-return volatility[2]. They find that the dynamics of daily return variance are due solely to daily persistence in the latent speed of arrival of information to the market, which leads to similar dynamics in the level of trading volume. In a similar vein, Lee and Swaminathan (2000) find that the effect of momentum appears more pronounced among high-volume stocks than low-volume stocks.

They show that trading volume is only weakly correlated with traditional liquidity proxies and that the volume effect is robust to various risk adjustments. However, Scott *et al.* (2003) propose that the predicting power of the price momentum and trading volume is a result of the underreaction of investors to earnings news – an effect that is most pronounced for high-growth companies. Wang (1994) suggests that the dynamic relation between volume and returns varies depending upon the motive for trading by the "informed investors". In light of these findings, this paper attempts to examine the relationship between "trading volume" (measured by the turnover ratio) and "momentum" strategies for Australian equities. The study of markets outside the USA is interesting since our objective is to provide out of sample evidence on the interaction between momentum strategies and future returns. The remainder of this paper is organised as follows. The next section deals with the data and portfolio aggregation procedures. Section 3 presents the findings while section 4 concludes the paper.

2. Data and methods

Our sample consists of stocks listed on the Australian Stock Exchange during the period June 1988 through May 2002 with at least a year of data prior to the portfolio formation date. Monthly stock and market returns, number of shares outstanding and traded and value of shares traded are obtained from the database maintained by the Securities Industry Research Center of Asia Pacific (SIRCA). We divide the sample into two periods because of data limitations. The first period is from June 1988 to May 1995. In this period, we only have returns data for our sample. There are 296[3] eligible stocks in this period. This sample provides some useful information about the momentum effect.

The second period is from June 1995 to May 2002. This sample has available information on past returns, trading volume, market capitalization, and stock prices. It is used to test the relationship between trading volume and "momentum" strategies. Trading volume is defined as the average monthly turnover in percentage during the portfolio formation period, where monthly turnover is the ratio of the number of shares traded each month to the number of shares outstanding at the end of the month. There are 165 stocks that match the criteria. We follow the approach of Lee and Swaminathan (2000) in constructing our portfolios. At the beginning of each month, all stocks are ranked independently on the basis of past returns and past trading volume. The stocks are then assigned to one of five portfolios based on returns over the previous J months (where $J = 3$, 6, 9 or 12) and one of three portfolios based on trading volume over the same period. All stocks are ranked in ascending order, so the top quintile based on the past return is the loser quintile and the bottom is the winner quintile. Similarly, the top treble based on the past volume consists of low-volume stocks and the bottom consists of high-volume stocks. The intersections resulting from the two independent rankings result in to 15 momentum-volume portfolios. In each month, the strategy buys the winner portfolio and sells the loser portfolio in each volume group. We focus on monthly returns of extreme winner and losers over the next K months (where $K = 3$, 6, 9 or 12) and next five years.

Similar to Lee and Swaminathan (2000), the monthly return for a K-month holding period is based on an equal-weighted average of portfolio returns from strategies implemented in the current month and the previous $K - 1$ months. For instance, the monthly return for a three-month holding period is based on an equal-weighted average of portfolio returns from this month's strategy, last month's strategy, and strategy from two months ago.

3. Findings

In this section, the results for price momentum and volume-based price momentum strategies and the information content of trading volume are presented. Recall that our main objective is to examine the relationship between "trading volume" (measured by the turnover ratio) and "momentum" strategies in an Australian setting.

3.1 Momentum strategies

At the beginning of each month, we rank all stocks independently on the basis of past returns. The stocks are then assigned to one of five portfolios based on returns over the previous J months ($J = 3$, 6, 9 or 12). In each month, we long the winner portfolio and short the loser portfolio. This section reports the returns of the portfolio strategies described above over the two periods: from 1988 to 1995 and from 1995 to 2002. To be consistent with Lee and Swaminathan (2000), we report results for the top quintile portfolio of extreme losers (R1), the bottom quintile of extreme winners (R5), and one intermediate portfolio (R3). Our findings show a clear momentum effect in both sample periods.

In Table I, we report the results for the first sample period. In this table, we report average monthly returns over the next K months ($K = 3$, 6, 9, 12). In addition, we also report the mean return from a strategy of buying the extreme winners and selling the extreme losers (R5 – R1). For instance, with a six-month portfolio formation period ($J = 6$), past winners gain an average of 1.37 per cent per month over the next six months ($K = 6$). We also report that the past losers lose an average of 1.51 per cent per month over the same time period. The difference between R5 and R1 is 2.88 per cent per

Table I.
Portfolios sorted on past returns (sample period: 1988-1995)

							Monthly returns				
J	Portfolio	Return	$K=3$	$K=6$	$K=9$	$K=12$	Year 1	Year 2	Year 3	Year 4	Year 5
3	R1	−0.111057	−0.034956	−0.017793	−0.012776	−0.008744	−0.000004	0.003758	0.004437	0.005407	0.004866
			(−7.348)	(−4.725)	(−3.83)	(−3.005)	(−0.002)	(2.866)	(4.384)	(7.401)	(8.225)
	R3	0.003	0.004547	0.003434	0.003542	0.003646	0.003808	0.005718	0.006363	0.006681	0.006734
			(2.162)	(1.92)	(2.223)	(2.452)	(3.501)	(7.604)	(11.723)	(18.427)	(23.043)
	R5	0.110872	0.035191	0.01822	0.014452	0.012477	0.009199	0.009224	0.008244	0.007639	0.00626
			(8.112)	(5.677)	(5.351)	(5.13)	(5.35)	(7.797)	(9.992)	(10.924)	(10.256)
	R5 − R1		0.070147	0.036013	0.027228	0.021221	0.009203	0.005466	0.003807	0.002232	0.001394
			(10.895)	(7.278)	(6.344)	(5.596)	(3.618)	(3.095)	(2.915)	(2.207)	(1.64)
6	R1	−0.080291	−0.027438	−0.015075	−0.010319	−0.00673	0.001169	0.005024	0.005474	0.006512	0.005761
			(−5.438)	(−3.959)	(−3.032)	(−2.1080)	(0.589)	(3.605)	(5.131)	(9.121)	(9.945)
	R3	0.0041	0.003366	0.003498	0.003501	0.003315	0.00381	0.005814	0.006675	0.006714	0.006682
			(1.622)	(2.087)	(2.249)	(2.438)	(4.157)	(8.602)	(13.287)	(20.201)	(21.294)
	R5	0.079977	0.024151	0.013734	0.011038	0.009318	0.007803	0.007818	0.007083	0.006733	0.005602
			(5.738)	(4.428)	(4.017)	(3.701)	(4.412)	(6.405)	(8.912)	(9.419)	(8.963)
	R5 − R1		0.051589	0.028809	0.021357	0.016048	0.006634	0.002794	0.001609	0.000221	−0.000159
			(7.852)	(5.866)	(4.883)	(4.004)	(2.495)	(1.508)	(1.209)	(0.218)	(−0.186)
9	R1	−0.068547	−0.023028	−0.012264	−0.007237	−0.003299	0.002695	0.005975	0.00636	0.007196	0.006317
			(−4.539)	(−3.195)	(−2.109)	(−1.096)	(1.336)	(4.085)	(5.622)	(9.995)	(10.226)
	R3	0.003328	0.001628	0.001747	0.002208	0.002348	0.004298	0.006214	0.006594	0.006537	0.00636
			(0.719)	(0.969)	(1.383)	(1.642)	(4.461)	(8.98)	(13.047)	(20.424)	(24.568)
	R5	0.065867	0.022417	0.012981	0.009973	0.008524	0.006943	0.006748	0.006036	0.005759	0.004748
			(5.652)	(4.412)	(3.702)	(3.469)	(4.01)	(6.08)	(8.066)	(7.776)	(7.23)
	R5 − R1		0.045445	0.025245	0.01721	0.011823	0.004248	0.000773	−0.000324	−0.001437	−0.001569
			(7.057)	(5.219)	(3.945)	(3.043)	(1.598)	(0.419)	(−0.239)	(−1.391)	(−1.741)
12	R1	−0.062044	−0.020117	−0.009093	−0.00404	−0.001221	0.003999	0.007124	0.007411	0.008003	0.006652
			(−4.054)	(−2.271)	(−1.152)	(−0.392)	(2.002)	(4.928)	(6.813)	(11.742)	(11.206)
	R3	0.002381	0.001026	0.001944	0.001221	0.001584	0.003523	0.005608	0.006359	0.006523	0.006427
			(0.443)	(1.045)	(0.777)	(1.161)	(3.634)	(7.093)	(11.158)	(19.186)	(21.271)
	R5	0.056968	0.018984	0.010965	0.008967	0.007397	0.006171	0.006206	0.005499	0.005277	0.004421
			(4.826)	(3.569)	(3.242)	(2.958)	(3.548)	(6.061)	(7.423)	(6.895)	(6.579)
	R5 − R1		0.039101	0.020058	0.013007	0.008618	0.002172	−0.000918	−0.001912	−0.002726	−0.002231
			(6.175)	(3.974)	(2.913)	(2.158)	(0.82)	(−0.518)	(−1.453)	(−2.661)	(−2.488)

Notes: This table presents average monthly returns for momentum portfolio strategies for the time period 1988-1995. R1 represents the loser portfolio with the lowest returns, and R5 represents the winner portfolio with the highest returns during the previous J months. K represents monthly holding periods where $K = 3$, 6, 9 or 12 months. Consistent with Lee and Swaminathan (2000), return refers to the average monthly return over the portfolio formation period, J. The numbers in the parentheses are t-values

month. Consistent with Lee and Swaminathan (2000) the differences in average monthly returns between R5 and R1 are significantly positive in all (J, K) combinations.

Our findings also show that momentum effect lasts until four years when portfolios are formed on past three months returns. The R5 – R1 portfolio yields a statistically significant positive return until year 4. For other portfolios, we document a reversal in the sense that R5 – R1 is not statistically significant beyond year 1 (where $J = 6$, 9 and 12). Nearly all R5 – R1 portfolios yield statistically insignificant returns, except for portfolio based on past six-month returns. We also find that when portfolios are based on past 12-month returns, R5 – R1 returns are negative post year 1 but significant in years 4 and 5. Portfolio based on past 12-month returns becomes loser in year 2. However, portfolio based on past three-month returns is still a winner, although the abnormal return is much smaller and not statistically significant. Our findings in this respect are consistent with Lee and Swaminathan (2000).

In Table II we report the results from the second time period, 1995-2002. It is important to note that the findings are similar to those from the first period. We also find that price momentum portfolios exhibit higher trading volume. For example, the average monthly turnover for the R1 and R5 portfolios in the nine-month portfolio formation period is 2.2 and 3.8 per cent respectively. However, the average turnover for the intermediate (R3) portfolio is only 1.5 per cent. Lee and Swaminathan (2000) find that trading volume is positively correlated with absolute returns and this positive relation is asymmetric. Similar to Lee and Swaminathan (2000), we also find asymmetry in the positive relation between absolute returns and trading volume in the sense that extreme winners have a higher trading volume than extreme losers.

3.2 The relationship between volume and momentum strategies

Table III reports portfolio returns over the next K months (where $K = 3$, 6, 9, 12) where portfolios are formed on a two-way sort between momentum and past trading volume. We follow the approach of Lee and Swaminathan (2000) and sort all stocks at the beginning of each month based on their returns over the past J months and divide them into five portfolios (R1-R5). We then independently sort the same firms based on their average monthly turnover rate over the past J months and divide them into three volume portfolios (V1-V3). V1 represents the lowest trading volume portfolio, and V3 represents the highest trading volume portfolio.

The results from Table III show that conditional on past returns low-volume stocks usually generate high returns than high-volume stocks over the next 12 months. The returns of V3 – V1 portfolios are almost all negative. There are some positive returns for the V3 – V1 portfolio, however, they are all in the three month holding period ($K = 3$) and not statistically significant. All the (J, K) combinations (except $K = 3$) have similar results. We find that low volume losers (R1V1) lose less than high volume losers (R1V3) in the next 12 months. Low-volume losers earn an average return between −2.3 and 0.07 per cent per month. High-volume losers earn an average return between −4.2 and −1.2 per cent per month. For example, for $J = 9$, $K = 9$, low-volume losers outperform high-volume losers by 1.3 per cent per month, although they are all losers with negative returns. The differences between low-volume losers and high-volume losers are statistically significant. The return differential between high and low-volume winners is similar. Low-volume winners (R5V1) earn an average return between 1.1 and 3.6 per cent per month, while high-volume winners (R5V3) earn an average return between −1.0 and 3.1 per cent per month. In sum, we confirm that stocks that

Table II. Portfolios sorted on past returns (sample period: 1995-2002)

						Monthly returns								
J	Portfolio	Return	Volume	SzRnk	Price	$K=3$	$K=6$	$K=9$	$K=12$	Year 1	Year 2	Year 3	Year 4	Year 5
3	R1	−0.1015	0.0221	4.42	1.73	−0.0317	−0.0161	−0.0126	−0.0109	−0.0065	−0.0043	−0.0047	−0.0042	−0.0011
						(−7.343)	(−4.568)	(−4.416)	(−4.108)	(−3.364)	(−4.137)	(−4.676)	(−2.998)	(−1.191)
	R3	0.0034	0.0151	5.85	4.36	0.0042	0.0060	0.0062	0.0062	0.0072	0.0045	0.0047	0.0055	0.0055
						(1.925)	(3.463)	(4.208)	(4.627)	(6.462)	(6.853)	(7.043)	(6.823)	(10.982)
	R5	0.1093	0.0394	5.34	4.14	0.0347	0.0184	0.0127	0.0088	0.0013	0.0002	0.0002	−0.0011	−0.0020
						(7.864)	(6.713)	(5.513)	(4.327)	(0.937)	(0.259)	(0.183)	(−1.502)	(−4.085)
	R5 − R1					0.0664	0.0345	0.0253	0.0196	0.0078	0.0045	0.0049	0.0031	−0.0008
						(10.757)	(7.728)	(6.897)	(5.894)	(3.445)	(3.559)	(3.721)	(1.917)	(−0.776)
6	R1	−0.0719	0.0220	4.39	1.53	−0.0243	−0.0126	−0.0096	−0.0085	−0.0048	−0.0039	−0.0036	−0.0033	0.0003
						(−5.332)	(−3.482)	(−3.072)	(−2.978)	(−2.656)	(−4.217)	(−3.435)	(−2.541)	(0.244)
	R3	0.0042	0.0154	5.84	4.35	0.0058	0.0076	0.0075	0.0074	0.0068	0.0046	0.0041	0.0045	0.0052
						(2.328)	(4.083)	(5.044)	(5.212)	(5.868)	(6.425)	(5.571)	(4.282)	(8.746)
	R5	0.0770	0.0392	5.53	4.69	0.0274	0.0149	0.0101	0.0060	−0.0016	−0.0011	−0.0003	−0.0025	−0.0014
						(6.096)	(5.533)	(4.352)	(2.949)	(−1.053)	(−1.365)	(−0.267)	(−3.084)	(−1.525)
	R5 − R1					0.0516	0.0275	0.0197	0.0145	0.0032	0.0028	0.0033	0.0009	−0.0017
						(8.077)	(6.099)	(5.057)	(4.134)	(1.342)	(2.307)	(2.249)	(0.56)	(−1.064)
9	R1	−0.0602	0.0222	4.44	1.47	−0.0205	−0.0107	−0.0078	−0.0071	−0.0044	−0.0040	−0.0036	−0.0038	−0.0013
						(−4.655)	(−2.998)	(−2.494)	(−2.454)	(−2.573)	(−4.847)	(−3.615)	(−3.589)	(−1.361)
	R3	0.0039	0.0158	5.82	4.19	0.0074	0.0070	0.0068	0.0068	0.0063	0.0049	0.0044	0.0041	0.0054
						(3.056)	(4.485)	(4.792)	(5.059)	(6.488)	(9.003)	(6.829)	(9.508)	(8.493)
	R5	0.0628	0.0382	5.68	5.09	0.0247	0.0135	0.0080	0.0041	−0.0023	−0.0008	−0.0011	−0.0031	−0.0014
						(6.091)	(5.318)	(3.786)	(2.092)	(−1.349)	(−0.76)	(−1.235)	(−3.155)	(−1.098)
	R5 − R1					0.0452	0.0242	0.0158	0.0112	0.0021	0.0032	0.0025	0.0007	0.0000
						(7.551)	(5.52)	(4.186)	(3.207)	(0.885)	(2.298)	(1.849)	(0.496)	(−0.22)

(Continued)

Table II.

J	Portfolio	Return	Volume	SzRnk	Price	Monthly returns $K=3$	$K=6$	$K=9$	$K=12$	Year 1	Year 2	Year 3	Year 4	Year 5
12	R1	−0.0528	0.0224	4.45	1.39	−0.0182	−0.0080	−0.0059	−0.0056	−0.0034	−0.0034	−0.0026	−0.0027	−0.0014
						(−3.799)	(−2.163)	(−1.881)	(−2.079)	(−2.136)	(−4.69)	(−2.547)	(−2.413)	(−1.363)
	R3	0.0040	0.0150	5.69	4.06	0.0070	0.0062	0.0054	0.0055	0.0056	0.0047	0.0036	0.0036	0.0056
						(3.093)	(3.578)	(3.927)	(4.623)	(5.069)	(6.814)	(5.371)	(7.02)	(8.332)
	R5	0.0550	0.0383	5.78	5.37	0.0207	0.0101	0.0053	0.0018	−0.0036	−0.0013	−0.0018	−0.0037	−0.0004
						(4.93)	(3.779)	(2.309)	(0.766)	(−1.945)	(−1.122)	(−1.668)	(−3.083)	(−0.325)
	R5 − R1					0.0389	0.0181	0.0112	0.0074	−0.0002	0.0021	0.0008	−0.0011	0.0009
						(6.106)	(3.967)	(2.879)	(2.081)	(−0.079)	(1.6)	(0.546)	(−0.644)	(0.562)

Notes: This table presents average monthly returns for momentum portfolio strategies for the time period 1995-2002. R1 represents the loser portfolio with the lowest returns, and R5 represents the winner portfolio with the highest returns during the previous J months. K represents monthly holding periods where $K=3$, 6, 9 or 12 months. Consistent with Lee and Swaminathan (2000) Return refers to the average monthly return, and volume represents the average monthly turnover. SzRnk represents the average mean size decile of the portfolio on the portfolio formation date. Price represents the average mean stock price of the portfolio in dollar terms on the portfolio formation date. The numbers in parentheses are t-values

		K = 3				K = 6				K = 9				K = 12			
J	Portfolio	V1	V2	V3	V3 – V1	V1	V2	V3	V3 – V1	V1	V2	V3	V3 – V1	V1	V2	V3	V3 – V1
3	R1	−0.0232	−0.0275	−0.0421	−0.0190	−0.0056	−0.0151	−0.0252	−0.0196	−0.0023	−0.0139	−0.0198	−0.0175	−0.0017	−0.0127	−0.0182	−0.0165
		(−4.786)	(−5.212)	(−7.365)	(−2.529)	(−1.376)	(−3.683)	(−5.266)	(−3.122)	(−0.831)	(−4.188)	(−4.882)	(−3.572)	(−0.78)	(−4.218)	(−4.891)	(−3.803)
	R3	0.0026	0.0043	0.0031	0.0005	0.0049	0.0042	0.0047	−0.0003	0.0056	0.0034	0.0033	−0.0024	0.0062	0.0021	0.0027	−0.0035
		(1.068)	(1.432)	(0.745)	(0.101)	(2.69)	(1.869)	(1.848)	(−0.086)	(4.181)	(1.862)	(1.519)	(−0.972)	(5.144)	(1.339)	(1.464)	(−1.556)
	R5	0.0356	0.0317	0.0308	−0.0048	0.0216	0.0174	0.0159	−0.0057	0.0165	0.0106	0.0096	−0.0069	0.0164	0.0066	0.0044	−0.0120
		(5.58)	(7.146)	(4.801)	(−0.532)	(6.436)	(5.063)	(3.745)	(−1.061)	(5.977)	(3.762)	(2.884)	(−1.583)	(7.223)	(2.53)	(1.526)	(−3.291)
	R5 – R1	0.0588	0.0593	0.0729	0.0141	0.0272	0.0325	0.0411	0.0139	0.0188	0.0245	0.0294	0.0107	0.0181	0.0193	0.0226	0.0045
		(7.338)	(8.698)	(8.485)	(1.444)	(5.16)	(6.078)	(6.425)	(2.024)	(4.814)	(5.628)	(5.603)	(1.988)	(5.707)	(4.847)	(4.809)	(0.995)
6	R1	−0.0121	−0.0258	−0.0336	−0.0215	−0.0028	−0.0148	−0.0200	−0.0172	0.0002	−0.0144	−0.0168	−0.0170	0.0007	−0.0130	−0.0155	−0.0162
		(−1.876)	(−4.849)	(−5.062)	(−2.317)	(−0.624)	(−3.542)	(−3.945)	(−2.546)	(0.055)	(−4.024)	(−3.879)	(−3.264)	(0.301)	(−3.732)	(−3.846)	(−3.468)
	R3	−0.0003	0.0088	0.0033	0.0036	0.0048	0.0072	0.0027	−0.0021	0.0068	0.0066	0.0017	−0.0051	0.0070	0.0057	0.0007	−0.0063
		(−0.134)	(2.836)	(0.741)	(0.718)	(3.359)	(3.133)	(0.87)	(−0.612)	(4.717)	(3.748)	(0.628)	(−1.697)	(5.036)	(3.95)	(0.251)	(−2.042)
	R5	0.0242	0.0322	0.0259	0.0018	0.0141	0.0180	0.0113	−0.0028	0.0141	0.0105	0.0050	−0.0090	0.0109	0.0064	0.0014	−0.0096
		(4.707)	(7.267)	(3.938)	(0.211)	(4.155)	(5.722)	(2.864)	(−0.538)	(5.426)	(3.831)	(1.637)	(−2.246)	(5.371)	(2.578)	(0.507)	(−2.843)
	R5 – R1	0.0363	0.0580	0.0595	0.0232	0.0169	0.0329	0.0313	0.0144	0.0139	0.0249	0.0218	0.0080	0.0102	0.0194	0.0169	0.0067
		(4.398)	(8.374)	(6.366)	(2.346)	(3.004)	(6.271)	(4.872)	(2.185)	(3.592)	(5.525)	(4.112)	(1.526)	(3.268)	(4.536)	(3.484)	(1.437)
9	R1	−0.0118	−0.0271	−0.0258	−0.0140	−0.0053	−0.0185	−0.0148	−0.0095	−0.0010	−0.0152	−0.0140	−0.0129	−0.0025	−0.0149	−0.0134	−0.0109
		(−1.655)	(−5.286)	(−4.119)	(−1.48)	(−1.385)	(−4.69)	(−2.843)	(−1.459)	(−0.342)	(−4.021)	(−3.18)	(−2.41)	(−0.974)	(−4.173)	(−3.443)	(−2.318)
	R3	0.0093	−0.0001	−0.0015	−0.0108	0.0078	0.0021	−0.0012	−0.0090	0.0080	0.0020	0.0004	−0.0076	0.0085	0.0012	0.0003	−0.0082
		(3.58)	(−0.036)	(−0.331)	(−2.099)	(5.244)	(0.844)	(−0.424)	(−2.828)	(5.582)	(0.87)	(0.17)	(−2.575)	(6.22)	(0.586)	(0.112)	(−3.029)
	R5	0.0250	0.0265	0.0186	−0.0064	0.0178	0.0108	0.0051	−0.0126	0.0142	0.0052	0.0001	−0.0141	0.0126	0.0023	−0.0049	−0.0175
		(5.922)	(5.295)	(3.048)	(−0.864)	(7.001)	(3.771)	(1.336)	(−2.739)	(7.326)	(2.055)	(0.046)	(−3.916)	(6.891)	(0.972)	(−1.758)	(−5.24)
	R5 – R1	0.0368	0.0536	0.0444	0.0076	0.0231	0.0292	0.0200	−0.0031	0.0153	0.0205	0.0141	−0.0012	0.0151	0.0172	0.0085	−0.0066
		(4.458)	(7.481)	(5.077)	(0.664)	(5.018)	(6.01)	(3.081)	(−0.549)	(4.24)	(4.483)	(2.643)	(−0.26)	(4.777)	(4.018)	(1.769)	(−1.512)

(Continued)

Table III.
Portfolios sorted on past returns and volume (sample period: 1995-2002)

Table III.

J	Portfolio	K = 3 V1	K = 3 V2	K = 3 V3	K = 3 V3 – V1	K = 6 V1	K = 6 V2	K = 6 V3	K = 6 V3 – V1	K = 9 V1	K = 9 V2	K = 9 V3	K = 9 V3 – V1	K = 12 V1	K = 12 V2	K = 12 V3	K = 12 V3 – V1
12	R1	−0.0140	−0.0243	−0.0247	−0.0107	0.0002	−0.0153	−0.0138	−0.0140	−0.0007	−0.0153	−0.0120	−0.0113	0.0002	−0.0154	−0.0129	−0.0131
		(−1.971)	(−4.208)	(−3.543)	(−1.075)	(0.048)	(−3.341)	(−2.556)	(−2.085)	(−0.229)	(−4.029)	(−2.622)	(−2.015)	(0.068)	(−5.324)	(−3.399)	(−2.839)
	R3	0.0036	0.0034	0.0047	0.0010	0.0050	0.0028	0.0029	−0.0021	0.0057	0.0009	0.0022	−0.0035	0.0071	0.0009	0.0009	−0.0062
		(1.63)	(1.001)	(1.165)	(0.227)	(3.248)	(1.145)	(0.958)	(−0.638)	(4.381)	(0.437)	(0.86)	(−1.182)	(6.437)	(0.477)	(0.396)	(−2.425)
	R5	0.0258	0.0174	0.0107	−0.0152	0.0172	0.0043	0.0002	−0.0170	0.0141	0.0012	−0.0058	−0.0199	0.0112	−0.0014	−0.0101	−0.0212
		(6.099)	(3.049)	(1.714)	(−1.976)	(5.809)	(1.159)	(0.062)	(−3.524)	(6.052)	(0.356)	(−1.95)	(−5.254)	(5.288)	(−0.467)	(−3.444)	(−5.891)
	R5 – R1	0.0398	0.0417	0.0353	−0.0045	0.0170	0.0196	0.0141	−0.0029	0.0148	0.0165	0.0062	−0.0087	0.0110	0.0140	0.0029	−0.0081
		(4.793)	(5.135)	(3.784)	(−0.419)	(3.421)	(3.325)	(2.129)	(−0.467)	(3.74)	(3.304)	(1.125)	(−1.848)	(3.272)	(3.336)	(0.598)	(−2.099)

Notes: This table presents average monthly returns for portfolios sorted on past returns and past average monthly turnover for the time period 1995-2002. K represents monthly holding periods where $K = 3$, 6, 9 or 12 months. R1 represents the loser portfolio, and R5 represents the winner portfolio. V1 represents the lowest trading volume portfolio, and V3 represents the highest trading volume portfolio. The numbers in parentheses are t-values

experience low trading volume in the recent past tend to outperform stocks that experience high trading volume.

Our findings are consistent with Lee and Swaminathan (2000) in this respect. They interpret this as evidence that low-volume firms command a greater illiquidity premium. According to the liquidity hypothesis, the portfolio with lower liquidity should earn higher expected returns (Lee and Swaminathan, 2000). However, Lee and Swaminathan (2000) also find that momentum premium is higher in high-volume firms. In this paper, we find similar results to those of Lee and Swaminathan's for portfolios based on past three and six month returns. Interestingly, for portfolios based on past nine and 12-month returns, the findings are opposite, that is, we find that the momentum premium is higher for low-volume firms.

The bottom row of each combination in Table III shows the return to a dollar-neutral price momentum strategy (R5 – R1). For example, for $J = 3$ and $K = 6$, the price momentum spread is 4.1 per cent for high-volume firms and only 2.7 per cent for low-volume firms. The difference of 1.4 per cent is statistically significant. However, the findings in the portfolios that are based on past 9 and 12-month returns are different in the sense that they support the liquidity hypothesis. For example, for $J = 12$ and $K = 12$, the price momentum spread is only 0.29 per cent for high-volume firms and 1.1 per cent for low-volume firms. The difference of 0.81 per cent is also statistically significant. Our findings contradict Lee and Swaminathan (2000) and Scott *et al.* (2003) who find that price momentum is more pronounced among high-volume stocks. Thus, it is our conjecture that the price momentum premium depends on the portfolio formation period.

3.3 Further tests

Table IV reports further tests conducted on these basic intermediate-horizon results. In this table, we report results for the six- and nine-month formation period ($J = 6$, $J = 9$)[4]. Recall that the results are based on five price momentum and three trading volume portfolios (5 * 3). Table IV shows that the results are similar when we change the construction of the portfolios. Panel A reports results using three momentum and five trading volume portfolios (3 * 5), whereas panel B reports results using three momentum and three volume portfolios (3 * 3).

Generally, Table IV shows that low-volume stocks out perform high-volume stocks for almost all portfolios. Momentum is more pronounced among high-volume stocks over 12 months for portfolios based on past six-month returns. For example, in panel A, for $J = 6$, $K = 9$, the momentum spread is 1.7 per cent for high-volume stocks and only 0.99 per cent for low-volume stocks. This effect could be driven by low-volume losers who gain 0.3 per cent per month and high-volume losers who lose 1.6 per cent per month. For portfolios that are based on past nine-month returns the results are mixed.

The momentum premium is higher in high-volume stocks when the holding period is short, but lower or disappearing when the holding period increases. For example, in panel A, $J = 9$ and $K = 3$, the difference in momentum premium between V5 and V1 is 0.86 per cent per month. However, when $K = 12$ the difference is -0.56 per cent per month. Thus, we are of the view that the magnitude of momentum premium not only depends on the portfolio formation period, but also on the holding period.

3.4 Findings over next five years

We find that low-volume[5] stocks tend to be much small and have higher price. Lee and Swaminathan (2000) find that high-volume stocks are more highly priced in USA.

Table IV.
Portfolios sorted on past returns and volume: further tests

J	Portfolio	K = 3 V1	K = 3 V3	K = 3 V5	K = 3 V5 – V1	K = 6 V1	K = 6 V3	K = 6 V5	K = 6 V5 – V1	K = 9 V1	K = 9 V3	K = 9 V5	K = 9 V5 – V1	K = 12 V1	K = 12 V3	K = 12 V5	K = 12 V5 – V1
Panel A: 3 price momentum, 5 trading volume portfolios																	
6	R1	−0.0023	−0.0179	−0.0264	−0.0241	0.0046	−0.0094	−0.0189	−0.0235	0.0030	−0.0098	−0.0162	−0.0192	0.0039	−0.0098	−0.0133	−0.0173
		(−0.495)	(−3.276)	(−3.985)	(−2.989)	(1.502)	(−2.205)	(−3.801)	(−4.022)	(1.388)	(−2.897)	(−4.01)	(−4.19)	(2.161)	(−3.161)	(−3.586)	(−4.172)
	R2	0.0021	0.0056	0.0038	0.0017	0.0052	0.0046	0.0016	−0.0036	0.0057	0.0045	−0.0011	−0.0068	0.0066	0.0034	−0.0044	−0.0109
		(0.827)	(1.623)	(0.654)	(0.272)	(3.648)	(1.67)	(0.406)	(−0.884)	(4.96)	(2.168)	(−0.331)	(−1.929)	(6.149)	(2.038)	(−1.373)	(−3.251)
	R3	0.0179	0.0271	0.0209	0.0030	0.0122	0.0150	0.0073	−0.0050	0.0130	0.0097	0.0010	−0.0120	0.0116	0.0068	−0.0021	−0.0138
		(5.261)	(7.078)	(3.218)	(0.412)	(5.627)	(5.721)	(1.801)	(−1.084)	(7.174)	(3.953)	(0.33)	(−3.382)	(6.737)	(3.314)	(−0.817)	(−4.387)
	R3 – R1	0.0202	0.0450	0.0473	0.0271	0.0076	0.0245	0.0261	0.0185	0.0100	0.0194	0.0172	0.0072	0.0077	0.0166	0.0112	0.0035
		(3.527)	(6.748)	(5.097)	(3.144)	(2.02)	(4.873)	(4.085)	(3.209)	(3.538)	(4.663)	(3.398)	(1.527)	(3.056)	(4.466)	(2.46)	(0.851)
9	R1	−0.0066	−0.0177	−0.0226	−0.0160	0.0002	−0.0119	−0.0183	−0.0185	0.0024	−0.0099	−0.0149	−0.0173	0.0017	−0.0091	−0.0134	−0.0151
		(−1.347)	(−3.351)	(−3.401)	(−1.943)	(0.056)	(−2.949)	(−3.564)	(−3.020)	(1.11)	(−3.093)	(−3.548)	(−3.662)	(0.94)	(−3.177)	(−3.487)	(−3.554)
	R2	0.0074	0.0026	−0.0005	−0.0080	0.0056	0.0046	−0.0057	−0.0113	0.0065	0.0026	−0.0050	−0.0115	0.0075	0.0008	−0.0057	−0.0133
		(3.64)	(0.728)	(−0.074)	(−1.074)	(3.977)	(1.476)	(−1.526)	(−2.837)	(5.323)	(0.999)	(−1.431)	(−3.102)	(6.321)	(0.339)	(−1.919)	(−4.136)
	R3	0.0159	0.0189	0.0085	−0.0074	0.0162	0.0096	−0.0012	−0.0174	0.0131	0.0059	−0.0053	−0.0184	0.0121	0.0041	−0.0086	−0.0207
		(3.883)	(4.702)	(1.426)	(−1.015)	(6.201)	(4.091)	(−0.321)	(−3.769)	(6.903)	(2.878)	(−1.757)	(−5.178)	(7.24)	(2.115)	(−3.075)	(−6.343)
	R3 – R1	0.0225	0.0365	0.0311	0.0086	0.0160	0.0216	0.0170	0.0010	0.0107	0.0158	0.0097	−0.0011	0.0104	0.0131	0.0047	−0.0056
		(3.529)	(5.515)	(3.48)	(0.976)	(3.785)	(4.609)	(2.668)	(0.177)	(3.712)	(4.16)	(1.867)	(−0.224)	(4.205)	(3.816)	(0.998)	(−1.324)

(Continued)

Table IV.

J	Portfolio	K=3 V1	K=3 V2	K=3 V3	K=3 V3 – V1	K=6 V1	K=6 V2	K=6 V3	K=6 V3 – V1	K=9 V1	K=9 V2	K=9 V3	K=9 V3 – V1	K=12 V1	K=12 V2	K=12 V3	K=12 V3 – V1
Panel B: 3 price momentum, 3 trading volume portfolios																	
6	R1	−0.0103	−0.0172	−0.0261	−0.0158	−0.0034	−0.0098	−0.0160	−0.0127	−0.0008	−0.0104	−0.0137	−0.0129	0.0000	−0.0090	−0.0122	−0.0122
		(−2.549)	(−3.948)	(−4.711)	(−2.312)	(−1.158)	(−2.931)	(−3.689)	(−2.429)	(−0.388)	(−3.8)	(−3.749)	(−3.102)	(−0.008)	(−3.216)	(−3.482)	(−3.149)
	R2	0.0016	0.0070	0.0050	0.0034	0.0053	0.0055	0.0027	−0.0026	0.0055	0.0049	0.0015	−0.0040	0.0061	0.0043	0.0004	−0.0057
		(0.775)	(2.619)	(1.273)	(0.765)	(4.338)	(2.736)	(1.035)	(−0.912)	(4.82)	(2.91)	(0.666)	(−1.585)	(6.206)	(2.935)	(0.153)	(−2.274)
	R3	0.0209	0.0235	0.0216	0.0007	0.0134	0.0139	0.0103	−0.0031	0.0127	0.0096	0.0053	−0.0075	0.0116	0.0069	0.0021	−0.0095
		(6.948)	(7.189)	(4.217)	(0.118)	(7.342)	(5.718)	(3.219)	(−0.826)	(8.767)	(4.579)	(2.154)	(−2.623)	(8.613)	(3.659)	(1.016)	(−3.842)
	R3 – R1	0.0311	0.0407	0.0477	0.0165	0.0167	0.0238	0.0263	0.0096	0.0135	0.0200	0.0189	0.0054	0.0116	0.0158	0.0143	0.0027
		(6.2)	(7.474)	(6.322)	(2.406)	(4.896)	(5.732)	(4.88)	(2.08)	(5.474)	(5.798)	(4.314)	(1.429)	(5.477)	(4.715)	(3.513)	(0.776)
9	R1	−0.0099	−0.0192	−0.0212	−0.0113	−0.0036	−0.0124	−0.0135	−0.0098	−0.0014	−0.0101	−0.0119	−0.0104	−0.0004	−0.0098	−0.0114	−0.0099
		(−2.599)	(−4.408)	(−3.946)	(−1.711)	(−1.378)	(−3.716)	(−3.11)	(−1.948)	(−0.759)	(−3.092)	(−3.161)	(−2.482)	(−0.279)	(−3.34)	(−3.396)	(−2.995)
	R2	0.0074	0.0002	0.0015	−0.0060	0.0061	0.0026	0.0001	−0.0060	0.0067	0.0019	0.0011	−0.0056	0.0076	0.0012	0.0012	−0.0064
		(3.622)	(0.071)	(0.414)	(−1.46)	(4.785)	(1.049)	(0.044)	(−2.161)	(5.918)	(0.861)	(0.46)	(−2.2)	(6.752)	(0.659)	(0.575)	(−2.71)
	R3	0.0166	0.0209	0.0150	−0.0016	0.0157	0.0102	0.0057	−0.0100	0.0128	0.0060	0.0015	−0.0113	0.0115	0.0039	−0.0023	−0.0138
		(5.698)	(5.478)	(3.021)	(−0.278)	(8.59)	(4.69)	(1.744)	(−2.696)	(9.493)	(3.071)	(0.635)	(−4.129)	(9.498)	(2.189)	(−1.072)	(−5.553)
	R3 – R1	0.0266	0.0400	0.0363	0.0097	0.0193	0.0226	0.0191	−0.0002	0.0142	0.0161	0.0134	−0.0009	0.0119	0.0137	0.0090	−0.0029
		(5.521)	(6.926)	(4.949)	(1.421)	(6.046)	(5.675)	(3.535)	(−0.041)	(6.134)	(4.427)	(3.01)	(−0.233)	(6.251)	(3.991)	(2.259)	(−0.901)

Notes: This table presents results for two-way sorts involving three price momentum and five trading volume portfolios and three price momentum and three trading volume portfolios. All these results are only for the six- and nine-month portfolio formation period ($J=6$ and 9). We use turnover as a proxy of trading volume. K represents monthly holding periods where $K=3$, 6, 9 or 12 months. R1 represents the loser portfolio. R3 represents the winner portfolio. V1 represents the lowest trading volume portfolio. V5 (V3) represents the highest trading volume portfolio when we form five (three) volume portfolios. The numbers in parentheses are t-values

In contrast, Australian stock prices are generally much lower than those in USA. Since the Australian stock market is much smaller than the US market, the existence of some difference between different countries is inevitable.

Our findings also show that the spread between winners and losers (R5 – R1) is higher for low-volume stocks. For example, the momentum spread for high-volume stocks is 0.12 per cent per month and 0.24 per cent per month lower than those of low-volume stocks in year 1. In addition, we find that the momentum effect disappears after 12 month of the formation date for high-volume stocks. However, the effect exists until year 4 for low and medium volume stocks. After year 4 the momentum effect disappears for all three groups. In contrast, Lee and Swaminathan (2000) find that high-momentum stocks with high-volume tend to subsequently outperform high-momentum stocks with low-volume.

When we look at the difference between high- and low-volume stocks (V3 – V1), controlling for price momentum we find that low-volume stocks outperform high-volume stocks for each of the next five years. This is another difference between the Australian market and the US market. Lee and Swaminathan (2000) find this effect for low-volume losers whereas we find it for all low-volume stocks. Since it is argued that trading volume may be a proxy for firm size effect we conduct the same test after adjusting for firm size. Although size adjustment decreases price momentum returns for high- and medium-volume portfolios, the adjustment has no effect on the volume results.

3.5 Price reversals, volume and momentum strategies

Lee and Swaminathan (2000) find that price reversals are more pronounced among low-volume losers (R1V1) and high-volume winners (R5V3). Price momentum is more pronounced among high-volume losers (R1V3) and low-volume winners (R5V1). It can be seen that low-volume losers have negative returns before they begin to earn positive returns after 12 months. In the US, low-volume losers begin to have positive returns only after year 1, which is one year later than in Australia. Similarly, high-volume winners begin to have negative returns one year early in Australia than in the USA. Low-volume winners in Australia always have positive and significant returns over the next five years while in the USA they become losers after year 3. Overall, the results confirm the findings of Lee and Swaminathan (2000) and the fact that the momentum effect is stronger in Australia.

We now proceed to test the two volume based price momentum strategies advanced by Lee and Swaminathan (2000). The first strategy is called early-stage strategy, which involves buying low-volume winners and selling high-volume losers. The second strategy is late-stage momentum strategy which means buying high-volume winners and selling low-volume losers and price momentum in these stocks should reverse faster. We test these two strategies by using raw data as well as size adjusted data.

We find that the simple strategy earns 0.28-0.33 per cent per month in the first three years before the momentum disappears. The late strategy begins losing in year 1. In contrast, the early strategy earns significant positive returns for all five years. When we compare these two strategies with the simple strategy, we find that early momentum strategies earn significantly higher returns in each of the next five years. However, late momentum strategies earn significantly lower returns in all of the five years. We find that the momentum premium for early strategies lasts longer than that in the USA. Lee and Swaminathan (2000) suggest that if we only look at the returns for late stage stocks it will be obvious that price momentum is an over-reaction to

fundamental news. The momentum premium disappears and the stocks in these portfolios begin losing and continue to lose in the next five years. Lee and Swaminathan (2000) also state that if we only look at the returns for early stocks it shows that price momentum is the effect of market under-reaction. Lee and Swaminathan (2000) argue that "both effects are part of a more general process by which information is incorporated into prices" (Lee and Swaminathan, 2000, p. 2045). Our results seem to support the view advanced by Lee and Swaminathan (2000).

3.6 Can volume predict future returns?

We find that trading volume, as measured by the turnover ratio, provides important information about momentum and that it can be used to predict future returns. Liquidity has proxies, such as volume, volatility, number of trades, bid-ask spread etc. In this paper, we use turnover ratio as a measure of liquidity following Datar *et al.* (1998). We form portfolios based on momentum and changes in trading volume. Stocks are independently sorted into five momentum portfolios and three portfolios based on changes in trading volume over the past one year (ΔV). We define the 12-month period just prior to the portfolio formation date as year t, then the change in volume as the average monthly turnover over the past six months minus the average monthly turnover in year $t-1$ ($\Delta V = V(6, t) - V(t-1)$).

This is different from Lee and Swaminathan's approach. In their study, they choose a four-year horizon instead of one year. In this study, we only have seven years of data with all available information and thus, if we choose a four-year horizon it would result in too few eligible observations. For the same reason, we reduced the long-term returns to four years, because we do not have enough observations in year 5. We document a positive relationship between the level of trading volume and the change in trading volume, although not very strong. We find that momentum premium is high- in low-volume stocks and stocks with the least increase (or the most decline) in volume. There is no momentum effect in stocks with high-volume and stocks with the most increase in volume. When low-volume losers begin to earn positive returns, losers with least increase in volume are still losing money and continue to lose even after four years.

3.7 Testing the momentum life cycle of Lee and Swaminathan (2000)

Lee and Swaminathan (2000) develop an interesting explanation for the findings in their study. This is the momentum life cycle (MLC) hypothesis. We apply this hypothesis to our findings and find that our results support this hypothesis. According to the momentum life cycle, stocks experience different periods of investor favoritism and neglect. High-volume winners and low-volume losers as late stage momentum stocks are more likely to reverse in the near future. Conversely, low-volume winners and high-volume losers as early stage momentum stocks are more like to persist in the near future. These phenomena are more pronounced in our findings.

For late stage momentum stocks, they reverse faster compared to stocks in Lee and Swaminathan's (2000) study, usually after 12 months. For early stage momentum stocks, they persist longer (in all the next five years). Lee and Swaminathan (2000) suggest that trading volume may help locate a given stock in the momentum life cycle and provide information about market sentiment of the stock. They argue when a stock is popular to the investors, its trading volume increases as well; when it is no longer popular, the trading volume decreases with the popularity. Thus, trading volume may provide useful information when making investment decisions.

4. Conclusion and final remarks

In this paper, we investigate the profitability of momentum strategies in an Australian setting. We find substantial momentum in monthly stock returns during the period 1988-2002. Various formation and holding periods are used to form momentum strategy portfolios. The abnormal returns from these portfolios vary from 0.3 to 7 per cent per month in the intermediate-horizon. The price momentum reversal reported in Lee and Swaminathan (2000) is confirmed here. However, the speed of the reversal in Australia is much slower than in the USA. That is, in the USA most of the momentum effects reverse after one year, but they last three to four years in Australia before disappearing. Moreover, we also find that the speed of the reversal depends on the formation period, with longer formation period leading to quick reversal.

In addition, we also find that trading volume provides information about the magnitude of momentum profits. However, in the long horizon, we find that high-momentum stocks with low-volume tend to outperform high momentum stocks with high-volume, which contradicts prior research. It is not clear whether this effect is due to possible differences between Australian and US stock markets. We also examine the early stage strategy and late stage strategy advanced by Lee and Swaminathan (2000). Since the momentum effect reversal in Australia is slower than in the USA, we argue that these strategies will be of use to Australian investors. When early strategy is applied, the momentum profit can be earned for four years instead of three years in USA. Our findings also support the liquidity hypothesis when portfolios are formed on past 9 and 12 month returns. Our findings show that the momentum life cycle (MLC) hypothesis works quite well in the Australian setting.

Notes

1. Jegadeesh and Titman (1993) find that when stocks are selected based on their past six month return and held for six months they realize a return of over 12 per cent per annum.
2. We thank the referee for suggesting that the volume based portfolios could be adjusted for risk following Lange (1999) and Brooks *et al.* (2001).
3. We once again thank the referee for suggesting an alternative approach whereby one could include all stocks that satisfy the inclusion criteria in any give month.
4. The results of portfolios based on past 3 and 12 month returns are similar to those based on past six and nine month returns.
5. Detailed tables (Tables V-VIII) and exhibits can be obtained from the corresponding author upon request.

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Further reading

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