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Abstract

It has been documented that a momentum investment strategy based on buying past well performing stocks while selling past losing stocks, is a profitable one in the Australian context particularly in the 1990s. The aim of this short paper is to investigate whether or not this feature of Australian stock returns is still evident. The paper confirms the presence of a medium-term momentum effect, but also provides some interesting new evidence on the importance of the size effect on momentum.

Keywords:

Stock returns, Momentum portfolios, Size effect.

JEL Classification Numbers:

G11, G12

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1. INTRODUCTION

Jegadeesh and Titman (1993, 2001) demonstrate that for US stocks, over an intermediate investment horizon of three to twelve months, a momentum investment strategy, defined as buying stocks whose immediate past performance is good ("winners") and selling stocks whose immediate past performance is poor ("losers"), is a profitable one. Since this influential work a number of other studies have confirmed and extended this result. Moskowitz and Grinblatt (1999) show that momentum exists in industry-based portfolios while Llewellyn (2002) demonstrates that momentum is also present in size and book-market sorted portfolios. Grundy and Martin (2001) take a longer-term historical perspective and show that a momentum strategy has been profitable in the US since the 1920s. There is thus a solid body of literature documenting that momentum is a robust and pervasive feature of US stocks and there is emerging evidence (Rouwenhorst, 1998) to suggest the presence of momentum in European markets.

In a previous paper, Hurn and Pavlov (2003) (HP hereafter) provide empirical evidence in support of the profitability of a momentum investment strategy in Australia by examining the returns of the largest 200 stocks by market capitalization listed on the Australian Stock Exchange (ASX) for the period December 1973 to December 1998. The evidence in favour of momentum in an Australian context is further strengthened by the favourable momentum results reported by Demir, Muthuswamy and Walter (2004) for the period 1990 to 2001 and Marshall and Cahan (2005) for the period 1990 to 2003. This paper revisits the results reported by HP to test the robustness of their conclusions. The motivation for this endeavour stems mainly from the argument of Sullivan, Timmermann and White (1999) who point out that data-snooping is a major factor encountered yet overlooked in a large body of the literature on the profitability of technical trading strategies. It is potentially important therefore to ascertain whether or not the momentum profits reported by HP are robust to this kind of reality check.

This paper tests the robustness of HPs conclusions by updating the research in two ways. *First*, the period of the stock returns data is expanded so that the sample on which the analysis is conducted now covers the period December 1973 to December 2004. The period 1998 to 2004 includes a period of strong growth in stocks worldwide and also a period of turbulence known as the "dotcom" bubble. *Second*, unlike the original HP paper, the current study is not limited to the largest 200 stocks by market capitalisation listed on the ASX. HP motivate the decision to limit the scope of the empirical analysis to large stocks by appealing to the fact that smaller stocks tend to be hampered by low liquidity. Rather than assuming that liquidity correlates strongly with size, the approach adopted here is aimed more directly at the liquidity problem. Specifically, the empirical analysis is conducted on the largest possible set of stock returns that satisfy a number of liquidity conditions.

The rest of the paper is structured as follows. Section 2 describes the dataset employed and Section 3 deals with various methodological points related to the construction of the momentum portfolios, including a discussion of the liquidity conditions used in their construction. In Section 4 the results obtained from implementing a momentum investment strategy with Australian stocks are presented. Conclusions and suggestions for further research are contained in Section 5.

2. DATA

The data are taken from the AGSM database containing monthly observations on prices, returns, dividends and capital reconstructions for all stocks listed on the ASX. The analysis is performed on simple monthly returns defined as the sum of the capital gain and dividend yield, taking into account any capital reconstructions.[2]

[2] The variable "price relative" in the AGSM database.

A feature of this update is that the HP sample has been extended so that the stock returns now cover the period from December 1973 to December 2004. We also allow for a much larger universe of securities. The portfolios considered in this paper include all securities listed on the ASX provided that they satisfy two simple liquidity criteria, the exact nature of which will be made clear later in the description of the momentum portfolio composition. The number of stocks that pass the liquidity criteria in any given month ranges between 600 and 900, substantially larger number of securities than the top 200 considered in HP.

Size Band	**Mean Return**
Top 100	1.31%
100-200	1.34%
200-300	1.21%
300-400	1.12%
400-500	1.14%
500-600	1.21%
600-700	1.37%
700-800	1.62%
800-900	3.05%

Table 1 Mean monthly returns (%) by Size (size is defined according to the relative ranking based on the price of the last observed trade).

As a baseline for comparative purposes, Table 1 reports the mean returns over sample for stocks in different size cohorts. The most notable feature of these figures is presence of a size effect for stocks in the 700-900 ranking. It is also interesting to note that there is evidence of a small U-shape in the average performance by size cohorts. Despite these observations, however, on grounds of these average performance figures, there appears to be no compelling reason to limit the momentum analysis to the top 200 stocks.

3. CONSTRUCTION OF MOMENTUM PORTFOLIOS

The construction of momentum portfolios follows closely the method described in Jegadeesh and Titman (1993) and is also described in HP. For convenience the salient points are repeated here:

1. Sort the stocks on the cumulative return over the past 6 months.
2. Split the sorted stocks into three groups with equal numbers of stocks.
3. Form an equal-weighted arbitrage portfolio at time t by buying the group of best performing stocks and short-selling the group comprising the worst performing stocks.
4. Keeping the composition of the arbitrage portfolio fixed, the returns for holding the portfolio for one month are computed for periods {t+1, t+2, ..., t+36}.
5. Repeat steps 1 to 4 for every time period.

In order to qualify for sorting into momentum portfolios in step 1 above, stocks are required to satisfy two liquidity criteria. *First*, stocks with no trades in the month leading to time t (current month) are automatically ruled out. *Second*, all stocks with more than one missing return observation over the 6-months momentum window are also excluded. This is different to the procedure adopted by HP who imposed a hard size limit on stocks. The current approach avoids the assumption that liquidity is necessarily strongly correlated with size.

Once momentum portfolios are constructed there are three important practical issues to deal with.

Missing return observations

The database contains a considerable number of periods when a particular stock is not traded and hence no price record exists. HP considered three different ways of dealing with missing data: the *unconditional mean approach*, where missing values were replaced by the sample mean; the *regression approach*, in which a factor model was estimated and used to produce estimates of missing returns; and the *simple approach*, where any missing

price observations were replaced with the price of the last observed trade. Upon reflection, it was clear that both the unconditional mean approach and the regression approach would almost certainly be plugging a missing value at time t using information that would only become available in future periods. For this reason it was decided to stick with the simple approach to dealing with missing values in the computation of the returns to the momentum strategy and thus make the investment strategy more realistic. Of course, the liquidity criterion was designed to mitigate the effect of these missing price records when constructing the portfolios.

Stock exits

Over the period covered by the sample, a substantial number of stocks were delisted and exited the database. To avoid the effects of survivorship bias, HP assumed that any such occurrence resulted in a 100 per cent capital loss for shareholders. The AGSM database now includes more information on reasons for stock exits and it became apparent during the course of the current research that the assumption made by HP may have been too extreme. Circumstances in which a full capital loss would not be warranted include, but are not limited to: mergers or acquisitions resulting in a named stock ceasing to exist; failing to meet ASX listing requirements; and equity reconstructions. As a consequence, zero loss is inferred for exiting stocks. Although this assumption is also rather extreme, some experimentation shows that although the treatment of existing stocks does affects the level of momentum profits, it does not change the overall pattern of average holding returns or the main conclusions of the paper.

Short selling

As pointed out by Demir et al. (2004), momentum strategies documented in the literature tend to ignore the implications of any short-selling restrictions that investors must face when dealing on the ASX. HP do not take account of these obstacles and this convention is maintained in the current research. This assumption may be rationalised on a number of grounds. *First*, it makes the current work directly comparable with the previous paper. *Second*, and perhaps more important, the focus of the research is on the search for robust

patterns in momentum profits that will be robust to transactions costs. It will also be demonstrated below that the pattern of momentum profits is split evenly between winning and loosing stocks, that is, the strategy of buying past winners still outperforms the index and mirrors the time pattern of mean returns on the momentum portfolio.

4. RESULTS

Before presenting the results of the current exercise it is worth summarizing the main results reported by HP. The most striking result is the statistically significant evidence found for the existence of short- to medium-term momentum in Australian stocks. Specifically, HP found that momentum profits for the yearly holding period post formation were statistically significant and ranged from 4.79% to 7.13% for portfolios formed from the largest 200 stocks. HP also evaluated a number of suggested explanations for the momentum and found them all to be unable to explain the magnitude of the returns. It was also found that following a contrarian investment strategy did not yield statistically significant abnormal returns over the investment horizons considered. For the record, Figure 1 reproduces the original results in HP with the proviso that the missing values are treated differently and the universe of stocks has changed.

Note that in the current research the significance of momentum profits in each period is not tested for. This is motivated by the recognition that the level of momentum profits will be influenced by the particular assumptions adopted to deal with the issues of missing observations, stock exits and transactions costs (such as short-selling restrictions). On the other hand, the time profile of holding period returns following portfolio formation appears to be a very robust feature of the data. A more satisfactory approach therefore would be to construct a test of the time pattern of momentum profits. This would require the formulation of a statistical model that can explain the observed pattern of profits over different horizons and is beyond the scope of this short update.

The momentum results for the period 1998 – 2004 are presented in Figure 2. The pattern of returns is much the same with one striking exception. There appears to be no momentum return when the analysis is limited to the top 50 stocks. This pattern is also evident in the earlier sample, but it is much stronger in the early 2000s. It appears therefore that the results are broadly comparable to those obtained by HP with the smaller sample. A universal feature of the data is that across all the sub-samples considered is that momentum appears strongest (especially in the first 6 months post portfolio formation) in the stocks ranked between 200 and 500. This is a new result, one which was precluded by the HP decision to limit the scope of their empirical analysis.

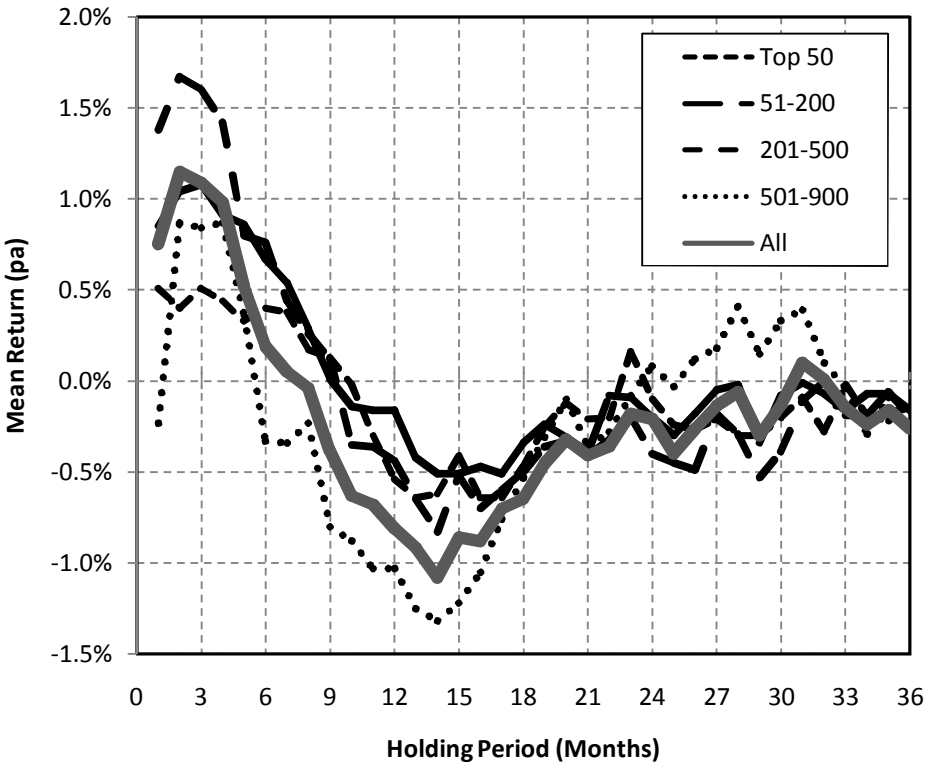

Figure 1 Mean monthly holding period returns for up to 3 years following portfolio formation (1973-1998).

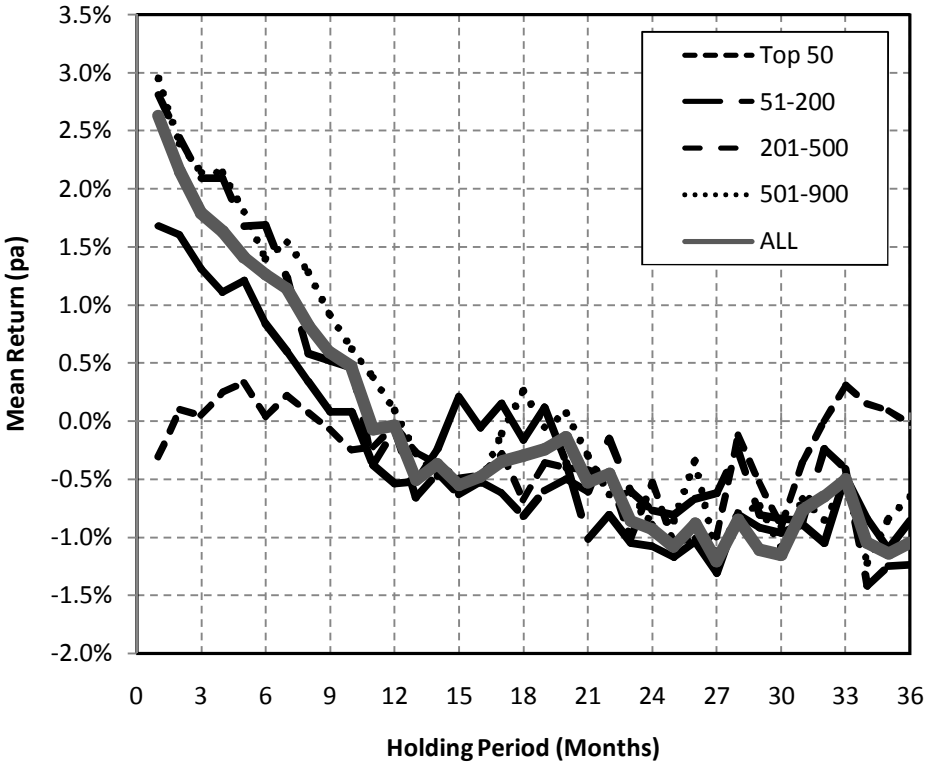

Figure 2 Mean monthly holding period returns for up to 3 years following portfolio formation (1998 – 2004).

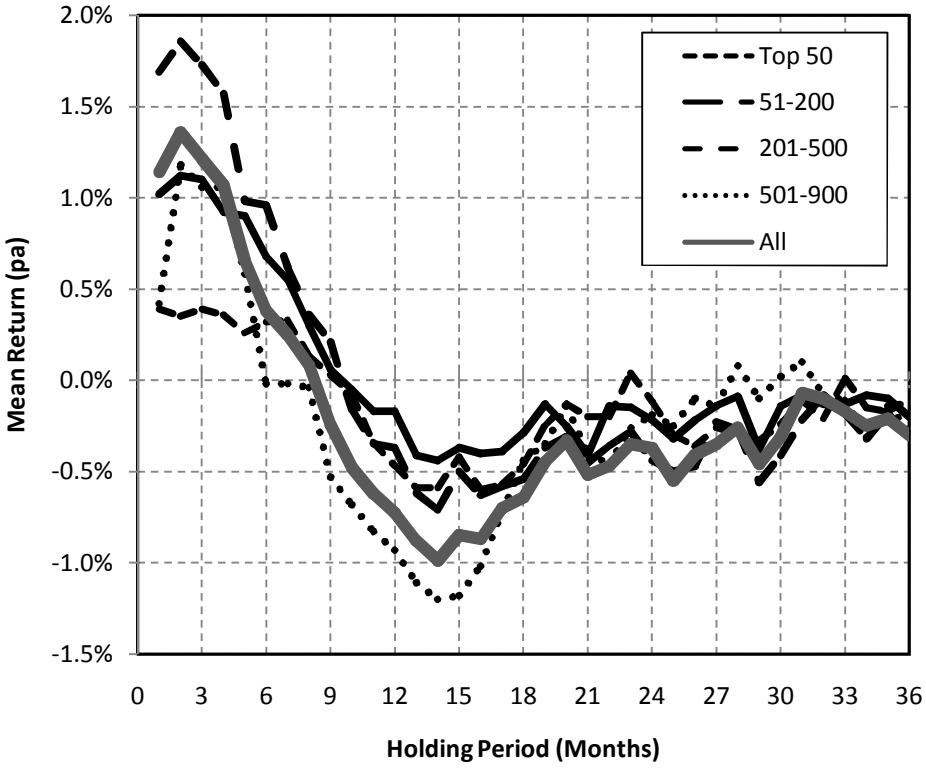

Figure 3 Mean monthly holding period returns for up to 3 years following portfolio formation (1974 – 2004).

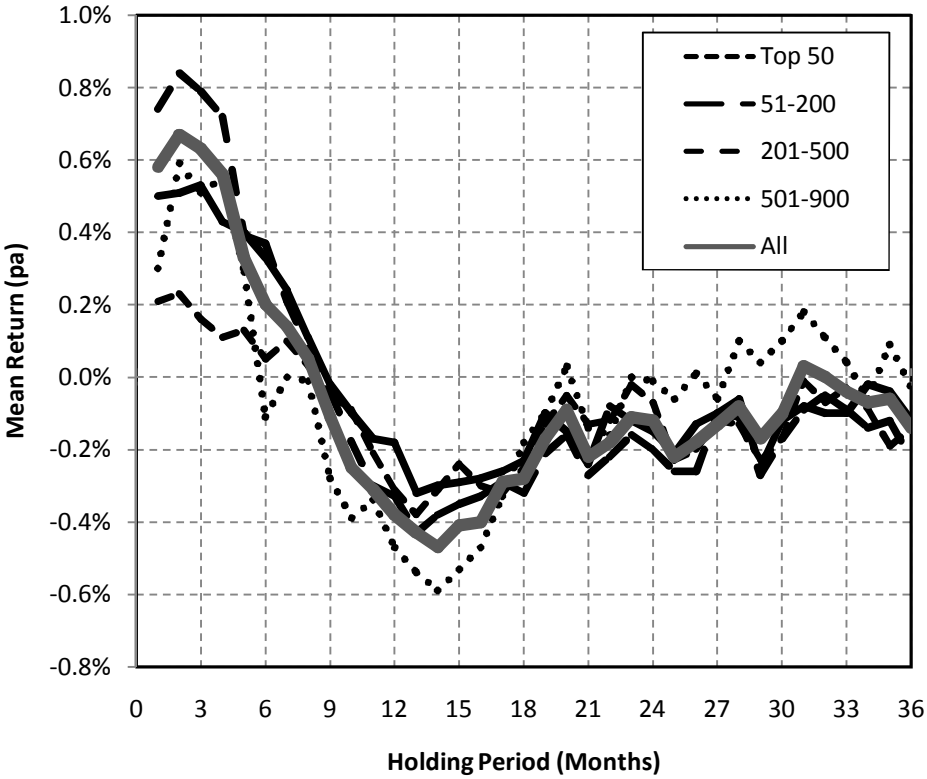

Figure 4 Mean monthly returns on a momentum portfolio formed by buying winners and shorting the equally weighted portfolio of all stocks within the size cohort (1973-2004).

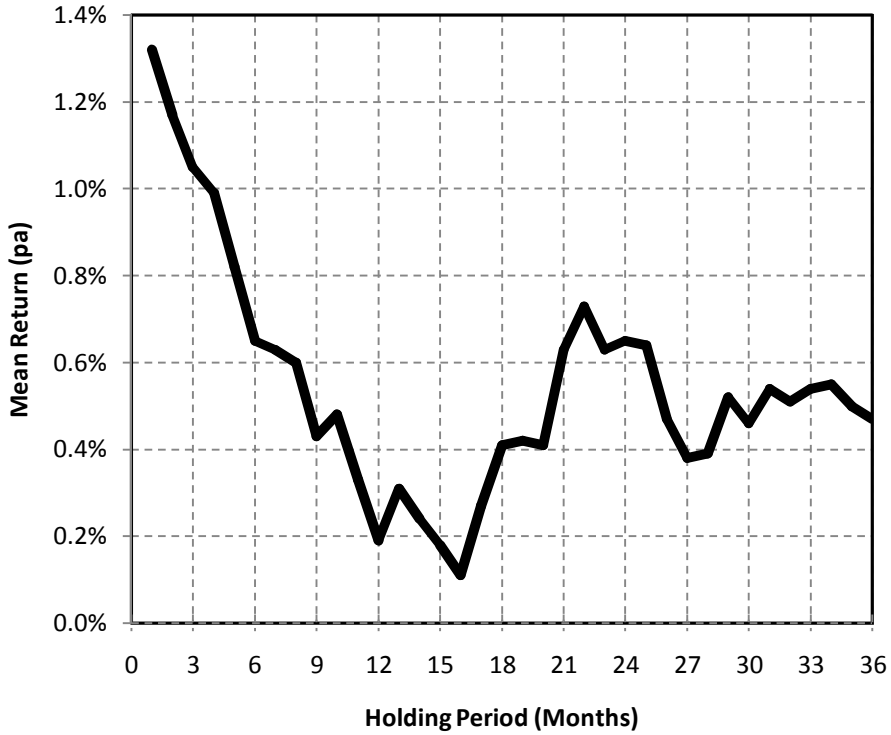

Figure 5 Mean monthly returns on a momentum portfolio formed from 9 size sorted portfolios (1973-2004).

Figure 4 demonstrates that the strategy of buying winners only still outperforms the relevant benchmark, proving the contention made earlier that the pattern of momentum profits is split evenly between winning and loosing stocks. In Figure 4 the momentum a portfolio of buying winners exhibits exactly the same pattern of profits as the full momentum strategy reported in Figures 1 – 3.

Given the apparent relationship between size cohorts and momentum evident in Figures 1 – 4, the returns to a momentum strategy based on size sorted portfolios were computed. The following procedure was used to construct size portfolios.

1. In each month the capital rank of the stock based on the last recorded price is assigned. It is also a requirement that the stock have a valid return in the previous month (so that prices at time *t* and *t-1* both exist). Table 2 reports the average number of stocks within size cohorts that pass this criterion in each time period.
2. Nine (9) portfolios were constructed from the ranked stocks spanning ranks from 1 – 900 in increments of 100.
3. The momentum strategy is implemented as described previously using the returns on the size portfolios. The strategy involves short selling the three worst performing portfolios of the previous six months and buying the three best performing portfolios.

It is important to emphasize that step 1 in the selection strategy is based on the trades observed in the month leading to portfolio formation and hence involves no sample selection. An easy trap to fall into is to form portfolios to only include stocks with observed current period returns (between t and t+1). The problem with the latter criterion is that it uses information not available at the time of portfolio formation and would potentially introduce sample selection bias into measured average returns. However, it also important to point out that the filter in step 1 also implies that implementing the portfolio returns reported on the figure 5 requires portfolio rebalancing in latter periods t+1, t+2, etc. (unlike the reported momentum strategies that freeze the portfolio at time t). For example to form a portfolio in period t+1 (for the

t+2 return), all stocks that did not trade between t and t+1 will have to be excluded from the portfolio. This difference is one potential explanation for the absence of contrarian profits above the horizon of one year.

The results are illustrated in Figure 5. The pattern of momentum profits is clearly evident and of comparable size to those reported when the analysis is conducted using individual stocks. This is a particularly interesting result as it demonstrates that momentum profits persist despite the reduction of cross-sectional variability to nine portfolios. This results suggests strongly that momentum is attributable to a systemic factor rather than to idiosyncratic variation in stock returns. It is also interesting to note that the momentum profits illustrated in Figure 5 exist over the entire spectrum of holding period returns. There is therefore no evidence at all to support a contrarian investment strategy in size portfolios.

Size Band	**Number of Stocks**
Top 100	97
100-200	98
200-300	96
300-400	94
400-500	92
500-600	89
600-700	87
700-800	83
800-900	76

Table 2 Average number of stocks by size cohort.

Finally, the pattern of momentum over time is illustrated in Figure 6 which shows the difference between the winners returns and losers returns as well as a 24 month moving average smoother. Momentum strongest in early 80s and late 90s and this trend continues in the early 2000s. Interestingly enough, this pattern is consistent with the conjecture that there is not a simple relationship between momentum profits and periods of strong economic growth.

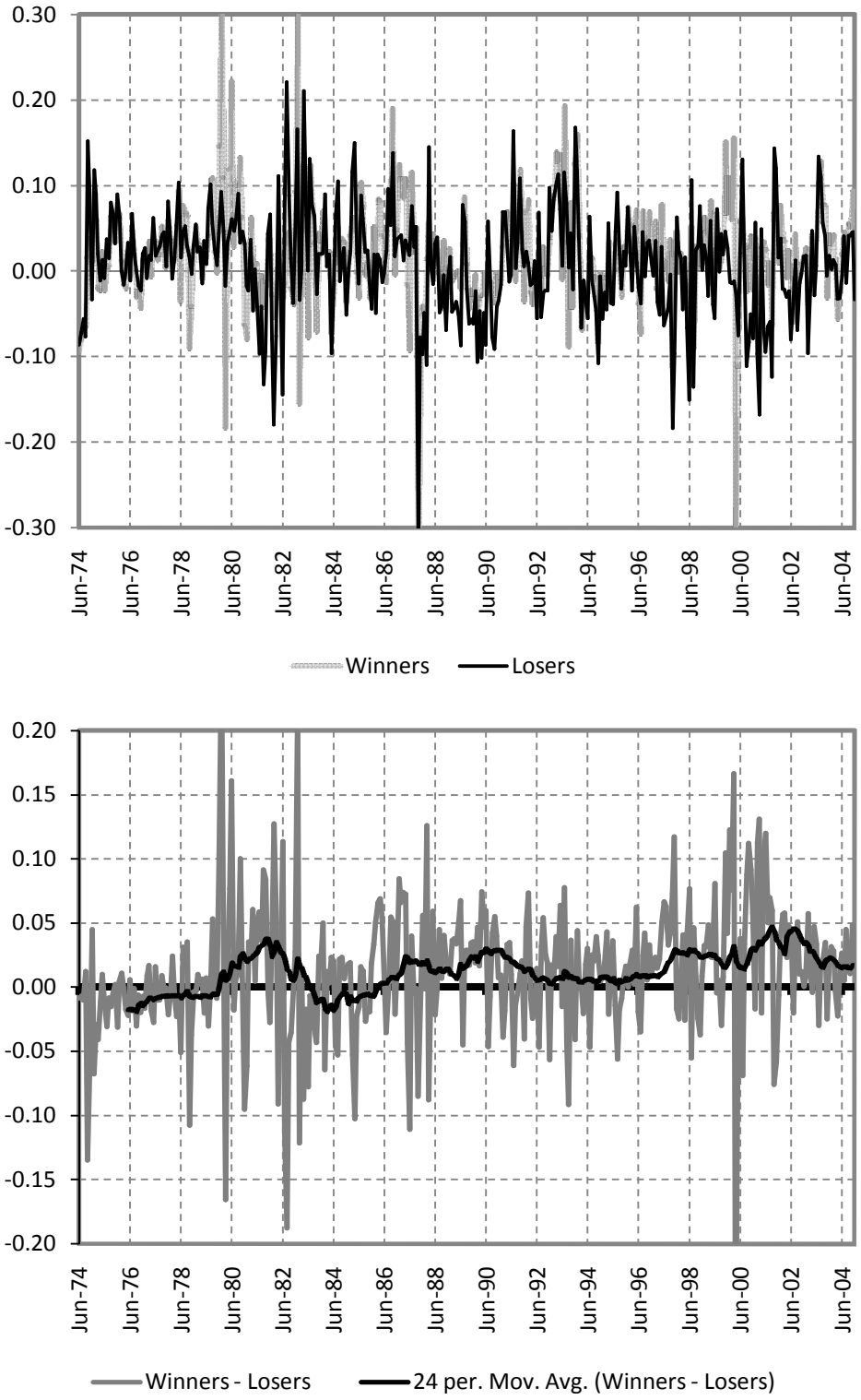

Figure 6 Monthly returns on the portfolios constructed from best performing (winners) and worst performing (losers) stocks (1974-2004).

5. CONCLUSION

The paper confirms the existence of short- to medium-term momentum in Australian stocks. The size of the momentum profits and the dynamics of the momentum profits are very similar to those reported in HP. Evidence is also presented that momentum is linked to size. It is clear that momentum has been strongest in the medium sized to smaller stocks (stocks whose capital rank is below 200). Furthermore, the strength of the momentum effect appears to vary over time with a preliminary conjecture being that momentum profits are not simply driven by strong economic growth.

Clearly there remains much to be done in this area. The emerging evidence of the size and time variability of returns to a momentum strategy need to be investigated in more detail. More important, however, there is a pressing need for a model of momentum to be developed which allows the rigorous testing of the statistical significance of the entire pattern of momentum profits in Australia.

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