Seasonality in Fund Performance: An Examination of the Portfolio Holdings and Trades of Investment Managers*

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This study examines the extent to which seasonal variation arises across calendar months in the performance of active Australian equity managers. While it is well documented that there is seasonality in equity market returns, it is unknown whether calendar month variation in managed fund performance exists. Employing a unique database of monthly stock holdings, we find evidence consistent with systematic variation in the risk-adjusted performance of active investment managers over the calendar year. Specifically, we find fund performance is higher in the months when corporate earnings are announced. We also document that the performance of fund managers is lower in the months preceding the tax year-end. Finally, we report evidence that investment manager performance is greater than normal in December, possibly due to both window dressing and the Christmas holiday effect. These findings have important implications for investors attempting to exploit anomalies in fund returns by timing their entry and exit points from active equity funds.

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1. INTRODUCTION

The funds management industry across most developed capital markets is economically significant and has grown rapidly over the past twenty years. In Australia, since 1990 the consolidated assets of funds under management have grown by over 300% from $145 billion to $700 billion as at March 2003.[1] Given the substantial growth in assets and the important stewardship role played by investment managers, fund manager performance has never before been as rigorously scrutinized as it is today. Reflecting the importance of fund managers is the growth in academic literature since Jensen (1968), which has been devoted to an examination of their performance (e.g., Elton, Gruber, Das and Hlavka (1993), Malkiel (1995), Gruber (1996), Carhart (1997) Daniel, Grinblatt, Titman and Wermers (1997) and Chen, Jegadeesh and Wermers (2000)).

A common feature most fund manager performance studies is that aggregate performance has been evaluated with respect to a single metric (e.g. alpha). As such, this implicitly assumes that investment manager returns do not vary across calendar months. However, there are a number of reasons, including those provided to explain seasonality in equity market returns, as to why the performance of fund managers may vary across calendar months. In this paper we develop these arguments and empirically test if there is monthly seasonality in fund performance.

If fund performance systematically varies across calendar months, then understanding the source of the phenomenon contributes both to our understanding of investment manager

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[1] In the US capital market a recent survey by the Investment Company Institute, a trade association of mutual fund companies, revealed that by year end 2000 there were almost 8,200 funds with net asset values totaling $6.97 trillion held in more than 240 million shareholder accounts. Further, $4 trillion of these assets were controlled by almost 4,400 separate investment companies composed exclusively of equity investments (2001 Mutual Fund Fact Book).

ability as well as behavioural characteristics in the management of portfolios. As a starting point, we employ some of the theories that have been proposed in order to explain the empirical evidence of seasonality in equity returns.[2] Under certain conditions, any seasonality in equity returns also implies a seasonality effect in the performance of investors who *cause* the equity return seasonality. Three well-documented explanations in the literature for seasonality are window dressing, holiday effects, and tax-loss selling. This leads to the prediction that tax-loss selling causes performance to be lower than normal in the month in which managers' engage in tax-loss selling behaviour, and that the holiday effect will lead to a manager's performance being higher than normal in the month prior to holiday period (i.e. December), and lower than normal in the month following the holiday period (i.e. January). We also predict the performance of the fund manager is greater than normal in months synchronised with earnings announcements.

We examine the calendar month performance of equity fund managers using a unique database of the monthly portfolio holdings of active investment managers. This database enables us to use the Daniel, Grinblatt, Titman and Wermers (1997) characteristic-based benchmark methodology to obtain estimates of the performance of fund managers for each calendar month. Prior mutual fund research has been unable to examine seasonality in performance due to unavailability of data with greater granularity. In general, prior researchers have only had available the net returns of mutual funds, or where they do have portfolio holding data it is only available at quarterly intervals (e.g. Chen, Jegadeesh and

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[1] There are a large number of studies which have provided evidence consistent with monthly seasonal patterns in equity returns. In the U.S. a number of papers have documented a January seasonal (Rozeff and Kinney (1976) Keim (1983)). In Australia a January effect has been documented by Officer (1975); Brown *et al.* (1983), Brailsford and Easton (1991), and more recently by Gaunt, Gray and McIvor (2000). There is also evidence of lower returns in the month of June (see Brailsford and Easton (1991) and Gaunt and Gray (2003)). Gaunt and Gray (2003) also report evidence of both large and significant negative autocorrelations in the month of July, consistent with tax-loss selling. This is found to be most pronounced across mid-cap and small-cap stocks.

Wermers (2000))[3]. The literature has therefore not been able to examine whether there is any variation in the performance of fund managers across calendar months.[4] In our study, using a database of monthly portfolio holdings, we are able to measure both gross performance and construct a benchmark of normal performance for each calendar month. This benchmark allows us to measure abnormal performance after controlling for calendar month variation in the gross performance due to the passive decision of holding stocks whose returns vary across time. This allows us to measure if there is any calendar month variation in the measured abnormal performance attributable to the fund managers' active trading and stock selection decisions.

Prior research has not directly examined variation in calendar month performance of mutual funds. However, closely related to our study is research that examines whether variation in the trading patterns of investors is associated with seasonality in equity returns. Examples of this research includes Gibson *et al.* (2000) who find some evidence (in the year following the change in the U.S. Tax Act legislation) of seasonal patterns in fund trading activity that is consistent with 'loser' stocks (prior to the tax year-end) being sold more rapidly than other stocks. Ng and Wang (2003) examine turn-of-the-year trading of U.S. institutional traders and find that sales of small 'loser' stocks in the last quarter of the year is most prominent, followed by institutions purchasing both 'winner' and 'loser' small stocks in the subsequent quarter. Ng and Wang (2003) conclude that institutional trading behaviour amongst small stocks contributes to the observed January effect. Carhart *et al.* (2002) find evidence

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[3] Examples of U.S. studies which examine mutual fund performance using quarterly data include Chen *et al.* (2000), Wermers (2000), Carhart *et al.* (2002) and Gibson *et al.* (2000)).

[4] While net return data is available at monthly intervals it is not possible from such data to construct benchmarks of normal performance for each individual calendar month. The benchmark of normal performance is constructed from a standard time-series factor regression estimated across all calendar months. Such regressions implicitly assume the benchmark to be constant across all individual calendar months and do not allow for seasonality in the benchmark for normal performance. It is therefore not possible to determine if any evidence of seasonality is due to the fund managers' activities, or as a result of variation in the benchmark.

consistent with quarter-end price inflation in stocks held by U.S. mutual funds, caused by managers engaging in aggressive trading strategies, such that a 'painting the tape' effect arises. Finally, utilising Finnish data, Grinblatt and Keloharju (2003) document that investors engage in tax-loss selling prior to tax-year end which is most pronounced in stocks experiencing the heaviest losses in the calendar year. Frino and Gallagher (2001) find evidence of a seasonal pattern in the tracking errors of S&P 500 index mutual funds. Taken together, these studies suggest there is seasonal variation in the performance of investors. This provides the motivation for this study to examine the existence of corresponding variation in performance with respect to periods in the year.

Our study reports the following results. First, our results are consistent with the risk-adjusted performance of active equity managers being significantly different across calendar months. Second, we confirm that the performance of equity fund managers is greater than normal in the months when corporate earnings are announced to the market. We also document that the performance of fund managers is lower in the month preceding the end of the tax year (i.e. 30 June). Finally, we find evidence that the equity fund performance is greater than normal in December, possibly due to window dressing and/or a 'holiday' effect. Overall, both the existence and magnitude of the variation in calendar month abnormal returns is consistent with there being seasonal variation in investment manager performance.

The results we find in relation to seasonality of fund performance have a number of implications. Firstly, at a practical level it provides potentially useful information to investors as to what period represents the best time to buy and sell units in managed fund products. Secondly, the evidence suggests that seasonality is a factor that contributes to variation in risk-adjusted performance (or managerial skill). This suggests seasonality should be controlled for as an improvement to mutual fund performance measures. This proposition is

further supported by conditional performance evaluation methodologies, such as those advocated by Chen and Knez (1996) and Ferson and Schadt (1996) who attempt to enhance performance measures by allowing for time variation in fund *risk*. Finally, our results provide some indirect support for some of the explanations identified as explanatory variables of seasonality in equity market returns.

This paper is structured as follows. Section 2 develops the research hypotheses examining seasonality in the performance of investment managers. Section 3 describes the portfolio holdings data and provides descriptive statistics. Section 4 outlines the research design employed and Section 5 presents the empirical results. The final section concludes the study.

2. THEORY AND HYPOTHESES

The main objective of this study is to examine if the risk-adjusted performance of active fund managers varies across calendar months and to present some stylised facts as to the average performance for each individual month. However, we also endeavour to provide some preliminary evidence as to why performance may vary over calendar months. In this section we develop some predictions as to why the average portfolio performance of fund managers may vary systematically across calendar months. For purposes of exposition, we attribute these as arising due to information and non-information based trading.

It is also important to recognise that there are likely to be a large number of reasons as to why the performance of the active fund manager may vary across calendar months. It is beyond the scope of this paper to investigate all possible reasons. Therefore, while we articulate specific hypotheses, we acknowledge that there are likely to be alternative explanations as to why the performance may vary over time.

2.1   *Information Motivated Trades*

A frequent assertion made in both the academic literature and financial press is that investment managers focus on short-term corporate earnings performance in their trading (see Porter 1992; Rajgopal and Venkatachalam 1998; Lang and McNichols 1997, Bushee 1998; 1999).[5] For example, McNichols and Trueman (1994) argue that an earnings public announcement will stimulate investment in the acquisition of private current-earnings information (relative to long-term earnings), as the investor can be sure their information will become reflected in prices.[6] This argument suggests active fund managers in any given period emphasize the prediction of current earnings.   The private information possessed by the investment manager can be impounded into prices in either (or both) the pre-announcement period or at the time of the announcement.[7] However, the performance effect is likely to be concentrated in earnings announcement months. This is because in the pre-announcement period, the point in time where the active fund manager's information for stocks i to N becomes impounded into price is likely to be randomly distributed over different pre-announcement calendar months.   As a consequence there will be no one month in the pre-announcement period in which there is a systematic effect. Accordingly, we hypothesise that

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[3] A simple argument can be put forward through relying on the basic principles of the limitations of arbitrage proposed by Shliefer and Vishny (1997) and the economic intuition of McNichols and Trueman (1994). It is argued by Shliefer and Vishny (1997) that the investment opportunities of an investor are limited to the type of private information expected to be impounded into price over the horizon the investor's performance is being assessed. It has been well documented empirically that a strong relationship exists between the inflow of new investment into a fund manager and the fund's most *recent* past performance (for examp le, see Ippolito (1992) and Sirri and Tufano (1998)). This suggests the performance of a fund manager is assessed over the short term. Given then a fund manager's compensation relates to her ability to maximize performance in the short-term, the fund manager will choose to acquire costly private information it anticipates will be impounded into prices in the short-term.   Current period earnings represents an information set which an investor can be certain will be impounded into price over a defined time horizon due to the mandated public announcement.

[4] Other papers examining the theoretical implications of investment horizons that end prior to the firm's liquidation reach similar conclusions, including Demski and Feltham (1994).

[5] It is well documented in the theoretical literature that if the anticipated earnings announcement stimulates private information search, the news may be completely pre-empted and revealed to the broader market by informed trade activity prior to announcement (see Kim and Verrecchia (1997)). This suggests the private information possessed by the fund manager can either be revealed to the market in the pre-announcement period or at the time of the announcement.

the performance of fund manager stockholdings in earnings announcement seasons is greater than the performance in normal months (H1).

2.2   *Liquidity Trading and Tax-Motivated Trades*

There are many reasons why an active investment manager may decide to engage in liquidity trading. These include trades motivated by unit holder fund flows and meeting taxation obligations. Liquidity trading is unlikely to be constant in terms of either volume or frequency across calendar months, given that exogenous determinants and market conditions cause portfolio managers to engage in portfolio turnover. Under certain conditions, systematic calendar month variation in liquidity trading will lead to a corresponding variation in the calendar month performance. We develop a number of predictions for such effects.

Three well-documented explanations for the seasonal returns in the US capital market at year-end are the tax-loss selling, window dressing and holiday effects.[8] The tax-loss selling hypothesis posits that heavy selling activity occurs around tax year-end for securities that have experienced price declines (i.e. 'loser' stocks). The motivation for this activity is that liquidating loser stocks leads to the manager matching realised capital gains against capital losses as a means of reducing tax liabilities.[9] At the commencement of the new tax year, investors typically reinvest in these same stocks leading to a reversal in stock price, and subsequently higher returns. In addition to engaging in strategies designed to improve an investors' after tax returns, Gibson, Safieddine and Titman (2000) also suggest that fund

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[8] The window dressing hypothesis posits that investment managers seek to present more respectable portfolios at year-end to impress both existing and prospective clients. This hypothesis is applicable in the U.S, where public reporting of stock holdings for mutual funds is required by the Securities and Exchange Commission (SEC) at semi-annual intervals. In Australia there is no legislated requirement for managers to publicly report their portfolio holdings. Therefore, the intuition underpinning the window dressing hypothesis may not be entirely applicable to Australian managers.

[6] Small stocks are more likely to be used as they are riskier in general so they have a high probability of price declines.

managers have other associated incentives to realize capital losses. First, the activity reduces the required cash distribution which needs to be paid to unit holders while also having the effect of minimizing the decrease in net asset values (NAVs) (from which management fees are determined). Second, a reduction in the required cash distribution to investors minimises the need to liquidate securities from the portfolio.

In Australia the tax year-end is 30 June. Under the condition that the trades of active fund managers are motivated by tax-loss selling in June and that this causes price pressure, it follows that the returns realized by the stocks that fund managers sell in June should be lower than in other calendar months.[10] This argument has empirical implications for the performance of both the portfolio holdings and trades of active fund managers which we state as hypotheses:

H2a   The performance of the active fund manager will be lower in June than in normal calendar months.

H2b   The active fund manager sells stocks in June at lower prices than the sell trades in normal calendar months.

We also predict that the performance of the fund manager may be greater (lower) than normal in December (January). This we suggest is due to the possible consequences of both window dressing and the holiday effect on the portfolio performance of active fund managers. The window dressing hypothesis posits that investment managers seek to present more respectable

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[7] Gibson, Safieddine, Titman propose because mutual funds in aggregate often hold a substantial fraction of a firm's actively traded shares, systematically buying or selling by funds over short-time horizons may exert price pressure. The evidence with respect to the existence of this price pressure condition is mixed. Sias and Starks (1997) examine the January effect. They examine whether this evidence of year-end price pressure is associated with individuals systematically selling losers before year-end for tax reasons or with institutions selling losers to window dress portfolios for clients. They find that individuals appear to be primarily responsible for the January effect. In addition, Gibson, Safieddine and Titman (2000) find no evidence of the tax motivated trades of fund managers having a price-pressure effect.

portfolios at year-end to impress both existing and future clients. This hypothesis was developed for fund managers in the U.S., where public reporting of stock holdings is required by the Securities and Exchange Commission (SEC) on a quarterly basis. In Australia there is no legislated requirement for managers to report their portfolio holdings. However, it is industry practice for fund managers to provide their portfolio holdings to both asset consultants and their largest wholesale clients. Therefore, the intuition underpinning the window dressing hypothesis may be applicable in Australia, although the effect may not be as strong as in the U.S. Under the condition that investment managers engage in window dressing, this implies portfolio performance in the following month may be lower than normal. This is because the action of window dressing inflates prices in the window dressing month, leading to abnormally high performance in December, which return to their equilibrium levels in the following month. Indeed, the U.S evidence shows that mutual funds earn significantly higher abnormal returns in December than any other month in the calendar, (see Wermers, 2000; Moskowitz, 2000). However, Moskowitz (2000) also speculates that window dressing, tax trading, or other agency issues explain the December phenomenon as a spurious occurrence.

An alternative hypothesis for abnormal monthly performance at year-end is the holiday effect. The literature has identified holiday anomalies across global equity markets, consistent with abnormal returns arising on days immediately prior to holidays (see Lakonishok and Smidt, 1988; Ariel, 1990; Cadsby and Ratner, 1992; Kim and Park, 1994; Meneu and Pardo, 2003). One of the explanations put forward for the holiday effect is the abnormally high number of trades undertaken by institutional investors prior to going on holidays. In Australia a number of holidays are concentrated at December month end and the first week of January. Specifically, the formal public holidays are Christmas Day (25th), Boxing Day (26th) and New Years Day (1st). In addition it is industry practice for the period between Boxing Day and

New Years day to be taken as holidays. If the holiday effect influences the trading behaviour of fund managers then this may cause them to engage in significant portfolio re-configuration prior to year-end. This may artificially inflate the December prices for the stocks they hold and buy. This implies portfolio performance in December may be greater than normal and lower than normal in the following month as prices return to their equilibrium levels in January.

In sum, both portfolio window dressing and the effect of the Christmas holiday period have the same two empirical implications for the portfolio performance of fund managers. We state these as hypotheses:

H3a   The fund managers purchase stocks in the month of December at prices that are greater than the buy trades in other calendar months.

H3b   The performance of the fund manager is lower in January than in normal calendar months

3. DATA

Our data consists of the month-end portfolio holdings for 35 active Australian investment managers in the period January 1990 to December 1997. We examine the portfolio holdings of fund manager investment products with the same objective – to outperform the ASX All Ordinaries Accumulation Index. The portfolio holdings data comprises information for active funds with data records comprising between 24 and 72 months. The data was obtained from two sources – a collaborative project between The University of Melbourne and the *Australian Investment Managers' Association* (AIMA) as well as portfolio holdings data from

the Frank Russell Company.[11] The two datasets were then merged to create an aggregated database which is employed in this research. This was achieved by designating the AIMA/University of Melbourne sourced portfolio holdings database as the primary dataset, and the Frank Russell Company data was then used to cross-check those funds within both databases.[12] For those investment managers not represented in the AIMA dataset, the calendar month portfolio holdings from the Frank Russell Company dataset were added to the data employed in this study.[13]

The active equity funds represented in the sample are 'flagship' investment vehicles for each of the major investment institutions offering services to institutional investors. The 'flagship' fund is representative of the overall manager's suite of investment products in the sector, and is typically the largest unit trust vehicle available to investors. While some of the investment managers did not provide data, the sample of managers remains highly representative of the overall market in the period.

INSERT TABLE 1 HERE

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[8] AIMA was an industry association that represented the Australian institutional investors. AIMA is now defunct and has been replaced by a representative body for the retail and wholesale funds management and life insurance industries called the Investment and Financial Services Association (IFSA). IFSA was formed in January 1998 as a consequence of the merger of three industry bodies: The Australian Investment Managers' Association (AIMA), the Investment Funds Association of Australia (IFA) and the Life Investment and Superannuation Association.

[9] The portfolio holding data sourced from the AIMA/University Melbourne collaborative project were treated as the primary dataset as the data was input from the original complete portfolio records extracted directly from the fund managers recording system. We could therefore be sure of the reliability of the data. Frank Russell Company maintains its own database of portfolio holdings, which it obtains directly from fund managers. While we had no reason to doubt the integrity of the data, as we did not control the establishment of this database it was treated as a secondary source.

[10] The final dataset comprised the portfolio holdings of 21 investment managers sourced from the AIMA/University of Melbourne and 14 fund managers from Frank Russell Company.

Table 1 shows the number of fund managers in both the sample and population in each calendar year between 1990 and 1997.[14] The sample provides 72 percent coverage (on average) of the investment manager universe over the period examined, and also reveals the extent of concentration in the Australian investment management industry. Table 1 records the aggregate dollar value of fund manager equity holdings over the sample period and documents that a large proportion of the total value of assets held by the investment managers are represented in our sample. Given the Australian investment industry is significantly smaller than the larger global markets of the U.S., Japan and U.K., the study is indeed representative of the total Australian market.

The study also employs Signal G earnings announcement information for Australian Stock Exchange (ASX) listed securities, and this data was provided by SIRCA.

4. RESEARCH DESIGN

In this paper we examine the performance of each fund manager j using two distinct units of observation; stockholdings and trades. An examination of the performance of stockholdings measures the performance return on each stock i held in the fund manager's portfolio as at each month end t. The objective of using this unit of observation is to determine if the portfolio performance of the fund manager varies as hypothesised across calendar months. We use the risk-adjusted return to stockholdings as our measure of the portfolio performance of the fund manager rather than the risk-adjusted net returns.

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[11] The population represents Australian equity fund management products with objective to outperform the ASX All Ordinaries Accumulation Index.

While net return data is available at monthly intervals, it is not possible from such data to construct benchmarks of normal performance for each individual calendar month. This is because time-series factor regressions have to be used to construct the benchmark. More specifically, such regressions implicitly assume the benchmark to be constant across all individual calendar months and do not allow for seasonality in the benchmark for normal performance. It is therefore not possible to determine if any evidence of seasonality is due to the fund managers' activities, or as a result of variation in the benchmark. In addition it has also been well documented that time-series factor regressions result in biased and inefficient estimates of a fund's performance.[15]

We also examine the abnormal performance of the stocks a fund manager trades. Specifically, the stocks they buy or sell. The motivation for this unit of observation is to examine if any identified seasonality in the performance of holdings is also identifiable in the trade portfolio hypothesized to cause the performance seasonality. The performance of the trade portfolios therefore acts as a robustness measure to guard against spurious results, alleviating to some extent the possibility that any identified seasonality is simply due to data mining. In addition, the trade portfolios may also have more power than holding to detect seasonality in performance.

4.1   Performance of Portfolio Holdings

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[15] The reasons put forward in the literature (see DGTW (1997) and Choi (2000) for a concise summary) are as follows. First, the difficulty with interpreting the alpha's from factor-model regressions is that estimated alphas and betas are biased when factor loadings are correlated with factor realizations (see also Grinblatt *et al.* (1995)). Second, when only the net fund return is available, the characterization of the style used by the fund manager in choosing stocks is imprecise, resulting in imprecise benchmarks to control for that style. Third, factor-model regressions restrict the relationship between expected returns and stock characteristics to be linear, which Lyon, Barber and Tsai (1998) argue is inappropriate. Fourth, the methodology of factor regressions assumes no interaction between factors, an assumption which Loughran (1997) shows is inappropriate.

An examination of the performance of stockholdings measures the abnormal return in month t on each stock i held in the fund manager's portfolio as at each month end t-1. The portfolio performance of fund j at time t is then simply the value or equal weighted abnormal return performance of all stocks held in month t-1. To measure the monthly abnormal *performance* of the stocks held in a fund manager's portfolio we use the Daniel, Grinblatt, Titman and Wermers 1997 (DGTW) Characteristic-Matching Performance Measure. The DGTW (1997) approach measures fund performance by comparing the actual return of each stock held against an expected return, given by a benchmark portfolio matched to the stock on the basis of size, book-to-market ratio and momentum characteristics.[16] The difference between the stock's actual return and the return of the matching benchmark portfolio is the stock's abnormal return.

It is important to understand that the DGTW benchmark matches the gross performance of fund manager j in month t with the benchmark performance of a similar portfolio of stocks in month t. If the returns of stocks varies across calendar months, for example due to seasonality in equity returns, then so will the benchmark. Therefore because we have a benchmark of normal performance that controls for equity market seasonality, any variations in the measured abnormal performance is attributable to the fund managers active trading and stock selection decisions (and not due to the passive decision of holding stocks whose returns vary across time).

We construct the DGTW performance measure as follows. Each stock held by the fund manager in each month is matched to a benchmark portfolio according to its size, book-to-

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[13] DGTW matched on these characteristics because past research has shown that these are the best ex-ante predictors of cross-sectional patterns in common stock returns. See Fama and French (1993, 1996), Jegadeesh and Titman (1993), and Daniel *et al.* (1997). Evidence consistent with Fama and French (1993) has been presented for the Australian equity market by Halliwell, Heaney and Sawicki (1999). Evidence consistent with momentum in the Australian capital market, similar to that of Jegadeesh and Titman (1993), has been reported by Gaunt and Gray (2003).

market rank and momentum rank. The abnormal return of a particular stock is calculated by subtracting the benchmark-matched portfolio return from the stock's return.[17] These differed returns are then multiplied by the portfolio weights of the fund to obtain the abnormal or benchmark-adjusted returns for each of the funds for each month. The month t component of the DGTW measure for fund manager j is defined as:

$$DGTW_{jt} = \sum_{i=1}^{N} \tilde{w}_{i,t-1}(\tilde{R}_{i,t} - \tilde{R}_t^{bi,t-1})$$ (1)

where $w_{i,t-1}$ is the portfolio weight for stock i at the end of month $t-1$, $R_{i,t}$ is the month t return of stock i and $R_t^{bi,t-1}$ is the month t return of the characteristic based passive portfolio that is matched to stock i during month $t-1$. This metric represents a performance measure for the portfolio of holdings as of each month-end for the following month. As an example, for portfolio holdings at 31 March, the performance estimates represents the abnormal return on the stocks in the month of April.

The weight of security i in the portfolio of fund manager j at time t is measured as:

$$W_{ijt} = \frac{P_{it} H_{ijt}}{\sum_{i=1}^{N} P_{it} H_{ijt}}$$ (2)

where P_{it} is the price of stock i at time t, and H_{ijt} is the number of shares held by fund manager j in stock i at time t.

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[14] The size, book-to-market, and momentum benchmark based portfolios are constructed as follows. Commencing in December 1989 and each following December 31, each stock in the AGSM Price Relative File that satisfied the data requirements, is placed into size, book-to-market and momentum portfolios. The composition of each portfolio is determined by each December sorting the universe of stocks into quintiles based on each firm's market value of equity. Firms in each size quintile are then sorted into quartiles based on their book-to-market ratio. Finally, firms in each of the 20 size/book-to-market portfolios are sorted into a further three portfolios based on their preceding twelve month return, calculated through to the end of November. This gives a total of 60 portfolios sorted by size, book-to-market and momentum.

In the U.S., only data relating to the ordinary shareholdings of fund managers are available and therefore the computation of the above metrics is straightforward. However in Australia, in addition to obtaining exposure to the performance of a stock through ordinary shares, some fund managers also utilize exchange-traded options. Therefore, to compute the weight of security i in fund manager j's portfolio we need to aggregate all the option contracts held at time t for stock i into an equivalent holding of ordinary shares. To determine the number of ordinary shares that must be bought or sold in order to achieve the same exposure to a small movement in the share price given the option contracts held, we compute the delta for each option contract held following Pinnuck (2003).[18] Using the delta we will thus replace each actual option position for a company in the portfolio (which may for example consist of several long and short positions in puts and calls) with an instantaneously equivalent position of the underlying ordinary shares.

Employing the DGTW (1997) measure we compute a performance measure for each fund manager j for each month t. For each fund manager, the time-series average, over all the specific calendar months that a fund exists, gives the DGTW measure for that fund for that calendar month. We thus have a sample for performance estimates for each fund manager for all of the twelve calendar months. To arrive at the average performance of active fund managers for any one month, we compute parameters and t-statistics based on the cross-sectional distribution of performance results for the fund managers in the sample.

4.2 Performance of Trades

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[15] An option's delta measures the sensitivity of the option price to changes in the stock price. Thus, the use of a stock equivalent position, defined as 1/(options).

We also examine the seasonal performance of each fund manager j using trades as a unit of observation by inferring trades from monthly changes in stock holdings. We measure $Trade_{itj}$ as the change in the weight of stock i from the beginning to the end of month t in fund manager j's portfolio:

$$Trade_{ijt} = w_{ijt} - w_{ijt-1}^{pt} \qquad (3)$$

where w_{ijt} is as defined by (2) and w_{ijt-1}^{pt} is defined as:

$$W_{ijt-1}^{pt} = \frac{P_{it}H_{ijt-1}}{\sum_{i=1}^{N} P_{it}H_{ijt-1}} \qquad (4)$$

where the weights at time $t-1$ given by (4) reflect the portfolio holdings at $t-1$ which are evaluated at the same end-of-month prices as weight w_{ijt}. The $Trade$ metric in equation (3) therefore measures the difference between two time-dependent portfolios (i.e. at t and $t-1$), which are evaluated at the same end-of-month prices. Therefore w_{ijt} differs from w_{ijt-1} only because of trading from $t-1$ to t. Intuitively, the latter value is the value of the starting portfolio if no trading arose during the month.[19]

We categorise these trades as either purchases or sales (where "purchase" stocks are all stocks with a positive $Trade$ measure). We then construct either equal-weighted "purchase" and "sale" portfolios. The performance of these trade portfolios is then measured using the DGTW approach as previously described for stock holdings.

4.3 Testing for the Significance of a Seasonality Effect

Both holdings w_{ijt} and w_{ijt-1} are evaluated at the same prices so that there are no spurious price change effects, allowing us to separate trades from price momentum effects.

To test the hypothesis we need a benchmark of normal monthly performance. We employ as a benchmark, for the hypothesized month, the average performance across all other months. For example, to test for a seasonality effect in June, we compare the performance of the fund manager in June to the average performance across all other 11 months in the calendar year.

To test the earnings hypothesis we need to define the earnings announcement months. In Australia, companies are required to report earnings on a half-yearly basis. Most companies have a year end of either 30 June or 31 December. As companies are required to report within 75 days of half-year end this implies most companies announce their earnings to the stock market in the months of February, March, August and September.

To provide empirical support for the above, we examine the distribution on an equal-weighted basis of earnings announcement months for the stocks held by fund managers to determine whether they are concentrated in August/September and February/March. We obtain the earnings announcement dates for stocks held from SIRCA. The results show that 82% of the stocks held by the fund managers announced their earnings in the predicted months.

5. EMPIRICAL RESULTS

We begin by examining fund performance using the portfolio holdings of managers and in the following section we study the performance of equity fund manager trades. We first consider the average performance of the sample of fund managers across *all* calendar months. We then determine if equity fund performance varies across calendar months in accordance with the hypotheses outlined in Section 2.

5.1 Portfolio Holdings

This section discusses the results of the performance evaluation methods set out above applied to the holdings of fund managers. Table 2 presents performance results using the DGTW (1997) measure for an equally weighted sample of fund managers. The Table presents the average performance across all calendar months and the performance results for each individual calendar month. We report results for both value and equal weighted portfolio holdings.

INSERT TABLE 2 and FIGURE 1 HERE

The results show, on average across all calendar months, the value but not equal-weighted holdings realize significant positive abnormal returns in the first month after the holding measurement date. This result is consistent with the most recent mutual fund performance research, which shows the stockholdings of mutual funds realize abnormal returns (see e.g., Daniel, Grinblatt, Titman and Wermers (1997) and Chen, Jegadeesh and Wermers (2000)).

We now examine whether, as hypothesized, the performance of fund managers varies across calendar months. The performance results reported in Table 2 for each calendar month represent the abnormal return realized in that month on a portfolio formed in the prior month. As an example the reported performance for January represents the abnormal return on the December month end stockholdings. The F-test rejects the null of equality of mean performance across calendar months for both the value and equal weighted portfolios.

Reviewing the individual monthly results and the graph in Figure 1 the following observations can be made. The best performing months for a value-weighted portfolio are August, September and December and the worst performing month is January. The results for an equal weighted portfolio also suggest the best performing months are August, September and December. However the worst performing month is June. Taken together the results

suggest the performance of active fund managers systematically varies across calendar months. To provide some insight into the reasons why the performance may vary we now turn to an examination of specific hypotheses.

We begin with an examination of the performance of the portfolio of value-weighted holdings. The benchmark for normal monthly performance is the average of all months other than the month directly examined. The reported performance of fund managers in the earnings announcement months is the average performance across the months of August/September and February/March. The results are reported in Panels A and B of Table 3. The results for June, July and the earnings announcement months show that the performance of the fund manager in these months is not significantly different from normal months. In contrast the performance of the fund manager is greater than normal in December and lower than normal in January. This result is consistent with the window dressing hypothesis at calendar year end.

INSERT TABLE 3 HERE

A value-weighted portfolio gives greater weight to large rather than small stocks. We expect, however, that any evidence of seasonality will be much more evident in small rather than large stocks. This is because, in relation to the earnings hypothesis, any private information the fund manager has in relation to large stocks is most likely to be revealed to the public prior to announcement. However for small stocks disclosure prior to announcement is much less likely. Therefore, earnings seasonality is likely to be much more evident for small than large stocks. In relation to the tax-loss selling hypothesis, the literature has argued that tax-loss selling more likely applies to small rather than large stocks (see Ng and Wang 2003). This is because small stocks, due to higher risk, are more likely to be losers. The same intuition would also apply to the window dressing hypothesis.

21

The above arguments suggest any evidence of seasonality in fund performance should be much stronger for smaller than large stocks. Providing some support for this argument is the evidence of seasonality in equity returns which has mostly been found in respect of small but not large stocks.[20] To operationalise this argument in a manner that avoids an arbitrary definition of small we examine the performance of an equal weighted portfolio.

Panels C and D of Table 3 presents the results for test of the hypotheses for equally weighted holdings. The results support both hypothesis H1 and H2. Specifically, as predicted by H1, the fund managers perform better than normal in the months in which the earnings announcements are concentrated (August/September and February/March). Also, as predicted by H2, the performance of the fund manager is lower in June than normal months. This result is consistent with the tax-loss selling hypothesis that fund managers are selling stocks at lower than normal prices. Consistent with a window dressing and holiday hypothesis, the results show the performance of the fund manager is greater in December than other months. However, this hypothesis is not supported by the results for January. The performance of the fund manager in this month is not significantly different from normal months.

5.2   Trades

The previous section, using portfolio holdings as the unit of observation, presented preliminary evidence consistent with seasonality in the performance of the active equity manager attributable to tax-loss selling, earnings and possibly window dressing. In this section we use stock trades as the unit of observation in order to both give robustness to the

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[20] Keim (1983)) reports that the January effect is most pronounced for small-cap stocks. Brown *et al.* (1983) also finds the seasonal effect is most pronounced for small-cap stocks in the Australian capital market.

results and also to potentially enable more powerful tests of the seasonality hypotheses related to investment manager activity.

INSERT TABLE 4 HERE

Table 4 presents performance results using the DGTW (1997) measure for an equally weighted sample of fund managers. The Table presents, for buy and sell trades, the performance results for each individual calendar month. The performance of these trade portfolios is measured over the same month as the trade (i.e., for trades in June the performance represents the abnormal returns realized in June). The F-test rejects the null of equality of mean performance across calendar months for all portfolios.

We now examine each of the specific hypotheses. The hypotheses examine the abnormal returns realized by the trade portfolio in the same month as the trade. We define the results for this test as the current month performance of the trade portfolios. Consistent with the prior section, we use as a benchmark for normal performance the average performance across all months other than the month being examined.

As a robustness measure we also measure the performance of the trade portfolios in the next month (i.e., for the sell trades in June we measure the abnormal returns realized in the month of July). We will refer to this performance measure as the next month's performance. We use as a benchmark the average of next month performance of all months other than the month being tested.

5.2.1 Tax Loss Selling

Table 5 (Panel A) presents the results for test of the hypothesis using the current month's performance of a portfolio equal weighted buy and sell trades. The performance results for the

June sells provide support for the tax-loss selling hypothesis. As predicted the mean and median performance of the June sells is significantly lower than normal months (at the 10 and 1 percent levels respectively).

INSERT TABLE 5 HERE

We consider two robustness tests for this result. Our first test has as its underlying premise that if the prices of stocks fund managers sell in June are abnormally low then they may revert to their normal level in July. To this test this we examine if the next months performance of the June sells is greater than the next months performance of sell trades in other months. The results, reported in Table 5 (Panel B), show there is no significant difference in next months performance of June sell trades and sell trades in other months.

We therefore consider an alternative and potentially more powerful robustness measure. For the tax selling hypotheses to hold then it should only be those stocks that fund manager are selling for tax reasons that should have lower than normal returns. This observation provides the premise for the following robustness test. We divide the sell trades in June into two portfolios being those stocks that fund managers are most likely to be selling for tax reasons (the "tax sell trades") and those sell trades which are motivated by reasons other than tax–loss activity ("normal sell trades").

The tax sell trades are those stocks which the fund manager most likely would have had an unrealized loss position as at the end of May. To identify these stocks, we calculate, for those stocks sold in June, the buy and hold return over the 12 months ending 31 May. We define tax-sell trades to be those stocks sold in June which were in the bottom two thirds of the distribution of stocks sold with negative returns over the past 12 months. The normal sell trades are those stocks sold in June, which had positive returns over the past 12 months. We then examine whether the mean return of the tax sell portfolio is lower than the mean return of

the normal sell trades in June. The results, reported in Table 6, show the mean return of the tax sell trades is significantly lower than that of the other sell trades thus supporting the tax selling hypothesis.

<div align="center">INSERT TABLE 6 HERE</div>

5.2.2   Portfolio Window Dressing and Holiday Effect

The results in Table 5 (Panel A) show the performance of the December Buys is significantly greater than normal calendar months. This is consistent with the results for stockholdings. These results are consistent with a window dressing hypothesis at December year-end. Providing some further support for this hypothesis is the performance results for the portfolio of December buys in the next period which are significantly lower than normal. This is consistent with the prices of those stocks fund managers buy in December reverting to their normal levels in January. These results are reported in Table 5 (Panel B).

5.2.3   Earnings Announcements and Seasonality

As a robustness test for seasonality in performance due to earnings we directly examine if the cause of the higher than normal performance of fund managers in August/September and February/March can be attributed to stocks making earnings announcements. We approach this by classifying the stocks held by the fund manager in August/September and February/March into two groups according to whether they announced their earnings in these months or other months. If earnings explain fund seasonality, then the performance in August/September and February/March of the earnings announcement stocks should be greater than the non-earnings announcement stocks. The results are reported in Table 7. The results show that in the months August/September and February/March the stocks that announce their earnings to the market outperform other stocks.

<div align="center">INSERT TABLE 7 HERE</div>

5.2.4   Seasonality by Investment Style

It is possible the seasonality in fund manager performance could vary across fund managers according to the investment style that they follow. To examine this, we identified those fund managers which follow a growth style and those which follow a value style. We then examined if the performance of value and growth funds differed between individual calendar months. The performance for each fund was measured using a portfolio of equal-weighted holdings. Of the twelve months we find only one month in which there is a significant difference between value and growth funds.[21] Therefore we can conclude that, on average, there is no significant difference in calendar month performance or seasonality between fund styles. It needs to be recognized that a potential reason for this finding is the small number of fund managers in each category. Therefore, due to the low power of the test, it is unlikely we are able to identify any significant differences even if they do exist.

6. CONCLUSION

This study examines the extent to which there is seasonal variation across calendar months in the performance of Australian equity fund managers. Employing a unique database of monthly portfolio holdings we examine risk-adjusted performance using characteristic-based benchmarks at more frequent intervals than unconditional and conditional regression-based analyses of investment performance. We find results consistent with the performance of active Australian investment managers being significantly different across calendar months. Specifically, the performance of active managers is greater than normal in the months when earnings are typically announced and lower in the months preceding the end of the tax year. In addition, we find evidence that the performance of fund managers is greater than normal in

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[21] This was in November where value funds outperformed growth funds.

December, possibly due to the effect of portfolio window dressing and/or the holiday effect coinciding with the turn-of-the-year.

It is important to recognise that while we have found results consistent with the performance of the fund manager varying across calendar months, we have only provided some preliminary evidence as to *why* the performance may vary. As the evidence in relation to why the performance may vary is preliminary, future research should examine in more detail alternative explanations for the calendar month variation in monthly performance. This also includes seasonality which relates to recession versus non-recession economic periods.

Notwithstanding this limitation, the results from this study have a number of implications. At a practical level, the results are important as they provide potentially useful information to investors regarding the best time to buy and sell units in fund management investment products. At a more academic level, evidence of the existence of seasonality provides insight into the factors that contribute to variation in fund performance. In addition, the existence of seasonality suggests the power of empirical tests designed to measure fund performance could be improved by controlling for this variation. Finally, an examination of seasonality in fund performance provides an alternate test to the existing approaches examining the drivers of seasonality in equity market returns.

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TABLE 1

Sample and Population of Equity Fund Managers in Australia

Year	Population		Sample		Sample as % of Population	
	No. of Funds	Aggregate TNA ($Mill)	No. of Funds	Aggregate TNA ($Mill)	No. of Funds (%)	Aggregate TNA (%)
1990	22	760	14	507	63	67
1991	23	1,258	15	898	65	71
1992	24	1,394	17	1002	71	71
1993	28	2,350	19	1873	68	79
1994	37	2,598	32	2154	86	82
1995	40	3,053	35	2745	87	89
1996	43	4,435	35	3853	81	86
1997	48	4,401	28	2904	58	66

The table shows the number of active equity funds in both the sample and the Australian population over the period from 1990 to 1997 as at 31 January each year. The population is active Australian equity fund managers. The table also shows the dollar amount of total net assets (TNA) in $AUD million.

TABLE 2
Calendar Month Performance of Portfolio Holdings

All Months	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	F-statistic
Panel A: Equal Weighted Holdings													
0.0088	-0.1810	-0.2680	0.1690	0.2517	-0.3290	-0.4990	-0.0270	0.5576	0.3093	-0.3710	-0.4300	0.7010	
0.26	-1.77	-1.84	1.60	2.97**	-3.41**	-6.49**	-0.18	4.06**	2.81**	-2.41*	-4.95**	7.12**	11.97**
Panel B: Value Weighted Holdings													
0.1393	-0.3900	-0.0520	0.0320	0.5170	-0.0840	0.1190	0.1510	0.3430	0.3640	0.0450	0.1400	0.5050	
4.55**	-4.03**	-0.70	0.35	5.81**	-1.20	1.37	1.79	3.46**	3.02	0.43	1.50	7.05**	8.11**

The table reports the performance of fund managers for each individual calendar month performance and the average performance across all months. The reported performance in each month is the abnormal returns realized on a portfolio of stocks formed in the prior month. For example the June performance is based on the returns realized in June by the May 31 portfolio holdings. Significance levels for t-statistics are ** and * indicate significance at the 1% level (two tail) and 5% level (two tail) respectively. Performance is reported in percentage per month.

TABLE 3
Seasonal Performance of Equity Portfolio Holdings

	Earn	June	July	January	December
Value-Weighted Holdings					
Panel A : Mean					
Mean	0.1734	0.1193	0.1507	-0.3900	0.5046
Benchmark	0.1333	0.0692	0.0692	0.2113	0.0369
Difference	0.0401	0.0501	0.0815	-0.6013	0.4677
t-statistic	0.60	0.47	0.77	-5.97**	4.51**
Panel B: Median					
Median	0.0390	0.0714	0.2310	-0.2952	0.5290
Benchmark	0.1210	0.0387	0.0387	0.2250	0.0301
Difference	-0.0820	0.0327	0.1923	-0.5202	0.4989
t-statistic	0.39	0.45	1.07	-6.02**	4.76**
Equal-Weighted Holdings					
Panel C: Mean					
Mean	0.1950	-0.4988	-0.0266	-0.1809	0.7020
Benchmark	-0.0011	0.0367	-0.0061	0.0083	-0.0740
Difference	0.1961	-0.5355	-0.0205	-0.1892	0.7760
t-statistic	3.83**	-3.98**	-0.15	-1.40	5.95**
Panel D: Median					
Median	0.1429	-0.4891	-0.0663	-0.1871	0.6909
Benchmark	-0.1086	0.0413	-0.0097	0.0117	-0.0008
Difference	0.2515	-0.5304	-0.0566	-0.1988	0.6917
t-statistic	4.25**	-4.10**	0.18	1.65	6.15**

The table reports the calendar month performance of equity portfolio holdings for months where there is predicted to be a seasonal effect. Portfolio holdings performance is examined using both value-weighted holdings (Panels A and B) and equal-weighted holdings (Panels C and D). The reported performance in each month is based on a portfolio of stocks formed in the prior month. The June performance is based on the returns realized in June by the May 31 portfolio holdings. The July performance is based on the return realized in July by the June 30 holdings. The benchmark is all those months other than the one being tested. Significance levels for *t*-statistics are ** and * indicate significance at the 1% level (two tail) and 5% level (two tail) respectively.

TABLE 4
Calendar Month Performance of Trades (Equal Weighted)

Current Returns on Trade Portfolio

	Jan	Feb	Mar	April	May	June	Jul	Aug	Sep	Oct	Nov	Dec	F-statistic
Buys	0.3045	-0.1110	0.1998	0.0893	-0.0860	-0.5840	-0.0190	0.5571	0.3428	-0.5250	-0.1240	0.9029	
t-statistics	0.86	-0.64	1.09	0.48	-0.36	-2.36*	-0.10	2.43*	1.12	-2.42	-0.61*	4.14**	3.28**
Sells	0.3832	-0.1320	0.8071	0.8137	-0.0510	-0.0660	0.8919	0.8351	0.6777	0.1934	-0.3050	0.5143	
t-statistics	1.22	-0.74	3.55**	5.08**	-0.25	-0.34	2.22*	4.58**	3.12**	0.55	-1.73	2.95**	3.23**

Results for trades of fund managers equal-weighted, based on cross-sectional distribution of the sample group. The Table reports the performance in the same month as the trades.
For example the June sell performance is the abnormal return in the month of June on the June sells. Significance levels for t-statistics are ** and * indicate significance at the
1% level (two tail) and 5% level (two tail) respectively. Returns are reported as percentage per month.

<div align="center">

TABLE 5

Performance of Trade Portfolios

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Panel A: Current Month Performance

	June Sells	Dec Buys	Dec Sells
Mean	-0.0630	0.9020	0.5143
Benchmark	0.4193	0.0030	0.3664
Difference	-0.4850	0.8900	0.1470
t-statistic	-1.86	3.67**	0.57
Median	-0.3109	0.6568	0.5860
Benchmark	0.3356	-0.0725	0.2520
Difference	-0.6460	0.7290	0.3340
Wilcoxon	-3.05**	4.01**	1.43

Panel B: Next Month Performance

	June Sells	Dec Buys	Dec Sells
Mean	-0.1378	-0.3370	-0.0330
Benchmark	-0.1039	0.1462	-0.113
Difference	-0.0339	-0.4830	0.0800
t-statistic	-0.16	-2.24*	0.39
Median	0.0220	-0.3300	0.0607
Benchmark	-0.0740	0.1598	-0.0910
Difference	0.0960	-0.4890	0.1510
Wilcoxon	0.63	-1.83	0.31

The table presents the performance results for trades of fund managers. Panel A presents the performance in the same month as the trades. The June sell performance is the abnormal return in the month of June on the June sells. Panel B presents the performance of the trade portfolios in the next month. The June sell performance is the abnormal returns realized on a portfolio of June sell trades in the month of July. Significance levels for *t*-statistics are ** and * indicate significance at the 1% level (two tail) and 5% level (two tail) respectively. Returns represent percentage per month.

TABLE 6
Performance Test of Tax-Loss Selling

	Tax Sell Trades	*Other Sell Trades*	*Difference*	*t-statistic*
Mean	-1.6610	0.2912	-1.9520	-2.20*

The table reports the performance in June of June sell trades attributed into a group of tax –sell trades and a group of other sell trades. Significance levels for *t*-statistics are ** and * indicate significance at the 1% level (two tail) and 5% level (two tail) respectively. Returns are expressed in percentage terms.

TABLE 7
Results for Earnings

	Earn Announce	*Non-Announce*	*Difference*	*t-statistic*
Mean	0.7249	-0.1440	0.8689	6.40**

The stockholdings in the earnings seasons were partitioned into two samples: Those that made announcements in the earnings seasons and the remainder who did not make earnings announcements in earnings seasons. Significance levels for *t*-statistics are ** and * indicate significance at the 1% level (two tail) and 5% level (two tail) respectively. Returns are expressed in percentage terms.

FIGURE 1 – Calendar Month Performance of Portfolio Holdings
This figure shows the calendar month performance of value-weighted and equal-weighted portfolios of stocks formed in the prior month. The abnormal returns are reported in percentage terms.