Unit trust funds and stock returns

Anderson, Gordon

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Abstract

Changes in quarterly holdings of Domestic General Equity unit trust funds in JSE sectors displayed a negative association with same quarter returns. The results were obtained from cross tabulations of unit trust sector holdings data taken from the period June 2002 to June 2009. The relationship was consistent with loss aversion behaviour: a tendency to hold stocks with negative returns to avoid realising a loss, and to sell stocks with positive returns to achieve a more immediate gain. This finding at the sector level of unit trust holdings was a reversal of the positive correlation between changes in holdings and stock returns observed in US mutual funds by Sias, Starks and Titman (2006).

Those sectors purchased by Domestic General Equity unit trusts in the preceding quarter generated significant positive abnormal returns over the following quarter. Trading rules, which replicated the weighted purchasing of sectors by unit trusts, were tested for holding periods of between one and four quarters. The trading rule with a single quarter holding period, generated an estimated cumulative return 43% greater than a benchmark of equal sector weightings from September 2002 to June 2009; but the high level of transaction costs associated with an average annual portfolio turnover ratio of 3.0 made it impossible to achieve such a return in practice.

G. Anderson

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1 Introduction

The total value of assets managed by South African unit trusts was R 703 bn in June 2009, yet unit trust ownership of listed equity comprised a surprisingly small fraction of total JSE market capitalisation, which amounted to only 4 % in 2009 (ASISA, 2009). For comparison, their American mutual funds counterparts owned approximately 25% of the market capitalisation of US stock markets in 2008 (WFE, 2008).

Not only were South African unit trusts under-represented on the stock exchange, they were also under-represented in the literature. Studies of US mutual funds dominated. The reasons behind this were not only the sheer number of US mutual funds, and the size of American stock markets, but also the ready availability of mutual fund holdings data for which US legislation required quarterly reporting. Mutual funds' behaviour on markets such as the New York Stock Exchange (NYSE), the American Stock Exchange (AMEX) and the National Association of Securities Dealers Automated Quotations (NASDAQ) has received extensive research coverage - see Griffin, Harris and Topaloglu (2003); Sias, Starks and Titman (2006); and Gompers and Metrick (2002).

Among the results of US studies, there was general agreement that an increase (decrease) in mutual fund shareholding was associated with an increase (decrease) in returns of the affected stocks over the same period. This was borne out by the results of Sias *et al*(2006) and Yan and Zhang (2009).

While there was general agreement in the literature regarding the positive relationship between same quarter returns and changes in ownership, there was uncertainty about the relationship between prior quarter sector returns and changes in unit trust fund holdings. Authors such as Alexakis, Niarchos, Patra & Poshakwale (2005) and Ben-Rephael, Kandel and Wohl (2009) predicted that positive abnormal sector returns should lead to increases in holdings, while others such as Goetzmann and Massa (2003) predicted no relationship whatsoever. For changes in shareholding and the relationship to future returns, the literature also gave conflicting predictions. Cai and Zheng (2004) predicted a negative relationship, yet results of Yan and Zhang (2009) indicated the reverse could apply.

An interesting observation by Chen, Jegadeesh and Wermers (2000) was the significant difference in returns on stocks that were bought by mutual funds as opposed to those being sold. Would sectors which South African unit trusts had purchased outperform the market in accordance with these findings? If so, would it then be profitable to mimic unit trust buying patterns using a trading rule?

There was no certainty that any findings from US studies could be applied to South African unit trusts. Rudman (2008) has pointed out that the smaller South African unit trusts operate under different conditions to US mutual funds. They do not benefit from the same economies of scale as their US counterparts in conducting company and sector specific research; while different exchange control and taxation regulations encourage different investing behaviours.

In contrast to the readily available US mutual fund holdings data, detailed holdings information of certain South African unit trusts have been withheld (Du Plooy, 2009/09/16). Instead of the hoped-for share level holdings information, sector level data had to be relied upon to assess the relationship between changes in holdings and returns. This study thus adopted the approach of comparing changes in quarterly JSE holdings of unit trust funds with returns at the sector level, and not at the level of individual shares.

The aim was to assess the relationship between changes in holdings of unit trust funds and returns. In addition, the study examined whether unit trusts had a sector picking ability, by measuring returns of sectors subsequent to increases or decreases in unit trust holdings. A series of trading rules were then tested based on the weighted purchases of unit trust fund buying from the previous quarter.

An analysis of historical South African unit trust holdings data was conducted. The time period of the study from June 2002 to June 2009, covered both bull and bear market conditions. The FTSE/JSE All Share Index rose from 10658 at the end of June 2002, peaked at 33310 on 22 May 2008 and then fell to 17771 on 20 November 2008, ending at 22049 on 30 June 2009. This allowed the investigation to cover both rising and falling market conditions.

2 Literature Review

2.1 *History of South African Unit Trust Funds*

The intention behind the establishment of the first South African unit trust in 1965 was to earn fees from investing the funds of private individuals, whose previous options were limited to purchasing shares using stock brokers. The unit trust alternative offered a lower investment threshold to gain access to a professionally managed portfolio, where risk was spread over a diverse range of shares with on-demand entry into and exit from the fund. In South Africa, unit trusts were created as trusts with overseeing trustee companies, while the equivalent mutual funds in the United States were organised as limited liability companies under a board of directors (Oldert, 2009).

By May 1969, unit trust assets had risen to R 1bn shared between nine funds, but a market crash in that same month slowed the growth of the industry over the next decade – in 1979 only 12 funds were available. Conditions improved in the 1980s with total assets under management growing to R 4.8 bn and the number of funds increasing to 31. In 1999, after a decade of consistent growth, there were 271 funds controlling R 113 bn. By 2009 this had multiplied to R658 bn shared between 891 funds. In the same year, domestic equity holdings of all funds amounted to 4% of total market capitalisation. (ASISA, 2009).

2.2 The Classification of Unit Trust Funds

In July 1999 a new unit trust classification system was implemented by the Association of Collective Investments (ACI), the forerunner to the present day Association for Savings and Investment SA (ASISA). The classification system was designed to group funds with similar investment styles and objectives into the same category. This enabled clients to choose an appropriate fund based on their desired asset class and risk exposure. The system also facilitated comparison between funds with similar mandates (Gallow, 2000).

Funds were classified according to a three tiered structure (Oldert, 2009) :

- **Tier 1: Geographic Focus of Asset Allocation.** There were three categories, Domestic, Worldwide and Foreign. Domestic funds were obliged to invest 80% of their assets in South African investments.

- **Tier 2: Broad Asset Allocation of the Fund.** The four categories of broad asset allocation were Equity, Asset Allocation, Fixed Interest and Real Estate.

- **Tier 3: Fine Classification of Asset Allocation.** Specific areas of focus existed for each type of broad asset allocation. For Equity funds there were eight Third Tier categories: General, Growth, Value, Large Cap, Smaller Companies, Varied Specialist, Resources & Basic Industries and Industrial Sector.

According to the above classification system, unit trusts which invested across every sector of the JSE in all sizes of companies were denoted as Domestic General Equity (DGE) funds. As Domestic funds they were required to hold at least 80% of assets in South Africa. As Equity funds, at least 75% of assets had to be allocated to

stocks. This category was the most significant holder of local equity among unit trust funds, accounting for 43% of all JSE stock owned by unit trust funds; equivalent to 1.7% of total JSE capitalisation (ASISA, 2009).

Unit trust fund managers shared features that distinguished them from individual traders. They operated under similar incentives based on investment performance and were constrained by similar regulations relating to the asset allocation requirements of the ASISA classification system. Like other institutional investors, the large stock portfolios of unit trusts yielded economies of scale for both in-depth company specific research and frequent share trading (Bennet, Sias and Starks, 2003).

2.3 Unit Trust Performance

The outcome of prior research was mixed. If mutual funds had access to superior information, one would expect superior performance. Evidence of above average performance was, however, lacking. Research from as far back as the 1960s by Friend, Brown, Herman and Vickers (1962), Sharpe (1966) and Jensen (1968), has shown that mutual funds do not consistently beat the market. More recent findings by Grinblatt and Titman (1993) as well as Hendricks, Patel and Zeckhauser (1993), documented some short-run market beating performance; but these were disputed by Malkiel (1995). The latter claimed that once the former's results were adjusted for survivorship bias, evidence of performance persistence vanished. Another study by Chen, Jegadeesh and Wermers (2000) also did not support the persistence of fund performance; any isolated cases of performance persistence were attributed to the momentum effect – the tendency of past "winner" stocks to outperform "loser" stocks – rather than to the stock selection skills of mutual fund managers.

Barber and Odean (2000) studied NYSE/AMEX and NASDAQ data from 1991 to 1996 and concluded that trading costs due to excessive portfolio turnover (77% for mutual funds in 1997 – compared to the 50% average for all market participants) were the primary cause for mutual fund underperformance.

Locally, the outcomes were similar, leading to Oldham and Kroeger's (2005) conclusion that there was no evidence of consistent above average performance over the period 1998 to 2002. Wessels and Krige (2005) found instances of short term mutual fund performance, but this did not translate into long term persistence. Interestingly, the worst performing funds produced below average performance more consistently than winner funds were able to replicate superior performance.

2.3.1 Stock Picking Ability

Although the overall performance of mutual funds relative to market benchmarks was in doubt, work by Chen, Jegadeesh and Wermers (2000) determined that stocks purchased by mutual funds had returns 2% higher than stocks that were sold; but the performance difference disappeared after the first year. Their findings supported the assertion that funds possess superior stock selection skills.

Nofsinger and Sias (1999) suggested that institutions in general purchase undervalued and sell overvalued stocks. Mutual funds accounted for between only 16% and 18% of all institutional ownership in this particular study, so the role of their behaviour in this phenomenon is uncertain.

Wermers (1999) has shown that stocks bought by institutions performed better on average over the following six month period than stocks they sold; the author attributed this to the information advantage gained from superior research. This suggested that changes in ownership by mutual funds and other institutions might have had some predictive power over stock returns.

2.3.2 Negative Timing Ability of Unit Trusts

Sehgal and Jhanwar (2008) defined market timing as the increasing (decreasing) of a portfolio's market exposure prior to a market increase (decrease). Volkman (1999) conducted a study in this field using US mutual fund returns from the 1980s. He concluded that the majority of funds demonstrated a negative market timing ability and no persistence in the ability to select undervalued investments. The small proportion of funds, which did display persistence in the selection of undervalued investments, did so at the expense of market timing performance. So both those funds with some performance persistence in the selection of undervalued investments, and those with none, demonstrated a perverse timing performance.

Edelen (1999) determined that liquidity pressures from clients adding to or drawing down their mutual fund investments, forced fund managers into unfavourable trades with negative returns, hence the negative market timing ability. The positive relationship between aggregate fund flow and market returns documented by Warther (1995), may have led to negative market timing ability through the following mechanism: aggregate flow from clients into funds forced liquidity motivated trading as fund managers tried to rebalance their portfolios. This trading created a demand shock which affected market prices before the fund managers had completed their

rebalancing trades, resulting in a rise in the market before the increase in market exposure (Edelen, 1999).

2.4 Market Returns and Changes in Mutual Fund Holdings

2.4.1 Hypotheses linking Returns and Changes in Holdings

Sias *et al* (2006) and Ben-Rephael, Kandel and Wohl (2009) have indentified three hypotheses to explain the relationship between changes in holdings and stock returns.

- **Information Hypothesis.** A group of investors possessing positive information about the future prospects of a company will buy stock from other investors. In an efficient market, this new information is used to adjust prices rapidly and without bias so that share prices fully reflect all available information (Fama, 1970). A study by Magnusson and Wydick (2002) indicated that the JSE had progressed to a state of "semi strong form efficiency", a term coined by Fama (1970) to indicate the degree to which the efficient market hypothesis holds true. Mutual funds had been found to contribute to the efficiency of markets by accelerating the way new information was incorporated into prices (Wermers, 1999).

- **Feedback Trading Hypothesis.** Investors react to recent performance – good news leads to investors committing more funds into the market. Investors increase holdings in those stocks with superior past performance, in the hope that performance will persist.

- **Price Pressure Hypothesis.** Cash flows into equities force prices temporarily upwards because of market inelasticities, increasing short run returns. These returns reverse when inflows subside.

2.4.2 Overall Market Returns and Mutual Fund Flows

A variety of authors: Kadiyala (2004), Edelen and Warner(2001), Fant (1999) , Edwards and Zhang (1998), Warther (1995), Hendriks, Patel and Zeckhauser (1990) have found a positive relationship between the monthly investment of cash into US mutual funds and overall equity market returns. The flow of cash from private investors was associated with a change in mutual fund stock holding, as fund managers invested the additional cash in equities according to their portfolio mandates.

A study by Warther (1995) rejected the Feedback Trading Hypothesis and the Price Pressure Hypothesis as possible explanations for the positive mutual fund flow and market return relationship. Fant (1999) also failed to find evidence in support of the Price Pressure Hypothesis. Goetzmann and Massa (2003), as well as Edelen and Warner (2001), found no evidence of feedback trading in their study of daily market returns and flows into US mutual funds. Instead they came out in support of the Information Hypothesis. Gruber (1996), however, presented evidence in favour of the Feedback Trading Hypothesis that mutual funds attracted cash flows, based on the premise that future performance was predicted by past performance.

Other evidence in favour of the Feedback Trading hypothesis has been presented by Karceski (2002), who demonstrated that equity funds attracted positive cash flows from other asset classes during periods of high market returns, in the same manner that funds with superior past performance attracted cash flows out of inferior performing funds.

Alexakis, Niarchos, Patra & Poshakwale (2005) found that positive equity market returns on the Athens Stock Exchange attracted increased flows into mutual funds, which was consistent with the Feedback Trading Hypothesis. In addition, the mutual fund flows themselves were found to lead to further increases in share prices due to an upward equity supply curve (Price Pressure Hypothesis).

Ben-Rephael, Kandel and Wohl (2009) studied Israeli mutual funds and reported findings similar to the Athens Stock Exchange study. The positive contemporaneous returns associated with mutual fund flows were also attributed to the Feedback Trading Hypothesis, while a partial reversal in these returns within 10 trading days was used as evidence to support the Price Pressure Hypothesis.

In the only study of its type on South African DGE unit trusts, Rudman (2008) also found a positive relationship between cash flows and contemporaneous returns; but flows for a particular month were negatively related to flows and returns from the following month. No significant relationship was found between flows and returns occurring more than one month into the future.

2.4.3 Returns on Individual Stocks and Mutual Fund Trades

Pruitt and Wei (1989) noted abnormal returns in stocks recently added to or deleted from the US Standard and Poor's 500 market index, and attributed the anomaly to the Price Pressure Hypothesis. Trading by mutual funds and other institutional investors forced prices upwards following a new inclusion in the S&P 500, and downwards following exclusion.

Hotchkiss and Strickland (2003) have demonstrated that differences in the trading behaviour of a stock's institutional shareholders were important for explaining share price behaviour in response to earnings announcements. They concluded that a link existed between share selection decisions of institutions and stock returns. Mutual funds in particular were found to contribute to the greater volatility in prices and volume of trades found at the time of earnings announcements.

Chakravarty (2001) analysed trades on the NYSE and found that medium sized trades initiated by institutions caused a disproportionately large price impact, possibly because the market perceived these institutions to have an information advantage. This was supported by Schnatterly *et al* (2008) who argued that the market perception is based on the reality that institutions have a superior ability to follow firms and gather information, while individual investors have less time and resources to gather the same level of detailed information.

2.4.4 Contemporaneous Returns

Sias and Starks (1997) provided empirical evidence from the NYSE between 1977 and 1991 that an autocorrelation in daily returns for individual stocks was related to the level of ownership by mutual funds and other institutions. Nofsinger and Sias (1999) found a correlation between institutional ownership and contemporaneous returns on the NYSE between 1977 and 1996, and attributed the result to a combination of positive feedback trading and institutional herding. The results demonstrated a strong relation between daily changes in institutional ownership and same day returns, but a very weak relationship between daily ownership changes and returns for subsequent periods.

A subsequent study by Sias, Starks and Titman (2006) also determined that changes in the level of stock ownership by US mutual funds were contemporaneously linked to returns in the same month and the same quarter. They also found a significant overall correlation between changes in ownership and returns in the following quarter. The results were obtained using New York Stock Exchange (NYSE) securities between 1980 and 2000.

2.4.5 Future Returns

Gompers and Metrick (2001) studied NYSE institutional data from 1980 to 1996. Mutual funds comprised between 6.9% and 9.0% of institutions included in their study. They concluded that the level of institutional ownership was a valid predictor of future returns. They attributed this to the Price Pressure Hypothesis. In a related

study, Jiambalvo, Rajgopal and Venkatachalam (2002) demonstrated that institutional ownership in a stock caused stock prices to increase ahead of earnings.

Yan and Zhang (2009) went even further by concluding that institutional ownership had a significant predictive ability for future returns. Their data covered all stocks traded on the NYSE, AMEX and NASDAQ from 1980 to 2004 and yielded a positive correlation between institutional ownership and stock returns for the next quarter as well as for the following year. Their results agreed with the Gompers and Metrick (2001) study; but the authors ascribed the finding to the Information Hypothesis.

Cai and Zheng (2004) studied 5891 stocks listed on both the NYSE and the AMEX between 1980 and 1996. They found quarterly stock returns to be negatively related to institutional trading from the previous quarter and concluded institutions followed a positive feedback strategy with purchases being related to past returns. They reported an increase in returns before and during the major buying, but found these excess returns disappeared in the following quarter. Stocks which experienced the most significant buying by mutual funds and investment advisors had positive returns over the four preceding quarters. For stocks with the most intense mutual fund selling, the opposite occurred.

The findings of Cai and Zheng (2004) were in conflict with those of Gompers and Metrick (2001), Sias *et al* (2006) and Yan and Zhang (2009), who maintained that levels of mutual fund holding were a valid indicator of future returns.

It was possible that the discrepancies in findings may have resulted from differences in the data sets used by the various authors. Yan and Zhang (2009), as well as Gompers and Metrick (2001), used data from the same period 1980 to 1996 and thus obtained similar findings. Sias *et al* (2006) used data over a longer time period from 1980 to 2000, while Cai and Zheng (2004) limited their dataset to include only those stocks traded on both the NYSE and the AMEX between 1980 and 1996. There was reason to suspect that data from another country's exchange, such as the JSE, could demonstrate a different behaviour.

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2.5 JSE Sectors

In 2006 the JSE switched from the FTSE Global Classification System (GCS) to the Industry Classification Benchmark (ICB), which unified the previously separate Dow Jones and FTSE systems of sector classification (Forssman, Dillon-Hatcher and Immelman, 2007). The old GCS system consisted of three tiers: 10 economic groups broken down into 36 industry sectors and with a further 102 industry subsectors. The new ICB system had four tiers with 10 top level Industries, 18 super sectors, 39 sectors and 104 sub sectors. Please refer to Table 9-1 and Table 9-2 in the appendix for details of the top level industries and sectors.

Barberis and Shleifer (2003) reported significant correlations between stocks within a particular class or sector. Categorization by sector was found to simplify processing of information and making of choices. It was easier to allocate funds across several dozen sectors than across hundreds of individual shares. They concluded that investors moved funds towards categories of shares with strong past performance;

which suggested the possibility of a relationship between changes in sector-specific holdings of mutual funds and past sector returns.

Froot and Teo (2008) found evidence that institutional investors reallocated portfolios across sectors to a greater extent than across random groupings. Flows into a particular sector predicted positive future returns.

2.6 Trading Rules

Du Plessis and Ward (2009) and Cubbin, Eidne, Firer and Gilbert (2006) have demonstrated the potential to earn abnormal returns on the JSE by following a passive investment strategy based on a trading rule. The assessment of trading rule performance depended on the selection of an appropriate benchmark. Kruger and Van Rensburg (2008) have noted that the FTSE/JSE All Share Index (ALSI) was biased towards large companies in a limited number of sectors, because it was a value weighted index.

Banz (1981) and Zarowin (1990) documented the small-firm effect which predicted higher returns in small capitalisation companies on US stock markets. Because of this phenomenon, returns on the ALSI had the potential to be downward biased with respect to any trading rule portfolio holding a greater proportion of smaller firms. Because of the potential inadequacy of the ALSI benchmark, Cubbin *et al* (2006) have included both the ALSI and an equal weighted index as benchmarks in their trading rule assessment.

2.7 Conclusion to Literature Review

Previous research into Mutual Fund holdings and returns has focused on three broad categories (Warther, 1995):

- **Micro Approach**. This examined differences in mutual fund performance and the associated flows of cash from one mutual fund to another as individual investors switched to those funds with recent above average performance.

- **Macro Approach**. This measured overall cash flows into all mutual funds and market wide returns.

- **Individual Holdings Approach**. This examined the relationship between changes in levels of mutual fund ownership of listed companies and abnormal returns.

This study of unit trust fund holdings investigated the pattern of sector returns versus changes in holdings at a sector level. It represented an intermediate option in the study of unit trusts between the Macro Approach and the Individual Holdings Approach.

The objective was to determine if sector returns and changes in South African unit trust sector holdings were related. The literature indicated that this behaviour was plausible given similar observations from the Macro Approach and the Individual Holdings Approach. Yet this was by no means a foregone conclusion; the bulk of findings have come from US based studies where the easy accessibility of institutional holdings data contributed to a proliferation of US research in this field.

There were significant reasons to suspect the results of US studies would not necessarily hold for South African unit trusts in general (Rudman, 2008):

- South African unit trust funds numbered several hundred, while there were several thousand US mutual funds. Unit trusts would not benefit from the same economies of scale as their US counterparts in conducting company and sector specific research.

- Different exchange control and taxation regulations would encourage different behaviours.

- South African unit trusts owned a much smaller fraction of the market than their US counterparts. If mutual fund trading did indeed have any effect on stock returns, the lower level of South African unit trust holdings would result in a greatly reduced or imperceptible impact.

- US mutual studies were conducted at the level of individual stocks, while this study analysed sector returns and the associated change in sector holdings.

While there was general agreement in the literature regarding the positive relationship between same quarter returns and changes in ownership, there was uncertainty about the relationship between prior quarter sector returns and changes in unit trust fund holdings. Authors such as Gruber (1996), Karceski (2002), Alexakis *et al* (2005) and Ben-Rephael *et al* (2009), who favoured the Feedback Trading Hypothesis, predicted that positive abnormal sector returns should lead to increases in sector holdings by unit trust funds; while others such as Warther (1995), Goetzmann and Massa (2003) as well as Edelen and Warner (2001), predicted no relationship whatsoever.

In the case of changes in shareholding and the relationship to future returns, the literature also gave conflicting predictions. Cai and Zheng (2004) predicted a negative relationship, as did Edelen (1999) and Volkman (1999) with their negative market timing finding that sector returns should decrease subsequent to an increase in unit trust fund holding. Yet results of Gompers and Metrick (2001), Sias *et al* (2006) and Yan and Zhang (2009) indicated the reverse could apply. Investment style research by Froot and Teo (2008), as well as Barberis and Shleifer (2003), also predicted a positive relationship between future sector returns and changes in sector holdings.

Chen, Jegadeesh and Wermers (2000) and Wermers (1999) found significant differences in stock returns depending on the direction of change in holdings. Would sectors which South African unit trusts had purchased outperform the market in accordance with these findings?   If so, would it then be profitable to mimic unit trust buying patterns using a trading rule? This study addressed the question though an analysis of historical South African unit trust holdings data.

3 Hypotheses

The following hypotheses were tested on JSE unit trust sector holdings and returns data:

3.1 Hypothesis 1

H0: There is no relationship between quarterly changes in aggregate DGE unit trust fund holdings in a sector and sector specific returns.

HA: There is a relationship between quarterly changes in aggregate DGE unit trust fund holdings in a sector and sector specific returns.

3.1.1 Sub Hypothesis 1A (Previous Quarter Returns)

H0: There is no relationship between quarterly changes in aggregate DGE unit trust fund holdings in a sector and sector specific returns from the previous quarter.

HA: There is a relationship between quarterly changes in aggregate DGE unit trust fund holdings in a sector and sector specific returns from the previous quarter.

3.1.2 Sub-Hypothesis 1B (Same Quarter Returns)

H0: There is no relationship between quarterly changes in aggregate DGE unit trust fund holdings in a sector and sector specific returns from the same quarter.

HA: There is a relationship between quarterly changes in aggregate DGE unit trust fund holdings in a sector and sector specific returns from the same quarter.

3.1.3 Sub Hypothesis 1C (Next Quarter Returns)

H0: There is no relationship between quarterly changes in aggregate DGE unit trust fund holdings in a sector and sector specific returns from the next quarter.

HA: There is a relationship between quarterly changes in aggregate DGE unit trust fund holdings in a sector and sector specific returns from the next quarter.

3.2 Hypothesis 2

H0: DGE unit trust funds have no sector picking ability.

HA: DGE unit trust funds have a sector picking ability.

3.2.1 Sub-Hypothesis 2A

H0: The sectors, into which DGE unit trust funds buy, do not subsequently outperform the market.

HA: The sectors, into which DGE unit trust funds buy, subsequently outperform the market.

3.2.2 Sub-Hypothesis 2B

H0: The sectors, from which DGE unit trust funds divest, do not subsequently underperform the market.

HA: The sectors, from which DGE unit trust funds divest, subsequently underperform the market.

3.2.3 Sub-Hypothesis 2C

H0: The sectors, into which DGE unit trust funds buy, do not subsequently outperform the sectors from which DGE unit trust funds divest.

HA: The sectors, into which DGE unit trust funds buy, subsequently outperform the sectors from which DGE unit trust funds divest.

3.3 Hypothesis 3

H0: A trading rule mimicking the value weighted buying by DGE unit trusts in JSE sectors cannot outperform the market.

HA: A trading rule mimicking the value weighted buying by DGE unit trusts in JSE sectors can outperform the market.

4 Research Methodology

4.1 Design

For this quantitative causal study (Zikmund, 2003), a quasi experimental design was employed using secondary time series data of quarterly DGE unit trust holdings in each JSE sector.

4.2 Population and Sampling

The target population consisted of all ASISA registered Domestic General Equity funds that existed at any time during the period June 2002 to June 2009. During this period some funds were created or reclassified, while others were terminated or renamed. Funds of funds were excluded as these maintained holdings indirectly though other DGE funds. Their inclusion would have resulted in double counting of sector holdings. In June 2002, data were available for 49 DGE unit trusts, increasing to 78 in June 2009 (ASISA, 2009).

The sample data comprised the monetary value of the holdings of each DGE fund reported per JSE sector. The data formed a time series of 29 quarterly ASISA holdings reports. The quarterly sector return data were sourced from the McGregor BFA database.

The study was limited to DGE unit trusts, as opposed to other categories of ASISA unit trusts, for the following reasons (Rudman, 2008):

- As a fund category, DGE unit trusts were the single largest class of all unit trusts in terms of total funds under management. They also held a larger

fraction of the JSE compared to any other category of fund. ASISA (2009) reported total DGE fund local equity holdings amounting to 1.7% of JSE market capitalisation, or 43% of domestic equity holdings of all types of ASISA registered unit trusts.

- DGE funds had a similar mandate and the same asset class restrictions. They were forced to keep their allocation decisions within equity, but were permitted to invest across all JSE sectors in stocks with small or large market capitalisations. They adopted no fixed investment strategy, but aimed to achieve medium to long term growth (ACI, 2008).

- South African GE funds were required to hold certain percentage of funds in domestic equities, ensuring that for all quarters there were data points of equity holdings. Other types of funds could potentially hold no equity but only property or cash over certain periods.

- DGE funds have adopted a common benchmark – the FTSE/JSE All Share Index (ALSI) which simplified comparison of performance with the market.

As many quarters as were feasible were included. This allowed the investigation to cover both rising and falling market conditions during which there were periods of net inflow and net outflow of funds from unit trusts. The period, June 2002 to June 2009, represented a time of exceptional bull and bear market conditions during which the ALSI rose from 10658 at the end of June 2002, peaked at 33310 on 22 May 2008 and then fell to 17771 on 20 November 2008, ending at 22049 on 30 June 2009.

4.3 Collection and Analysis

4.3.1 Changes in Holdings and Sector Returns

Studies of this nature typically correlated quarterly changes in the proportion of institutional holdings with returns using linear correlations (see Sias, Starks and Titman, 2006). The ASISA unit trust data were not amenable, however, to the same approach. Outliers and nonlinearities in the quarterly reports affected both the coefficients of determination as well as the confidence intervals of correlation coefficients (Hintze, 2007). To overcome these shortcomings, the continuous data were reduced to ordinal form according to the table below:

Table 4-1 Ordinal Variable Categories

Quarterly Abnormal Sector Returns (Calculated using Equation 4-3 with respect to ALSI)		Changes in DGE Fund Holdings (Calculated using Equation 4-1 or Equation 4-2)	
1	**Negative** For returns less than -0.1%	1	**Sells** For quarter-on-quarter decreases in sector holdings less than -0.1%
2	**Zero** For returns of magnitude less than 0.1%	2	**Holds** For fractional changes in holdings of magnitude less than 0.1%
3	**Positive** For returns greater than 0.1%	3	**Buys** For quarter-on-quarter increases in sector holdings greater than 0.1%

Cross tabulations were prepared for the quarterly sector returns versus changes in unit trust holdings. The numbers of observations falling into the three rank orders, Sells, Holds and Buys, were determined using two different criteria:

1. **Equal Weighted.** The change in holdings for each fund in each sector over every quarter (ie all fund-sector-quarters) was calculated according to Equation 4-1 on page 27. Each fund-sector-quarter was then ranked into the Sells, Holds or Buys categories. Changes in holdings by all funds were thus treated equally regardless of the absolute value of the change. The same 0.1% criteria was still applied to the Hold category.

2. **Value Weighted.** The net change in total holdings for all funds was calculated for each sector over every quarter (i.e. all sector-quarters) according to Equation 4-2 on page 28. Those sector-quarters with a decrease in holdings were ranked in the Sells category, those with less than a 0.1% change were placed in the Holds category and those with an increase in sector holdings were placed in the Buys category. This measure was biased towards those funds with the largest absolute changes in sector holdings.

Estimation of Changes in DGE Fund Holdings

Funds registered with ASISA were obliged to provide detailed quarterly holdings information, but in many cases these funds requested that detailed holdings information at the level of individual stocks be withheld from third parties (Du Plooy, 2009/09/16). Overall quarterly sector holding information was, however, made available. This information was then used to estimate whether a particular fund increased or decreased its holdings within a particular sector for a given quarter:

The equal weighted quarterly fractional change in value of a fund's holdings within a specific sector i over a specific quarter t was estimated using the Equation 4-1

below. Equal weighted quarterly changes were calculated for every fund-sector-quarter:

$$\delta_{f,i,t} = \left(\frac{S_{f,i,t}}{P_{f,t}}\right) - \left(\frac{S_{f,i,t-1}}{P_{f,t-1}}\right)\left(\frac{1+Rs_{i,t}}{1+Rm_t}\right)$$ **Equation 4-1**

where

$\delta_{f,i,t}$ is the equal weighted change in the proportion of holdings for fund *f* within a specific sector *i* for quarter *t*

$S_{f,i,t}$ is the value of holdings of fund *f* in sector *i* at end of quarter *t*

$P_{f,t}$ is the value of total equity holdings of fund *f* at end of quarter *t* for all sectors

$Rs_{i,t}$ is the return for the sector *i* over quarter *t*

Rm_t is the return for the market over quarter *t*

The factor $\left(\frac{1+Rs_{i,t}}{1+Rm_t}\right)$ was included as the last term in the above equation to filter out those instances where changes in the value of holdings arose due to differing sector and market returns, and not the active reallocation of existing funds or the injection of new funds into a particular sector.

The value weighted quarterly fractional change in the value of total holdings for within a specific sector *i* over a specific quarter *t* was estimated using Equation 4-2. Value weighted changes were calculated for every sector-quarter:

$$\cdot_{i,t} = \left(\frac{\sum_{f=1}^{f=N} S_{f,i,t}}{\sum_{f=1}^{f=N} P_{f,t}} \right) - \left(\frac{\sum_{f=1}^{f=N} S_{f,i,t-1}}{\sum_{f=1}^{f=N} P_{f,t-1}} \right) \left(\frac{1 + Rs_{i,t}}{1 + Rm_t} \right)$$

Equation 4-2

where

$\cdot_{i,t}$ is the value weighted change in proportion of total holdings for all funds within a specific sector *i* for quarter *t*

N is the total number of unit trust funds included in the analysis

The returns used were calculated as abnormal sector specific returns with respect to the relevant benchmark :

$$Rsa_{i,t} = Rs_{i,t} - Rb_t$$

Equation 4-3

where

$Rsa_{i,t}$ is abnormal return for sector *i* over quarter *t*

Rb_t is the benchmark return for over quarter *t*

Abnormal sector returns were calculated using the ALSI as the benchmark. Abnormal portfolio returns for testing sector picking ability and trading rules were calculated using a benchmark of equal sector weightings.

Chi-Square Test for Independence

Each expected frequency in the lth row and m^{th} column of the cross tabulation, was calculated using the formula (Zikmund, 2003):

$$E_{lm} = \frac{R_l C_m}{n}$$

Equation 4-4

R_l is the total of frequency values in the kth row

C_m is the total of frequency values in l^{th} column

n is sample size

The chi-square statistic was calculated according to Zikmund (2003):

$$\chi^2 = \sum_{k=1}^{KL} \frac{(O_k - E_k)^2}{E_k}$$

Equation 4-5

χ^2 is the chi-square statistic

O_k is the observed frequency in the kth cell

E_k is the expected frequency in the kth cell

The degrees of freedom associated with the chi-square statistic were determined thus:

$$D = (K - 1)(L - 1)$$

Equation 4-6

The chi-square test was used to determine if the observed frequencies in the cross tabulations differed significantly from the calculated expected frequencies. If the chi-square statistic was significant, then the null hypothesis of independence between the two variables was rejected.

The value of the chi-square statistic indicated dependence only; it did not provide any information on the strength and direction of the association between the two variables. Following recommendations by Diamantopoulos and Schlegelmilch (2000), the Spearman's rank-order correlation was used to determine this information for the bivariate relationship between the ordinal sector returns and changes in unit trust holdings. The correlation varied between -1 and +1 in proportion to the strength of the relationship. The sampling distribution of the correlation followed the t-distribution, which allowed for testing of significance.

The statistics software application, *PASW Statistics 18*, was used to calculate chi-square statistics as well as Spearman's rank-order correlations for the cross tabulated unit trust data.

4.3.2 Unit Trust Fund Sector Picking

Research Hypothesis 2 was tested using a method adapted from Chen, Jegadeesh and Wermers (2000). If unit trust fund managers had sector picking skills, then a portfolio of those sectors with aggregate unit trust fund buying should have outperformed a portfolio of those sectors with aggregate selling. The latter should have generated negative abnormal returns relative to a reference portfolio consisting of equal weightings of each sector. In contrast, the portfolio of unit trust fund buying should have generated positive abnormal returns.

Accordingly, three portfolios were created:

- **The Buys Portfolio** earned a weighted average of sector index returns for those sectors in which there was net buying by DGE funds. Each sector index was weighted in proportion to the value of buying by unit trusts in the sector.

- **The Sells Portfolio** earned a weighted average of sector index returns for those sectors in which there was net selling by unit trusts. Each sector index was weighted in proportion to the value of unit trust selling in the sector.

- **The Equal Sector Weightings Index (ESWI)** represented a reference portfolio with equal weighting of all sector indices. This benchmark generally outperformed the ALSI and was deemed to provide a more conservative approach for the sector picking hypothesis testing.

Quarterly abnormal returns for both the Buys and the Sells Portfolios were tabulated for holding periods of one, two, three and four quarters (see Table 5-18). The following statistical tests were applied to the series of quarterly returns from each holding period :

One Sample T-Test

This was used to test Sub-Hypotheses 2A and 2B. The alternative hypothesis was expressed as a directional hypothesis which presupposed a positive bias in the Buys Portfolio returns and a negative bias in the Sells Portoflio. Sample means, standard errors, and t statistics were computed for the set of returns from each holding period.

Paired Sample T-Test

Paired sample T-Tests were used to test Sub-Hypothesis 2C. The test was applied to pairs of returns from the Buys and Sells portfolios for corresponding formation quarters with the same holding period. The directional alternative hypothesis anticipated the Buys Portfolio returns to be greater than the Sells Portfolio returns.

Wilcoxon Signed Rank Test

This non-parametric test was applied to those sets of quarterly returns for a given holding period, which did not follow a normal distribution and were thus not eligible for the T-Tests. (Hintze, 2007)

4.3.3 Trading Rules

The trading rules described below were used to determine the cumulative returns of portfolios mimicking unit trust buying for 27 consecutive quarters. Five trading rule variants were created in line with the five different holding periods used to calculate the quarterly returns of the Buys Portfolio in the previous section: Q0; Q1; Q1-Q2; Q1-Q3; and Q1-Q4. The quarterly returns of these portfolios approximated the quarterly returns of the Buys Portfolio in Table 5-18 with the corresponding holding period.

Trading Rule Portfolio Q0 (TRP Q0)

This trading rule bought into sectors at the beginning of a quarter based on the weighted overall active investment by unit trusts in the same quarter. Sectors were disposed at the end of the quarter, with all proceeds reinvested according to the value weighted buying of unit trusts in the next quarter. Unlike the remaining trading

rules, this rule is impossible to implement as it requires foreknowledge of unit trust sector buying at the start of the quarter. It is included, nevertheless, to illustrate differences between the benchmark and same quarter returns that unit trusts are able to realise.

Trading Rule Portfolio Q1 (TRP Q1)

Sectors were bought at the start of the quarter in replication of overall weighted buying by unit trusts from the previous quarter. At the end of the quarter the portfolio holdings were sold with all proceeds reinvested according to the value weighted buying of unit trusts during the previous quarter.

Trading Rule Portfolio Q1-Q2 (TRP Q1-Q2)

This scheme had a two quarter "look-back" period implemented by selling 50% of the portfolio value at the end of each quarter, with reinvestment of this amount in the next quarter mimicking the value weighted investment of unit trusts during the previous quarter. At the start up phase of the portfolio, only 50% of the value was invested in the market, the other 50% was retained, earning interest at the prevailing R 153 risk free rate. These funds were then switched into sectors at the start of the next quarter, resulting in a fully invested position being achieved only at the start of the second quarter.

Trading Rule Portfolio Q1-Q3 (TRP Q1-Q3)

A three quarter look-back period was adopted, with end-of-quarter selling and repurchasing amounting to one third of the total portfolio value. The result was a rolling three quarter holding period. The third sold at the end of each quarter was

reinvested in accordance with the sector weightings of unit trust fund buying from the previous quarter. A two quarter start-up period was required before all portfolio funds were invested in the market. During this time, funds not invested in the market earned interest at the prevailing R 153 bond rate.

Trading Rule Portfolio Q1-Q4 (TRP Q1-Q4)

Investments were held for a four quarter rolling holding period. At the end of each quarter, the 25% fraction of the portfolio which had been held for four quarters was sold off and the proceeds then reinvested using the value weighted unit trust sector allocation from the previous quarter. All funds were only fully invested in the market by the start of the fourth quarter. Prior to this, those funds not invested in the market attracted interest at the prevailing R153 bond rate.

Reward to Volatility Measure

The performance of each trading rule was assessed using the Sharpe ratio (Bodie, Kane and Marcus, 2009) which gives the reward to volatility (risk) trade-off. Portfolios with higher Sharpe ratios were considered to have performed better than those with lower Sharper ratios.

$$S_p = \frac{E(r_p) - r_f}{\sigma_p}$$
Equation 4-7

S_p is the Sharpe ratio of portfolio p

$E(r_p)$ is the expected rate of return of portfolio p

r_f is the risk free rate of the R153 bond

σ_p is the unbiased estimate of the standard deviation of returns of portfolio p

4.4 Limitations

This study was restricted to seven years of quarterly unit trust fund data. In contrast, previous studies of a similar nature have covered 16 to 20 year periods; with higher sampling frequencies at monthly or even daily intervals- see Yan and Zhang (2009), Sias *et al* (2006) and Gompers and Metrick (2001).

Quarterly unit trust fund data provided only a snapshot of a state at a particular time, and did not record daily balancing of portfolios made by fund managers, or the quarterly abnormal sector return prevailing at the actual time of trading. This may have been almost three months prior to quarter end.

The three month gap in successive sets of quarterly data limited the ability to discriminate between past, contemporaneous, and future returns. All returns arising in the same quarter were classified as being contemporaneous, whereas they could have preceded or followed changes in holdings by almost three months. There was a danger that short run relationships between holdings and returns were not detected.

Certain unit trust funds did not release their actual holdings on a stock by stock basis (ASISA, 2009); which necessitated the sector holdings approach. It was therefore, impossible to measure changes in holdings in terms of number of the number of shares bought or sold. Instead, this was estimated in Equation 4-1 using the reported values in sector holdings. Inaccuracies in the estimation were bound to have arisen where the ownership of stocks by unit trust funds in a sector did not match the weightings of the shares comprising the sector index.

Not only did this lead to inaccuracies in the estimation of holdings, but the returns themselves were only approximate. Because the exact portfolio composition of unit trust funds were not released, actual sector returns experienced by each fund could not be determined; instead the return on the sector index was used as a proxy.

The FTSE/JSE sector indices from which sector returns were calculated did not account for dividends, so all calculated return data excludes dividend flow. Because they were based on currently listed companies, their use introduced a survivorship bias in the quarterly returns.

Efforts were made to reduce survivorship bias in the unit trust fund sector holdings data, by including all DGE funds that existed at any stage over the study time frame (2002-2009). The fund listings were, however, not comprehensive. The sector holdings of funds managed by Metropolitan and Coronation Asset Managers were not included by ASISA in the quarterly unit trust fund sector holdings reports (this study's major source of secondary data), owing to the incompatible format in which they supplied ASISA their data (Du Plooy, 2009/09/16).

5 Results

5.1 Sample Description

Table 5-1 Summary of General Domestic Equity Unit Trusts (ASISA, 2009)

Year	Number of Funds included in Analysis	Total Assets of All DGE Funds (RM)	Domestic Equities Held by All DGE Funds (RM)	JSE Market Capitalisation (RM)	Domestic Equities Held as % of JSE Market Cap
2002	49	30 222	26 183	1 799 580	1.5%
2003	58	26 530	24 100	1 481 050	1.6%
2004	55	35 985	33 909	1 918 988	1.8%
2005	57	55 473	51 845	2 720 380	1.9%
2006	61	81 851	77 498	4 299 890	1.8%
2007	73	112 032	105 292	5 641 337	1.9%
2008	71	102 604	90 867	5 950 333	1.5%
2009	78	88 608	80 727	4 732 893	1.7%

Table 5-2 Summary of Sectors, Quarters and Unit Trust Funds included in Data (2002-2009)

	Sectors	Quarters	Funds	Potential Sector-Quarters	Potential Fund-Sector-Quarters
Total	38	29	153	29 x 38 = **1102**	29 x 38 x 153 = **168606**

Not all funds existed for all quarters; not all funds had holdings in all sectors. The JSE sector classification system changed in 2006, so certain sectors were present only from 2002-2005, while others were introduced after 2006. The actual number of available sector-quarters and fund-sector-quarters varied according to the table below.

Table 5-3 Sector-Quarters and Fund-Sector Quarters with Available Data (2002-2009)

	Sector-Quarters	Fund-Sector-Quarters
Previous Quarter Returns	906	38025
Same Quarter Returns	914	38333
Next Quarter Returns	908	38219

5.2 Variable Categories

The chi-square test required a minimum expected cell value of five (Zikmund, 2003), however, the Zero category for quarterly sector returns (refer to Table 4-1 on page 25) yielded expected frequencies below this value. Consequently the Negative and Positive return categories were adjusted to absorb the Zero category

Table 5-4 Amended Ordinal Variable Categories

Quarterly Abnormal Sector Returns (Calculated using Equation 4-3 with respect to ALSI)	Changes in DGE Fund Holdings (Calculated using Equation 4-1 or Equation 4-2)	
1 **Negative Return** For returns < 0%	1	**Sells** For quarter-on-quarter decreases in sector holdings less than -0.1%
	2	**Holds** For fractional changes in holdings of magnitude less than 0.1%
2 **Positive Return** For returns 0%	3	**Buys** For quarter-on-quarter increases in sector holdings greater than 0.1%

To assess the sensitivity of any association to the default 0.1% threshold between Buys, Holds and Sells, the cross tabulations were re-run using 0.01% and 0.5% as the threshold criterion. The summary results are available in the Appendix in Table 9-3 and Table 9-4 together with bar charts in Figure 9-1 to Figure 9-12.

5.3 Graphical Representation of Cross Tabulations

The charts which follow provide a graphical representation of the returns vs changes in holdings cross tabulations for previous, same and next quarter returns (all using the 0.1% threshold criterion). An additional bar is included in each chart to indicate the expected cell frequencies against which the observed frequencies were tested using the chi-square test.

Figure 5-1 Value Weighted Changes in Holdings and Previous Quarter Returns
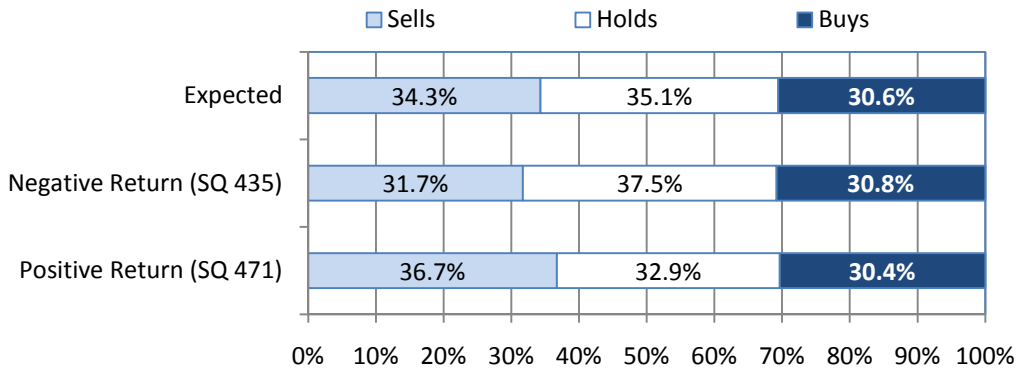
Figure 5-2 Value Weighted Changes in Holdings and Same Quarter Returns
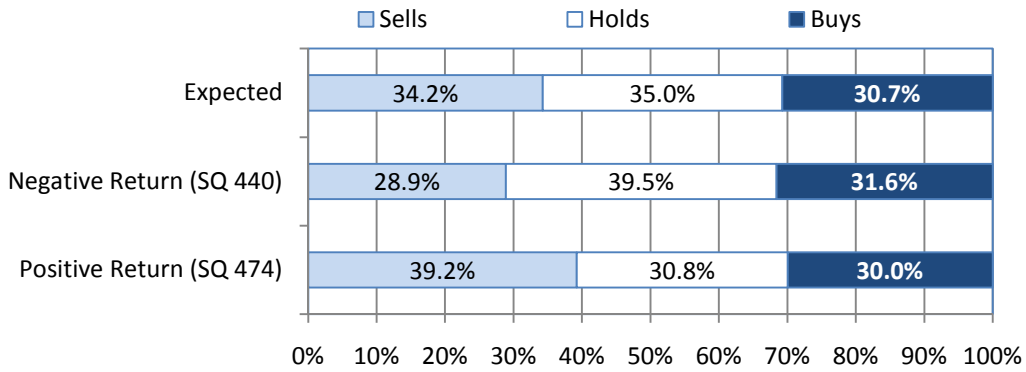
Figure 5-3 Value Weighted Changes in Holdings and Next Quarter Returns
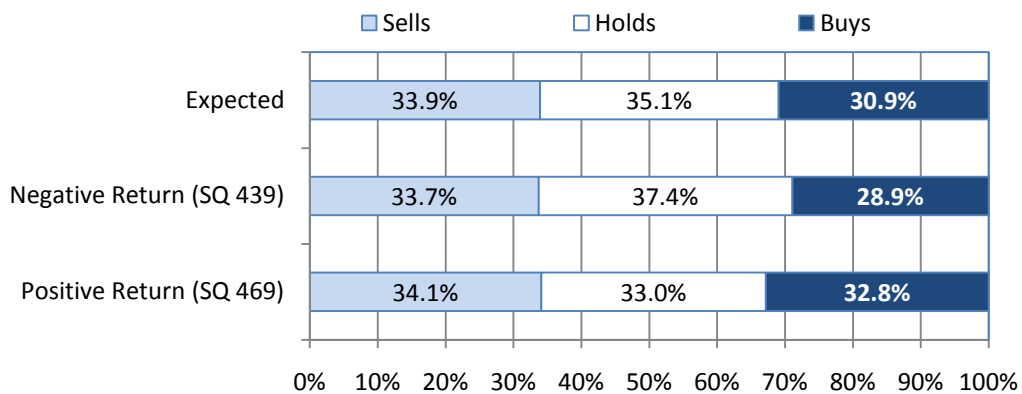
Figure 5-4 Equal Weighted Changes in Holdings and Previous Quarter Returns
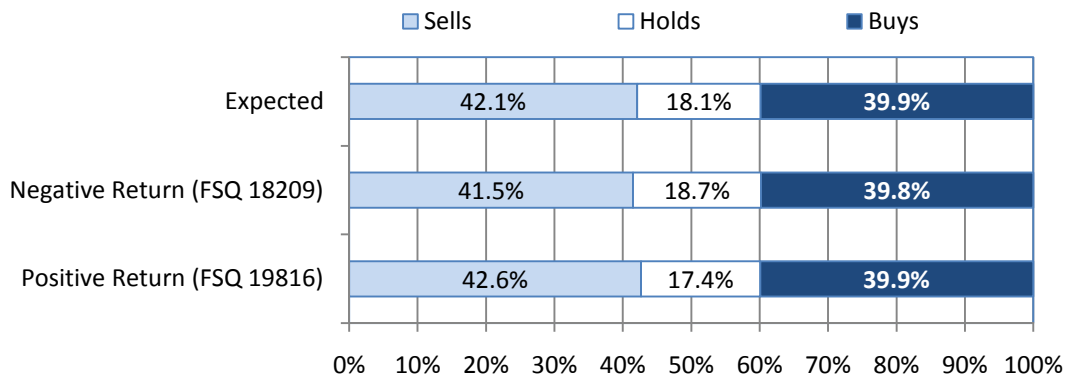
Figure 5-5 Equal Weighted Changes in Holdings and Same Quarter Returns
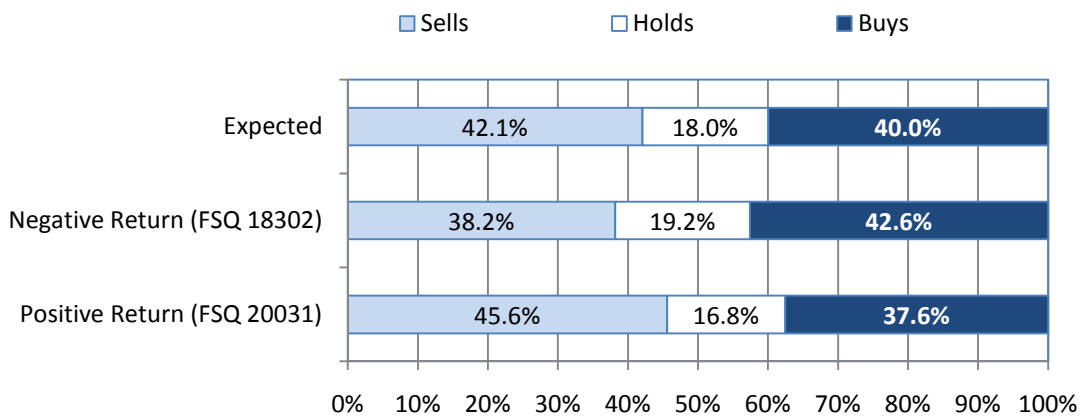
Figure 5-6 Equal Weighted Changes in Holdings and Next Quarter Returns
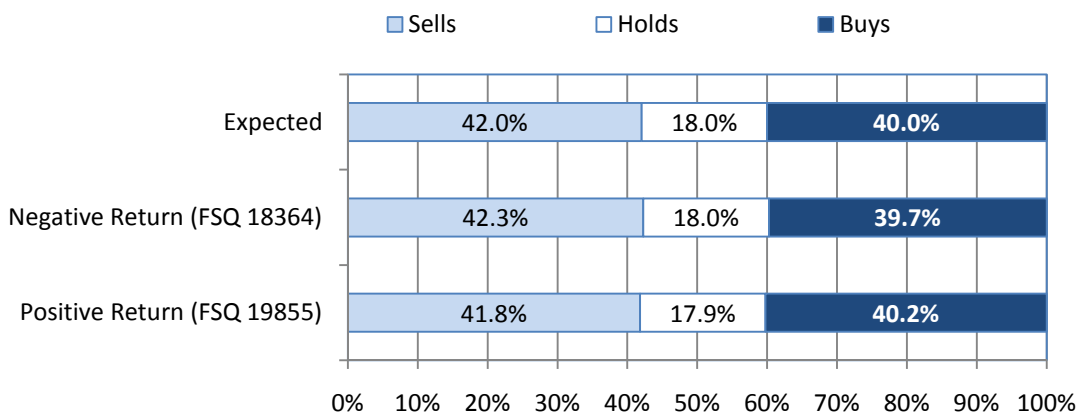
5.4 Hypothesis 1 – Relationship between Holdings and Returns

H0: There is no relationship between quarterly changes in DGE unit trust fund holdings in a sector and sector specific returns.

HA: There is a relationship between quarterly changes in DGE unit trust fund holdings in a sector and sector specific returns.

5.4.1 Sub Hypothesis 1A (Previous Quarter Returns)

H0: There is no relationship between quarterly changes in DGE unit trust fund holdings in a sector and sector specific returns from the previous quarter.

HA: There is a relationship between quarterly changes in DGE unit trust fund holdings in a sector and sector specific returns from the previous quarter.

Value Weighted Changes in Holdings for All Eligible Sector-Quarters

Table 5-5 Value Weighted Changes in Holdings and Previous Quarter Returns

		Sells	Holds	Buys	Total
Negative Return	Count	138	163	134	435
	%	**31.7%**	**37.5%**	**30.8%**	**100.0%**
Positive Return	Count	173	155	143	471
	%	**36.7%**	**32.9%**	**30.4%**	**100.0%**
Total	Count	311	318	277	906
	%	**34.3%**	**35.1%**	**30.6%**	**100.0%**

Table 5-6 Statistics for Value Weighted Changes in Holdings and Previous Quarter Returns

Chi-Square Statistic	
Significance Level	$p < 0.05$
Value	3.007
Degrees of Freedom	2
P-Value	0.222
Decision	Cannot reject null hypothesis

Spearman Correlation	
Significance Level	$p < 0.05$
Value	-.035
T Value	-1.041
P-Value	0.298
Decision	Cannot reject null hypothesis Cannot draw conclusion on direction of relationship

Equal Weighted Changes in Holdings for All Eligible Fund-Sector-Quarters

Table 5-7 Equal Weighted Changes in Holdings and Previous Quarter Returns

		Sells	Holds	Buys	Total
Negative Return	Count	7553	3409	7247	18209
	%	**41.5%**	**18.7%**	**39.8%**	**100.0%**
Positive Return	Count	8449	3457	7910	19816
	%	**42.6%**	**17.4%**	**39.9%**	**100.0%**
Total	Count	16002	6866	15157	38025
	%	**42.1%**	**18.1%**	**39.9%**	**100.0%**

Table 5-8 Statistics for Equal Weighted Changes in Holdings and Previous Quarter Returns

Chi-Square Statistic	
Significance Level	$p < 0.05$
Value	11.613
Degrees of Freedom	2
P-Value	0.003
Decision	Reject null hypothesis

Spearman Correlation	
Significance Level	$p < 0.05$
Value	-0.006
T Value	-1.145
P-Value	0.252
Decision	Cannot reject null hypothesis Cannot draw conclusion on direction of relationship

5.4.2 Sub-Hypothesis 1B (Same Quarter Returns)

H0: There is no relationship between quarterly changes in DGE unit trust fund holdings in a sector and sector specific returns from the same quarter.

HA: There is a relationship between quarterly changes in DGE unit trust fund holdings in a sector and sector specific returns from the same quarter.

Value Weighted Changes in Holdings for All Eligible Sector-Quarters

Table 5-9 Value Weighted Changes in Holdings and Same Quarter Returns

		Sells	Holds	Buys	Total
Negative Return	Count	127	174	139	440
	%	**28.9%**	**39.5%**	**31.6%**	**100.0%**
Positive Return	Count	186	146	142	474
	%	**39.2%**	**30.8%**	**30.0%**	**100.0%**
Total	Count	313	320	281	914
	%	**34.2%**	**35.0%**	**30.7%**	**100.0%**

Table 5-10 Statistics for Value Weighted Changes in Holdings and Same Quarter Returns

Chi Square Statistic	
Significance Level	$p < 0.05$
Value	12.356
Degrees of Freedom	2
P-Value	0.002
Decision	Reject null hypothesis

Spearman Correlation	
Significance Level	$p < 0.05$
Value	-.076
T Value	-2.298
P-Value	0.022
Decision	Reject null hypothesis Negative association

Equal Weighted Changes in Holdings for All Eligible Fund-Sector-Quarters

Table 5-11 Equal Weighted Changes in Holdings and Same Quarter Returns

		Sells	Holds	Buys	Total
Negative Return	Count	6987	3521	7794	18302
	%	**38.2%**	**19.2%**	**42.6%**	**100.0%**
Positive Return	Count	9134	3374	7523	20031
	%	**45.6%**	**16.8%**	**37.6%**	**100.0%**
Total	Count	16121	6895	15317	38333
	%	**42.1%**	**18.0%**	**40.0%**	**100.0%**

Table 5-12 Statistics for Equal Weighted Changes in Holdings and Same Quarter Returns

Chi-Square Statistic	
Significance Level	$p < 0.05$
Value	216.321
Degrees of Freedom	2
P-Value	0.000
Decision	Reject null hypothesis

Spearman Correlation	
Significance Level	$p < 0.05$
Value	-0.069
T Value	-13.526
P-Value	0.000
Decision	Reject null hypothesis Negative association

5.4.3 Sub Hypothesis 1C (Next Quarter Returns)

H0: There is no relationship between quarterly changes in DGE unit trust fund holdings in a sector and sector specific returns from the next quarter.

HA: There is a relationship between quarterly changes in DGE unit trust fund holdings in a sector and sector specific returns from the next quarter.

Value Weighted Changes in Holdings for All Eligible Sector-Quarters

Table 5-13 Value Weighted Changes in Holdings and Next Quarter Returns

		Sells	Holds	Buys	Total
Negative Return	Count	148	164	127	439
	%	**33.7%**	**37.4%**	**28.9%**	**100.0%**
Positive Return	Count	160	155	154	469
	%	**34.1%**	**33.0%**	**32.8%**	**100.0%**
Total	Count	308	319	281	908
	%	**33.9%**	**35.1%**	**30.9%**	**100.0%**

Table 5-14 Statistics for Value Weighted Changes in Holdings and Next Quarter Returns

Chi-Square Statistic	
Significance Level	$p < 0.05$
Value	2.327
Degrees of Freedom	2
P-Value	0.312
Decision	Cannot reject null hypothesis

Spearman Correlation	
Significance Level	$p < 0.05$
Value	0.021
T Value	0.637
P-Value	0.524
Decision	Cannot reject null hypothesis Cannot draw conclusion on direction of relationship between variables

Equal Weighted Changes in Holdings for All Eligible Fund-Sector-Quarters

Table 5-15 Equal Weighted Changes in Holdings and Next Quarter Returns

		Sells	Holds	Buys	Total
Negative Return	Count	7762	3304	7298	18364
	%	**42.3%**	**18.0%**	**39.7%**	**100.0%**
Positive Return	Count	8306	3562	7987	19855
	%	**41.8%**	**17.9%**	**40.2%**	**100.0%**
Total	Count	16068	6866	15285	38219
	%	42.0%	18.0%	40.0%	100.0%

Table 5-16 Statistics for Equal Weighted Changes in Holdings and Next Quarter Returns

Chi-Square Statistic	
Significance Level (two tailed)	$p < 0.05$
Value	1.005
Degrees of Freedom	2
P-Value	0.605
Decision	Cannot reject null hypothesis

Spearman Correlation	
Significance Level	$p < 0.05$
Value	0.005
T Value	0.991
P-Value	0.322
Decision	Cannot reject null hypothesis Cannot draw conclusion on direction of relationship between variables

5.4.4 Summary of Results for Hypothesis 1

The Sub-Hypothesis 1A null hypothesis could not be rejected for three of the four tests. In terms of value weighted trading, the p-values for the chi-square and Spearman correlation tests all exceeded the 0.05 significance level. The chi-square statistic for the equal weighted measure of unit trust trading was significant, but the corresponding Spearman correlation was not.

All hypothesis tests for same quarter returns and fund trading resulted in the rejection of the Sub-Hypothesis 1B null hypothesis. A statistically significant negative Spearman correlation was obtained for both the equal weighted and value weighted measures of trading, indicating a negative association between same quarter returns and changes in unit trust fund holdings.

The null form of Sub-Hypothesis 1C for next quarter returns could not be rejected in any of the four tests. The chi-square p-values were 0.312 and 0.605 for the value weighted and equal weighted trading measures respectively; the corresponding Spearman correlation p-values were 0.524 and 0.322. These results are summarised in Table 5-17.

Table 5-17 Summary of Findings for Hypothesis 1

Sub-Hypothesis Number		Basis of Measurement			
		Equal Weighted Trading		Value Weighted Trading	
		Chi-Square Statistic	Spearman Correlation	Chi-Square Statistic	Spearman Correlation
1A Previous Quarter Returns	**Reject H0?**	**Yes**	No	No	No
	p-value	**0.003**	0.252	0.222	0.298
1B Same Quarter Returns	**Reject H0?**	**Yes**	**Yes. Negative relationship**	**Yes**	**Yes. Negative relationship**
	p-value	**0.000**	**0.000**	**0.002**	**0.022**
1C Next Quarter Returns	**Reject H0?**	No	No	No	No
	p-value	0.605	0.322	0.312	0.542

5.5 Hypothesis 2 - Stock Picking Ability

H0: DGE unit trust funds have no sector picking ability

HA: DGE unit trust funds have sector picking ability

Table 5-18 Portfolio Performance - Annualised Abnormal Returns

Holding Period	Buys Portfolio					Sells Portfolio				
	Q0	Q1	Q1 to Q2	Q1 to Q3	Q1 to Q4	Q0	Q1	Q1 to Q2	Q1 to Q3	Q1 to Q4
Formation Quarter										
30 June 2009		14%	9%				4%	6%		
31 March 2009	-2%	-7%	3%	1%		-14%	-17%	-11%	5%	
31 December 2008	-7%	-1%	7%	11%	10%	110%	2%	-1%	1%	2%
30 September 2008	36%	2%	8%	3%	4%	19%	5%	23%	14%	13%
30 June 2008	-6%	19%	-13%	-6%	-4%	3%	-3%	9%	-3%	-1%
31 March 2008	41%	2%	3%	-2%	4%	-1%	13%	10%	12%	5%
31 December 2007	5%	10%	6%	2%	6%	13%	-21%	15%	26%	-4%
28 September 2007	-2%	4%	6%	7%	3%	39%	-1%	0%	0%	-2%
29 June 2007	12%	1%	-1%	-4%	-2%	-22%	-6%	-1%	7%	7%
30 March 2007	4%	-6%	1%	0%	6%	23%	18%	6%	4%	4%
29 December 2006	66%	60%	41%	22%	23%	19%	-12%	3%	6%	3%
29 September 2006	16%	-14%	-12%	-5%	-3%	-8%	3%	27%	36%	26%
30 June 2006	-9%	64%	30%	19%	23%	32%	38%	11%	0%	7%
31 March 2006	-59%	35%	26%	4%	-4%	16%	2%	16%	8%	5%
31 December 2005	30%	16%	8%	21%	10%	-2%	6%	4%	-10%	-13%
30 September 2005	-6%	17%	9%	12%	19%	17%	-108%	-84%	-91%	-77%
30 June 2005	12%	7%	-34%	-43%	-51%	8%	0%	-2%	-2%	-14%
31 March 2005	-9%	5%	8%	3%	8%	7%	-3%	-5%	-6%	-11%
31 December 2004	30%	-28%	-11%	-9%	-42%	7%	-26%	-7%	2%	8%
30 September 2004	-59%	40%	7%	14%	7%	65%	-8%	8%	1%	1%
30 June 2004	0%	-25%	-18%	-27%	-17%	5%	1%	-1%	-4%	-1%
31 March 2004	-8%	8%	11%	6%	2%	-5%	10%	12%	12%	23%
31 December 2003	-22%	25%	12%	1%	1%	88%	81%	26%	22%	25%
30 September 2003	-20%	-13%	-3%	-1%	-1%	80%	-23%	-23%	-19%	-14%
30 June 2003	2%	32%	13%	20%	12%	0%	-24%	2%	-1%	-1%
31 March 2003	13%	3%	-9%	-9%	-9%	-2%	5%	3%	0%	-7%
31 December 2002	-40%	-26%	-17%	-17%	-16%	-3%	6%	4%	4%	6%
Mean	**0.7%**	**9.1%**	**3.3%**	**0.9%**	**-0.5%**	**18.9%**	**-2.1%**	**1.8%**	**1.0%**	**-0.4%**

Note: The annualised abnormal returns were referenced to returns from a benchmark index of equal sector weightings (ESWI).

The main hypothesis have been broken down in three sub-hypotheses which were tested on the returns listed in Table 5-18 on page 49. The holding periods listed are inclusive of the starting and ending quarters. So the holding period "Q1 to Q3", for example, included three quarters: Q1(the formation quarter), Q2 and Q3 (the termination quarter).

5.5.1 Sub-Hypothesis 2A

H0: The sectors, into which DGE unit trust funds buy, do not subsequently outperform the market benchmark.

HA: The sectors, into which DGE unit trust funds buy, subsequently outperform the market benchmark

Table 5-19 Hypothesis Tests for Buys Portfolio over Different Holding Periods

Holding Period	Q0	Q1	Q1 to Q2	Q1 to Q3	Q1 to Q4
Null Hypothesis	$H_0: \mu$ 0%	$H_0: \mu$ 0%	$H_0: \mu$ 0%	$H_0: \mu$ 0%	$H_0: \mu$ 0%
Alternate Hypothesis	$H_A: \mu > 0\%$	$H_A: \mu > 0\%$	$H_A: \mu > 0\%$	$H_A: \mu > 0\%$	$H_A: \mu > 0\%$
Significance Level	$p < 0.05$	$p < 0.05$	$p < 0.05$	$p < 0.05$	$p < 0.05$
Sample Mean	0.7%	9.1%	3.3%	0.9%	-0.5%
Standard Deviation	28.1%	23.1%	15.5%	14.7%	17.1%
Standard Error	5.5%	4.4%	3.0%	2.9%	3.4%
Data Follows Normal Distribution	Yes	Yes	Yes	No	No
Degrees of Freedom	25	26	26	25	24
Type of Test	T-Test	T-Test	T-Test	WSRT	WSRT
t-value (T-test)	0.133	2.044	1.112		
z-value (WSRT)				0.7746	0.8207
p value (1-tailed)	0.447	0.026	0.138	0.219	0.206
Reject Null Hypothesis?	No	Yes	No	No	No

Note: WSRT in the table above represents the Wilcoxon Signed Rank Test for Difference in Medians

5.5.2 Sub-Hypothesis 2B

H0: The sectors, from which DGE unit trust funds divest, do not subsequently underperform the market benchmark.

HA: The sectors, from which DGE unit trust funds divest, underperform the market benchmark.

Table 5-20 Hypothesis Tests for Sells Portfolio over Different Holding Periods

Holding Period	Q0	Q1	Q1 to Q2	Q1 to Q3	Q1 to Q4
Null Hypothesis	H_0: μ 0%	H_0: μ 0%	H_0: μ 0%	H_0: μ 0%	H_0: μ 0%
Alternate Hypothesis	H_A: μ <0%	H_A: μ <0%	H_A: μ <0%	H_A: μ <0%	H_A: μ <0%
Significance Level	$p < 0.05$	$p < 0.05$	$p < 0.05$	$p < 0.05$	$p < 0.05$
Sample Mean	18.9%	-2.1%	1.8%	1.0%	-0.4%
Standard Deviation	32.5%	29.8%	20.3%	21.7%	19.4%
Standard Error	6.4%	5.7%	3.9%	4.3%	3.9%
Data Follows Normal Distribution	No	No	No	No	No
Degrees of Freedom	25	26	26	25	24
Type of Test	WSRT	WSRT	WSRT	WSRT	WSRT
z-value (WSRT)	2.730	-0.192	1.898	1.511	0.686
p value (1-tailed)	0.998	0.424	0.971	0.935	0.754
Reject Null Hypothesis?	No	No	No	No	No

Note: WSRT in the table above represents the Wilcoxon Signed Rank Test for Difference in Medians

5.5.3 Sub-Hypothesis 2C

H0: The sectors, into which DGE unit trust funds buy, do not subsequently outperform the sectors from which DGE unit trust funds divest.

HA: The sectors, into which DGE unit trust funds buy, subsequently outperform the sectors from which DGE unit trust funds divest

Table 5-21 Hypothesis Tests for Difference in Returns of Buys and Sells Portfolios

Holding Period	Q0	Q1	Q1 to Q2	Q1 to Q3	Q1 to Q4
Null Hypothesis	$H_0: \mu_B - \mu_S$ 0%	$H_0: \mu_B - \mu_S$ 0%	$H_0: \mu_B - \mu_S$ 0%	$H_0: \mu_B - \mu_S$ 0%	$H_0: \mu_B - \mu_S$ 0%
Alternate Hypothesis	$H_A: \mu_B - \mu_S$ >0%	$H_A: \mu_B - \mu_S$ >0%	$H_A: \mu_B - \mu_S$ >0%	$H_A: \mu_B - \mu_S$ >0%	$H_A: \mu_B - \mu_S$ >0%
Significance Level	$p < 0.05$	$p < 0.05$	$p < 0.05$	$p < 0.05$	$p < 0.05$
Mean Difference	-18.1%	11.1%	1.6%	-0.1%	-0.1%
Standard Deviation	49.8%	35.5%	24.9%	27.9%	27.5%
Standard Error	9.8%	6.8%	4.8%	5.5%	5.5%
Data Follows Normal Distribution	No	No	No	No	No
Degrees of Freedom	25	26	26	25	24
Type of Test	WSRT	WSRT	WSRT	WSRT	WSRT
z-value (WSRT)	-1.206	1.538	-0.240	-0.572	-0.336
p value (1-tailed)	0.886	0.062	0.595	0.716	0.632
Reject Null Hypothesis?	No	No	No	No	No

Note: WSRT in the table above represents the Wilcoxon Signed Rank Test for Difference in Medians

5.5.4 Summary of Results for Hypothesis 2

Only the Q1 Buys portfolio with single quarter holding period demonstrated a statistically significant abnormal return. None of the results of the Sells portfolio were significant; neither were the differences in returns between the Buys and Sells portfolios.

Table 5-22 Summary of Results for Testing of Hypothesis 2

Sub-Hypothesis		Holding Period				
		Q0	Q1	Q1 to Q2	Q1 to Q3	Q1 to Q4
2A **Buys**	**Reject H0?**	No	**Yes**	No	No	No
	p-value	0.447	**0.026**	0.138	0.219	0.206
2B **Sells**	**Reject H0?**	No	No	No	No	No
	p-value	0.998	0.424	0.971	0.935	0.754
2C **Buys-Sells**	**Reject H0?**	No	No	No	No	No
	p-value	0.886	0.062	0.595	0.716	0.632

5.6 Hypothesis 3 - Trading Rules

H0: A trading rule mimicking the value weighted buying by DGE unit trusts in JSE sectors cannot outperform the market.

HA: A trading rule mimicking the value weighted buying by DGE unit trusts in JSE sectors can outperform the market.

The trading rules described on page 32 in the methodology section were graphed on the following pages. Two additional curves were included for performance comparison:

1. An equal sector-weightings index (ESWI) which consisted of equal weightings of all sector indices. This was analogous to the equally weighted index used by Cubbin *et al* (2006) in a similar trading rule assessment.

2. The FTSE/JSE All Share Index (ALSI). This has been scaled to a starting value of one at the end of September 2009, to aid comparison with the trading rule portfolios.

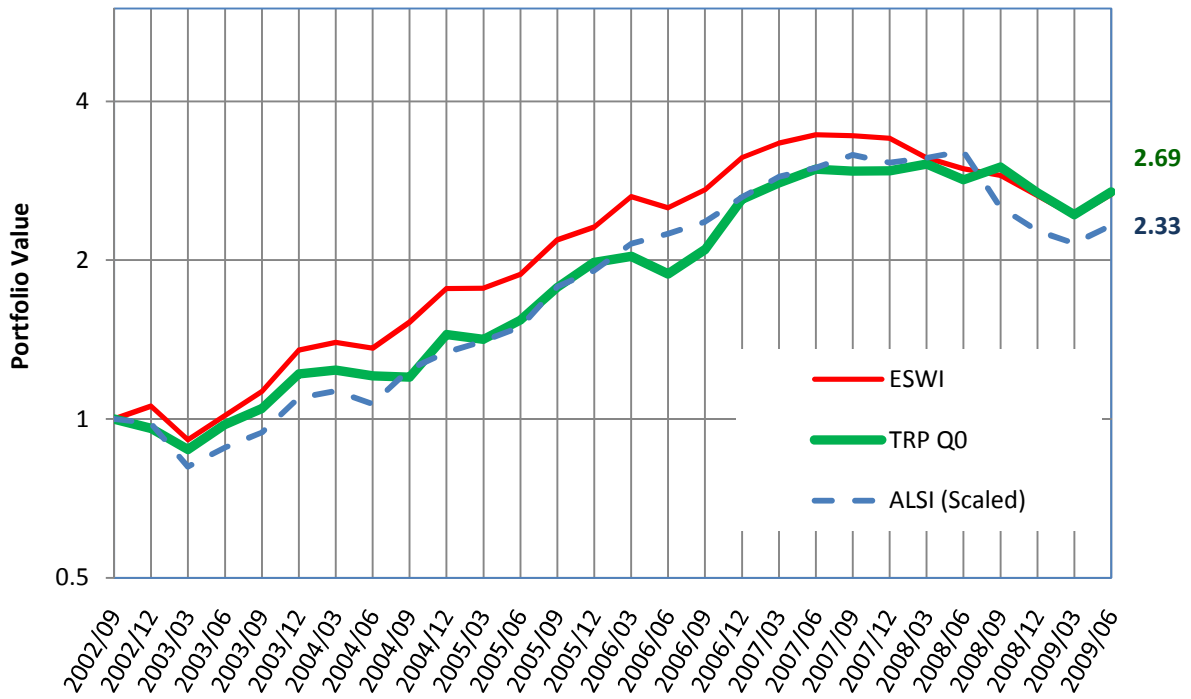**Figure 5-7 Trading Rule Portfolio Q0 (Single Quarter Holding Period)**

Figure 5-8 Trading Rule Portfolio Q1 (Single Quarter Holding Period)
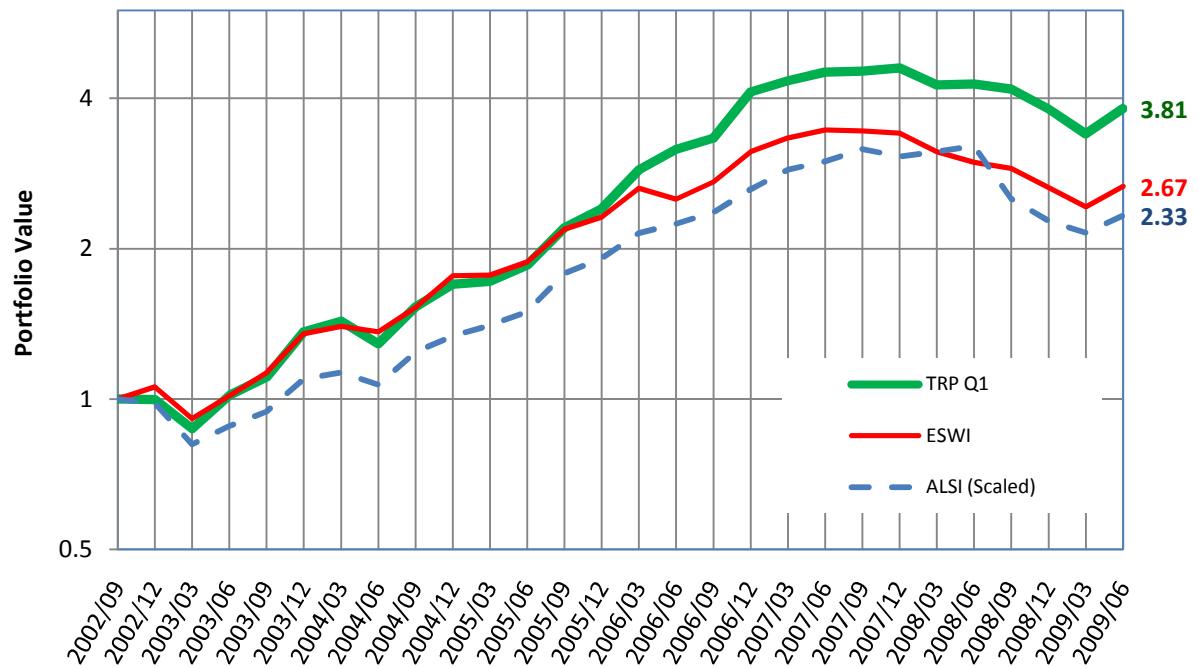
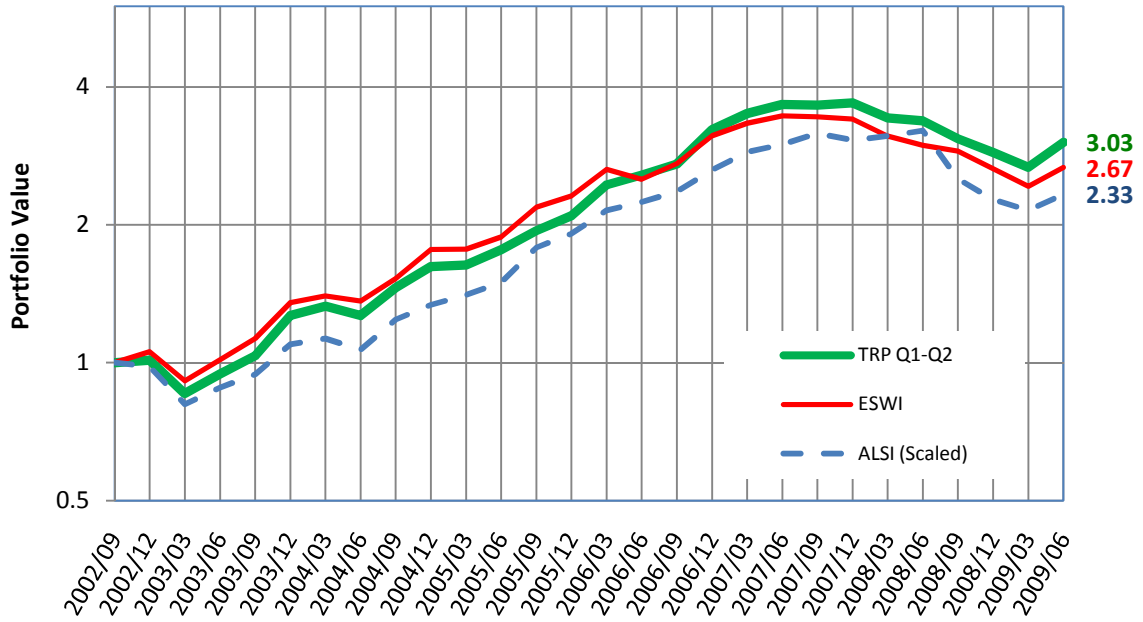**Figure 5-9 Trading Rule Portfolio Q1-Q2 (Two Quarter Rolling Holding Period)**

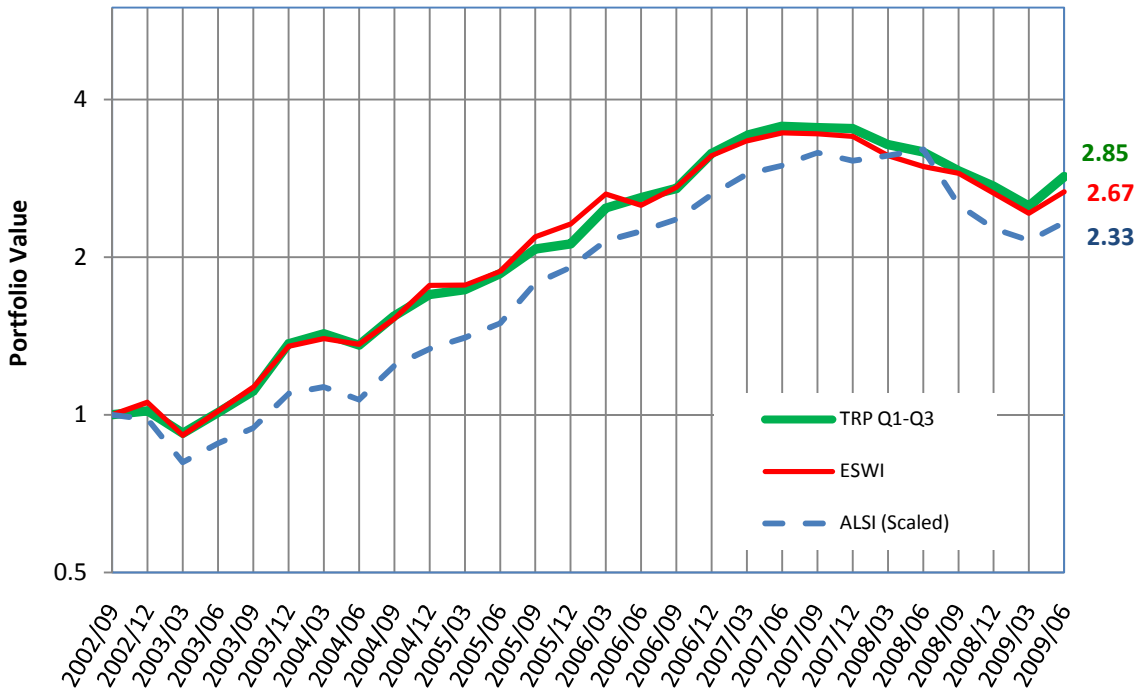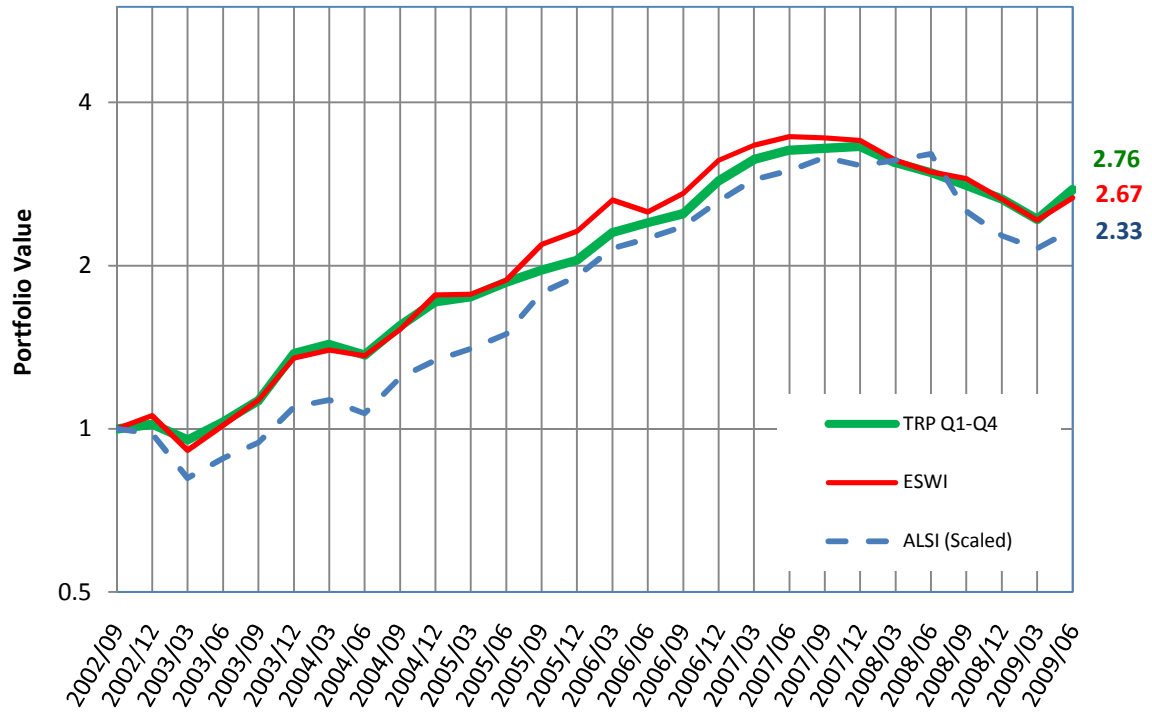**Figure 5-10 Trading Rule Portfolio Q1-Q3 (Three Quarter Rolling Holding Period)**

Figure 5-11 Trading Rule Portfolio Q1-Q4 (Four Quarter Rolling Holding Period)

5.6.1 Summary of Results for Hypothesis 3

Evidence for the rejection of the null hypothesis, that a trading rule mimicking the value weighted buying by DGE unit trusts in JSE sectors cannot outperform the market, is presented in the table below.

Table 5-23 Tabulation of Trading Rule Portfolio Performance

Description	Trading Rule Portfolio					Benchmark	
	TRP Q0	TRP Q1	TRP Q1-Q2	TRP Q1-Q3	TRP Q1-Q4	ESWI	ALSI
Start Value (R)	1	1	1	1	1	1	1
End Value (R)	2.69	3.81	3.03	2.85	2.76	2.67	2.33
Average Number of Sectors in Portfolio	10	10	17	21	24		
Max Portfolio Value Allocated to Any Sector	79.8%	79.8%	43.4%	37.8%	30.0%		
Effective Annual Return	15.8%	21.9%	17.8%	16.8%	16.2%	15.6%	13.3%
Annual Abnormal Return with Respect to ESWI	0.17%	6.30%	2.21%	1.16%	0.60%		
Six-Monthly Average Return	8.6%	11.6%	9.4%	8.7%	8.3%	8.2%	7.7%
Six-Monthly Standard Deviation	14.6%	16.8%	15.2%	14.3%	12.8%	14.6%	15.6%
Six-Monthly Sharpe Ratio	0.296	0.434	0.333	0.309	0.309	0.265	0.216
Annual Turnover Ratio	3.02	3.02	1.51	1.01	0.75		
Level of Significance of Positive Abnormal Quarterly Returns (see Table 5-19)	0.447	0.026	0.138	0.219	0.206		
Reject Null Hypothesis	No	Yes	No	No	No		

Note: Format of table adapted from Du Plessis and Ward (2009)

Average risk free rate (R153) = 8.8%

P-values recorded in the Buys portfolio listed in Table 5-19 indicate the level of significance of positive abnormal returns for each trading rule with the corresponding holding period.

6 Discussion of Results

6.1 Hypothesis 1 - Holdings and Returns

6.1.1 Sub-Hypothesis 1A (Previous Quarter Returns)

Value Weighted Measures

The cross tabulation in Table 5-5 indicates that the frequency of Sells for negative returns (31.7% of the row total) is lower than the expected 34.3%, while Sells paired with positive returns (36.5% of the row total) occur more frequently than expected. The frequency of Sells thus increased in moving from negative to positive previous quarter returns. This is depicted graphically in the bar chart, Figure 5-1 on page 39.

The frequency of Holds exhibits the opposite behaviour to Sells, decreasing from 37.5% (greater than the expected 35.1%) to 32.9% (less than expected) when switching from negative to positive previous quarter returns.

The graphic shows that the frequency of Buys remains virtually tied on the returns variable; and within 0.2 percentage points of the expected value (30.6%). Most of the variation occurs in the Sells and Holds ranks of the changes in holdings variable, and not in the Buys rank.

The variation from expected values was not sufficiently large, however, to be statistically significant. The chi-square test p-value of 0.222 was above the stipulated 0.05 significance level. The negative Spearman correlation value of

-0.035 was also not statistically significant. Consequently, no conclusions could be drawn about the existence of a relationship between unit trust trading and previous quarter returns.

Equal Weighted Measures

The same trends observed in Figure 5-1 for the value weighted holdings appeared in the corresponding graph for equal weighted trading in Figure 5-4. The frequency of Sells increased from below expected for negative returns (41.5%) to above expected for positive returns (42.6%). Conversely, the frequency of Holds decreased from 18.7% (above the expected 18.1%) to 17.4% (below expected). Again, the frequency of Buys remained approximately the same as the expected value (within 0.1% of the expected 39.9%) for both the negative and positive returns categories.

Although the relative differences between the observed and expected frequencies were smaller for the equal weighted cross tabulation (Table 5-7) than the corresponding value weighted cross tabulation (Table 5-5), the equal weighted chi-square statistic was significant, while the value weighted statistic was not. The greater number of observations from 38025 eligible fund-sector-quarters used in the equal weighted measure as opposed to 906 sector-quarters used in the value weighted cross tabulation was the reason for the difference.

The null hypothesis for independence of the returns and trading variables was rejected; but the Spearman correlation for the strength and direction of relationship was not statistically significant. The conclusion drawn was that a relationship existed between previous quarter returns and equal weighted fund trading; but the strength

and direction of the relationship as determined by the Spearman correlation was not statistically significant. A tentative deduction from the cross tabulations was that funds were more likely to sell when returns from the previous quarter were positive; than when they were negative. Correspondingly, they were less likely to hold when returns were positive in the previous quarter, than when they were negative. There was no appreciable difference between the frequencies of buying when previous quarter returns were negative or positive.

The evidence from the cross tabulations did not support the Feedback Trading Hypothesis whereby positive sector returns in the previous quarter should lead to increased buying in the current quarter; or conversely, negative returns in the previous quarter should lead to more selling in the current quarter. In fact the opposite occurred, where negative returns in the previous quarter were associated with a greater propensity to hold, and positive returns in the previous quarter were associated with an increased frequency of selling.

These results are in agreement with the findings of Goetzmann and Massa (2003) as well as Edelen and Warner (2001) in their studies of US mutual funds; but in conflict with Cai and Zheng (2004) who found that stocks which experienced the most significant buying by mutual funds had positive returns over the four preceding quarters; while those with the most intense selling had negative returns in prior quarters. This might have been due to a difference in measures: the cross tabulation results were based on trading and returns at the sector level, while the findings of Cai and Zheng arose from the study of trading in individual shares.

6.1.2 Sub-Hypothesis 1B - Same Quarter Returns

Value Weighted Measures

The same trend observed in Figure 5-1 for previous quarter returns, was repeated for same quarter returns in Figure 5-2, but the variation from the expected frequencies was more pronounced. The frequency for Sells during quarters with negative returns was 28.9% of the row total, compared to an expected 34.2%. During quarters with positive returns, the relative frequency of Sells increased to 39.2%. The frequency of Sells thus diminished when same quarter returns were negative and increased when returns when positive. The frequency of Holds complemented the frequency of Sells with a high of 39.5% versus an expected 35.0% when returns were negative, and an unexpected low of 30.8% when returns were positive.

Changes in the relative frequency of Buys with negative or positive returns were not as pronounced as that of Sells or Holds. The frequency of Buys during quarters with negative returns was 31.6% (marginally higher than the expected 30.7%) and 30.0% when returns were positive (less than expected).

The chi-square test statistic was significant with a p-value of 0.002, enabling the rejection of the null hypothesis for independence between the returns and changes in holdings variables. A statistically significant Spearman correlation of -0.076 indicated a weak negative relationship between same quarter returns and changes in unit trust sector holdings. Negative returns were associated with increases in buying and holding, while positive returns were associated with increases in selling.

Equal Weighted Measures

The results of the equal weighted measures cross tabulation in Figure 5-5 and Table 5-11 supported the value weighted results; but the difference between the observed (42.6%) and expected (40.0%) frequency of Buys during quarters with negative returns was more pronounced. There was also a corresponding decrease in the frequency of Buys to 37.6% when returns were positive, which was more pronounced than the value weighted measure.

The pattern of Holds matched the pattern of Buys. When returns were negative, Holds were more frequent than expected (19.2% versus 18.0%); when returns were positive they were less frequent than expected (16.8%) making way for increased selling (45.6% versus the expected 42.1%). The observed frequency of Sells decreased to 38.2% when returns became negative.

The larger number of observations (38333) in the equal weighted cross tabulation contributed to lower p-values for the chi-square statistic (p-value=0.000) and Spearman correlation (p-value =0.000). This provided much stronger evidence for rejecting the null hypothesis of no association between returns and changes in holdings.

The Spearman correlation value of -0.069 confirmed the same weak negative relationship, between contemporaneous returns and changes in holdings, that was obtained for the value weighted results.

Comparison with Findings from Other Studies

The negative relationship between returns and changes in sector holdings support neither the information hypothesis, nor the Feedback Trading Hypothesis nor the price pressure hypothesis. All three hypotheses imply a positive relationship between returns and increases in mutual fund holdings.

This negative relationship between contemporaneous returns and changes in holdings conflicts with the findings of Nofsinger and Sias (1999). Their findings were based on shorter sampling intervals, which may partially account for the difference. Subsequent work by Sias, Starks and Titman (2006), however, examined quarterly US mutual fund holdings data (the equivalent to the sampling interval used in this study) and also arrived at the same conclusion – that changes in mutual fund holdings were positively related to share returns.

A potential source of the discrepancy is the fact that Sias *et al* studied behaviour at the level of individual shares, while the present research analyses sector level holdings and returns; but perhaps more significant is the difference in the proportion of the market held by held by US funds compared to local DGE unit trusts. The former owned approximately 25% of the capitalisation of US markets (WFE,2008), while the DGE unit trusts owned only 1.5% of JSE market capitalisation in 2008 (ASISA,2009).

Sias *et al* (2006) have attributed their findings to the information advantage held by mutual funds and other institutional investors. As mutual funds conducted trades, prices adjusted to reflect the new information. The authors also suggested that

institutional demand causes prices to rise in accordance with the price pressure hypothesis. According to this theory an increase in US mutual fund demand has the potential to increase prices to a much greater extent than demand from South African DGE unit trusts which own less than two percent of JSE listed shares, compared to mutual funds which hold 25% of US stock markets.

The negative returns versus changes in holdings relationship also stands out against studies conducted at the level of overall market returns and mutual fund flows. Kadiyala (2004), Edelen and Warner (2001), Fant (1999) , Edwards and Zhang (1998), Warther (1995) and Hendriks *et al*(1990) found a positive relationship between aggregate US mutual fund flows and overall contemporaneous equity market returns. Such findings were not only limited to US studies. Alexakis *et al* (2005) found a positive contemporaneous returns relationship on the Athens Stock Exchange, as did Ben-Rephael *et al* (2009) in their study of Israeli mutual funds. Locally, Rudman (2008) also reported similar results for South African DGE unit trusts.

The negative relationship between abnormal returns and changes in unit trust holdings at the sector level is not, however, incompatible with a positive contemporaneous relation between actual returns and mutual fund flows at the overall market level. The abnormal sector returns in this study were relative to the benchmark market return. It was thus possible to have negative abnormal sector returns coexisting with a positive market return.

The relationship observed for previous quarter returns also applied to same quarter returns: Sells were more frequent when returns were positive, and Holds or Buys were more frequent when returns were negative. Therefore, the observed frequencies of Sells and Buys recorded in the cross tabulations for contemporaneous returns were consistent with these transactions having occurred once stock prices had changed. In other words the unit trusts were likely to have traded after the negative or positive quarter-on-quarter returns became apparent, and not before. This has been deduced in spite of the three month gap in successive sets of quarterly data, which limited the ability to determine whether trades in the quarter occurred before or after the tabulated returns could be realised. If this were not the case, and changes in holdings were more likely to have occurred before the negative of positive nature of the quarterly return became apparent, the results for next quarter returns should also demonstrate the same relationship – but they do not. In fact, there was no significant relationship between next quarter returns and changes in holdings.

In their pioneering study of loss aversion behaviour, Shefrin and Statman (1985, p788) observed the disposition of US mutual funds to "sell winners and ride losers". This appears to be the case for South African DGE unit trusts which sold their sector holdings more frequently than expected when returns were positive, and less frequently than expected when returns were negative.

Odean (1998) and Barber, Lee, Liu and Odean (2007) also found strong evidence of loss aversion behaviour. However, their findings were limited to individual investors only. The mutual funds which were included in the latter study (based on the

Taiwanese Stock Exchange) exhibited no reluctance to sell losers or predisposition to sell winners in contrast to the behaviour demonstrated by DGE unit trusts.

6.1.3 Sub-Hypothesis 1C - Next Quarter Returns

Value Weighted Measures

The chi-square test statistic for the next quarter value weighted cross tabulation in Table 5-14 was not significant (p-value = 0.312). The same applied for the Spearman correlation (p-value = 0.524). The null hypothesis, for changes in holdings being independent of returns, could not be rejected.

Unlike the previous results for same quarter returns, which yielded a greater than expected frequency of buying during periods with negative returns, these had greater than expected buying in the quarter preceding a positive return; and less than expected buying in quarters preceding negative returns. The difference between these observed and expected frequencies, however, was too small to be significant. Patterns of selling deviated no more than 0.2 percentage points from the expected row frequencies; the frequency of holding flexed by 2.3 percentage points more for quarters preceding negative returns and 2.1 percentage points for quarters preceding positive returns.

Unlike the cross tabulations relating to sub-hypotheses 1A and 1B, where the frequency of buying exhibited the lowest relative deviation from the expected values, selling exhibited the smallest variation in the value weighted tabulation for sub-hypothesis 1C.

Equal Weighted Measures

The deviation from expected frequencies in the equal weighted cross tabulation shown in Table 5-16 (and graphically in Figure 5-6) were less pronounced than the corresponded value weighted results in Table 5-13. Both the chi-square test statistic and the Spearman correlation in Table 5-16 were not significant (with p-values 0.605 and 0.322 respectively). The null hypothesis for independence of changes in holdings with respect to next quarter returns could not be rejected.

The lack of association between the two variables was clear in Figure 5-6 where the bars for negative and positive returns showed little apparent variation from the expected values.

Comparison to Findings from Other Studies

The equal weighted measures yielded no apparent association between changes in holdings and next quarter returns. In contrast, the value weighted measure showed a slight increase in the frequency of buying for positive next quarter returns, and a reciprocal decrease in buying for negative next quarter returns; but these results were not statistically significant. They appear to be leaning towards the findings of positive future returns versus changes in holdings by Gompers and Metrick (2001), Sias *et al* (2006), Froot and Teo (2008) and Yan and Zhang (2009).

6.1.4 Sensitivity of Results to the 0.1% Threshold Criterion

The main results summary in Table 5-17 was based on a 0.1% threshold criterion for categorising changes in holdings into Buys, Holds and Sells. Alternate results are presented in the Appendix using a 0.01% and 0.5% threshold criterion (refer to Table 9-3 and Table 9-4 and graphs in Figure 9-1 to Figure 9-12). The following can be concluded about the affect on the results due to variation in the threshold criterion:

- The direction of the association between changes in holdings and same quarter returns was not affected. The association remained negative as demonstrated by the negative (and significant) Spearman correlation result in Table 9-3 and Table 9-4.

- In general, the significance of the chi-square test results decreased with decreases in the threshold criterion. When the threshold criterion was set at 0.01%, the only remaining significant association was that between same quarter returns and equal weighted changes in holdings. At a threshold criterion of 0.1% there were three significant relationships at the 0.05 level. When the threshold criterion was increased to 0.5%, the same three associations remained significant, together with the association between equal weighted changes in holdings and next quarter returns.

It was decided to retain 0.1% as the threshold criterion for the main results. At this value, the criterion divided up the sample of value weighted observations into approximately equal proportions of around one third. The 0.01% and 0.5% criterion both yielded categories which failed to divide up the sample into even allocations.

6.2 Hypothesis 2 - Sector Picking Ability

6.2.1 Sub-hypothesis 2A – Buys Portfolio

The annualised abnormal returns for the Buys Portfolio are given in the left hand section of Table 5-18. The returns on portfolios with holding periods of one, two, three and four quarters are listed. Portfolio Q0 was based on the net weighted buying of sectors by DGE funds during the formation quarter. The remaining Buys portfolios Q1; Q1 to Q2; Q1 to Q3 and Q1 to Q4 were based on the weighted buying of unit trusts in the quarter prior to the formation quarter.

The one tailed null hypothesis for mean returns less than or equal to the sector picking benchmark was only rejected for Buys portfolio Q1, with a T test statistic of 2.044 and a single tailed p-value of 0.026. The test statistics for the portfolios with holding periods exceeding one quarter were not significant. The superior performance exhibited by sectors into which funds bought on a value weighted basis is evidence that unit trust funds do have stock picking ability; but that the stocks chosen only exhibit short run superior performance over the following quarter. Holding periods of two, three and four quarters do not exhibit significantly superior performance. This suggests that a trading rule based on the sector picking of unit trust funds should limit its holding period to a single quarter.

The evidence of stock picking ability on the Q1 Buys Portfolio is in agreement with results of the study by Chen et al (2000), although their Buys portfolios continued superior performance beyond the first quarter. The mean return of the Q0 Buys Portfolio (0.7%), which was not significantly different from zero, does not support the

contention that DGE unit trusts engage in momentum trading. If the unit trust did engage in momentum trading, a significantly positive mean return on the Q0 Buys Portfolio would be expected, indicating purchasing of those stocks with superior prior performance.

6.2.2 Sub-hypothesis 2B – Sells Portfolio

Results for the Sells Portfolio are displayed in the right hand section of Table 5-18. The one tailed null hypothesis for mean returns greater than or equal to the sector picking benchmark was not rejected for any of the holding periods. In fact the mean return on the Sells Portofolio Q0 holding period (18.9%) was actually greater than zero (at a significance level of 0.002), in contradiction to the negative value anticipated by the formulation of the directional null hypothesis, as derived from the findings of Chen *et al*. This provided additional evidence of the loss aversion behaviour of DGE unit trusts selling in those sectors with superior recent returns.

6.2.3 Sub-hypothesis 2C – Buys Portfolio vs Sells Portfolio

The null hypothesis 2C that the return of Buys Portfolio was not larger than that of the Sells Portfolio was not rejected for any of the holding periods. The most significant p-value of 0.062 occurred for the Q1 holding period. Although the Buys Portofolio average return was 9.1% greater than the -2.1% of the Sells Portfolio for holding period Q1, the non-normality of the returns sample for the Sells Portfolio necessitated a non parametric test – the Wilcoxon Signed-Rank Test for Difference in Medians – for testing the null hypothesis. The imprecision of the parametric test,

combined with the high degree of variation in the sample, reduced the significance of the results.

Chen *et al* (2000) found a sustained, significant difference between mutual fund Buy and Sell portfolios sustained over a four quarter holding period; the results from this study of DGE unit trusts indicated a difference that was most significant for the Q1 holding period (0.062) but which at no stage satisfied the 0.05 significance criterion. The Q1 to Q2 difference had the expected sign, but was not significant. The Q0, Q1 to Q3 and Q1 to Q4 holding periods exhibited differences in mean returns that were the opposite of that expected by the alternate hypothesis.

6.3 Hypothesis 3 - Trading Rules

6.3.1 Choice of Benchmark

The graphs show that the value of the ALSI benchmark lagged behind the ESWI for almost the entire duration of the study, apart from the three month period around June 2008 at the market peak.

The ALSI was a market capitalisation weighted benchmark, and the JSE was dominated by large companies in the resources sector. The ALSI was, therefore, biased towards large companies in a limited number of sectors (Kruger and Van Rensburg, 2008). The ESWI had equal weightings of all sectors, so it was not dominated by the large resource companies on the JSE. The small-firm effect, which Banz (1981) and Zarowin (1990) found to predict higher returns generated by small capitalisation companies on US stock markets, could possibly have accounted for

the superior performance of the ESWI benchmark with respect to the ALSI. It was thus more appropriate to compare the performance of the trading rule portfolios against the ESWI benchmark than the ALSI.

6.3.2 Trading Rule Portfolio Performance

The plots in Figure 5-7, Figure 5-8, Figure 5-9, Figure 5-10 and Figure 5-11 showed the cumulative results of the five different trading rules; which were summarised in Table 5-23. All portfolios started with an initial investment of R 1 at the end of September 2002 and terminated on the last day of June 2009.

TRP Q0 underperformed the ESWI until September 2008 when it surpassed this reference portfolio, finishing at R 2.69 with an overall annual return of 15.8%. The ESWI closed the period at 15.6%, only fractionally below Portfolio Q0 portfolio. The latter was the worst performing of the trading rule portfolios both it terms of final value and the risk adjusted Sharpe-ratio.

TRP Q1 was optimal in terms of pure return and risk adjusted return: its 21.9% effective annual return was the highest of all portfolios and 6.3% above the benchmark ESWI. TRP Q1 recorded the greatest variation in six-monthly average returns (with a 16.8% standard deviation); but its high returns more than adequately compensated for the variation. The TRP Q1 Sharpe-ratio of 0.434 surpassed the 0.265 of the ESWI and the 0.216 of the ALSI.

A trend emerged of reducing returns with increases in trading rule holding period. The two quarter holding period Q1-Q2 portfolio (TRP Q1-Q2) returned an effective

17.8% annually, lower than TRP Q1, but higher than the ESWI. TRP Q1-Q3 returned 16.8% annually, lower than TRP Q1-Q2, but above the ESWI. TRP Q1-Q4 returned 16.2%, lower than TRP Q1-Q3, but still slightly higher than the ESWI.

The trading rules which included a larger average number of sectors in their portfolios appeared to track the ESWI benchmark more closely. This is apparent from comparison of the charts for portfolios TRP Q0 and TRP Q1, which held 10 sectors on average, to those of TRP Q1-Q2, TRP Q1-Q3 and TRP Q1-Q4 which held between 17 and 24 sectors on average.

All trading rules with differing holding periods outperformed the market. The trading rule for TRP Q0 was impossible to implement as it required foreknowledge of unit trust sector buying at the start of the quarter in which the buying was to occur, unlike the other portfolios which replicated weighted sector buying by unit trust from the previous quarter.

The returns of TRP Q1 were based on the same quarterly returns of the Buys Portfolio with a single quarter holding period (as shown in Table 5-18). These quarterly returns demonstrated a mean effective annual abnormal return that was significantly greater than zero with a one tailed p-value of 0.026. The superior performance of TRP Q1 with respect to the benchmark was thus statistically significant; providing evidence for rejection of the null hypothesis. A trading rule mimicking the value weighted buying by DGE unit trusts in JSE sectors could outperform the market.

The trading rules confirmed the sector picking ability of unit trusts for one quarter holding periods, but their ability to choose sectors with positive abnormal performance diminished as the holding period increased.

The trading rules were tested over a relatively short period of 6.75 years. Even TRP Q0, which demonstrated the best performance, consistently exceeded the cumulative return of benchmark only in the second half of the test period. A longer testing period would have been preferable.

A constraint to the implementation of the trading rule was the delay between quarter end and the release of the relevant DGE unit trust sector holding data. At the time of writing, it was ASISA policy to only release sector holdings, 30 days after the close of the quarter (Du Plooy, 2009/09/16). It was not determined how this 30 day delay in implementation of the trading rule would affect the portfolio returns.

It was unfortunate that TRP Q1, with the best calculated performance, recorded the highest turnover ratio (3.02). In comparison, the average turnover ratio for all US stock market participants in 1997 was significantly lower at 0.50, with mutual fund specific turnover equal to 0.77 (Barber and Odean, 2000). The high turnover ratio on TRP Q1 resulted from quarterly re-balancing to maintain a composition of sectors matching unit trust buying in the previous quarter. The burden of transaction costs have not been included in the present analysis, but would severely impact the profitability of the trading rule.

There were also implications relating to fund size and liquidity. Maintaining a portfolio with sector holdings designed to mimic unit trust fund sector buying patterns would require holdings in all companies comprising the relevant sector index. The feasibility of maintaining such holdings would be affected by capital availability, the liquidity of infrequently traded stocks and transaction costs. Investing in exchange traded index tracker funds could be a viable alternative to maintaining direct holdings, but the availability of such funds is limited to a few sectors (Laing, 2009).

7 Conclusion

7.1 Holdings and Returns

Evidence was found for a relationship between previous quarter returns and changes in equal weighted unit trust sector holdings. There were higher frequencies of buying when abnormal returns in the previous quarter were positive. Negative previous quarter returns were associated with reduced buying and increased holding of sectors. This finding contradicted the Feedback Trading Hypothesis which predicted increased frequencies of buying following positive past returns.

There was a negative relationship between same quarter returns and changes in unit trust holdings for both value weighted and equal weighted measures. The negative same quarter returns relationship was more pronounced than the relationship between previous quarter returns and changes in holdings. This finding at the sector level of unit trust holdings represented a notable departure from the positive correlation observed by Nofsinger and Sias (1999) and Sias *et al* (2006). These two studies measured changes in holdings at the level of individual stocks, not sectors. In addition, they were conducted in US stock markets where mutual funds owned a greater share of all stocks (25%) in comparison to the JSE where DGE unit trusts held only 1.5%.

Studies conducted at the level of overall market returns by Ben-Rephael *et al* (2009), Rudman (2008) and Kadiyala (2004) also documented a positive relationship between returns and flows into mutual funds from individual investors; which, again, contrasted with the sector level findings.

The findings of a negative association between returns and changes in holdings provided no support for the Information Hypothesis, Positive Feedback Trading Hypothesis or the Price-Pressure Hypothesis; all of which would predict the exact opposite. A plausible explanation for the negative relationship is loss aversion behaviour. The result of this is a tendency to hold stocks with negative returns to avoid realising a loss, and to sell stocks with positive returns to achieve a more immediate gain. This type of behaviour is consistent with the results from previous and same quarter returns.

There was no apparent association between next quarter returns and changes in holdings. If this association was found to have been positive, it would have provided additional evidence for the sector picking ability of unit trusts.

These findings, derived from 29 quarters of data from June 2002 to June 2009, should be tested over a longer time span, to determine if there are conditions under which the negative relationship no longer holds. ASISA have fund asset allocation data available from 1980, although changes in JSE sector classifications have complicated the quarter on quarter comparison of holdings information (Du Plooy, 2009/11/09).

In light of the lack of agreement between the sector findings for South African DGE unit trusts and results from studies of US mutual funds, it is important to replicate the US studies on South African unit trusts at the individual share level. This would, of course, apply only to those funds which have made detailed holdings information

available. This should illustrate if the negative relationship between sector holdings and returns is an anomaly, or if it also appears at the level of individual shares.

Access to historic holdings information of unit trusts at the level of individual stocks would also allow for exact calculation of the quarter on quarter changes in unit trust fund sector holdings; in this study they were merely approximated. Detailed holdings information would permit an assessment of the estimating error, and verification of the quarterly sector findings.

Finally, recourse to the records of brokerage houses could overcome the problem associated with the quarterly sampling intervals. Access to the selling prices of stocks by unit trust funds, could verify whether the selling associated with positive abnormal returns occurs after prices have risen or before. If prices were found to have risen after selling, this would point to the negative market timing ability of unit trusts reported by Volkman (1999) and Edelen (1999), instead of the presently hypothesised loss aversion behaviour.

7.2 Sector Picking Ability

In spite of a lack of evidence for a relationship between from next quarter returns and changes in holding relationship, hypothesis testing on the Buys and Sells portfolios indicated unit trusts had sector picking ability. The Buys Portfolio, consisting of value weighted sector purchases from the preceding quarter, generated statistically significant positive quarterly abnormal returns. The sector picking ability was limited to holding periods of one quarter only; sectors held for longer generated diminishing returns.

The Q0 Sells portfolio, which replicated same-quarter selling by unit trusts, generated significantly positive returns. This was further evidence of loss aversion behaviour by unit trusts: selling stocks with positive returns and holding those with negative returns.

7.3 Trading Rules

The results of the trading rule portfolios followed intuitively from evidence presented for the sector picking ability of unit trusts. As predicted by the average quarterly returns of the Buys Portfolios (in Table 5-18), the trading rule cumulative returns (in Table 5-23) also decreased with increasing holding periods.

The trading rule with a one quarter holding period (TRP Q1) generated the highest cumulative return over a 27 quarter period from the end of September 2002 to the end of June 2009. Its terminal value was 43% greater than the benchmark. A trading rule mimicking the value weighted buying by DGE unit trusts in JSE sectors was thus shown to outperform the relevant market benchmark.

Generating abnormal returns with a one quarter holding period was shown to be possible in principle; but the limited holding period created problems for practical implementation. Additional transaction costs would be incurred by the necessary quarterly portfolio rebalancing. There is scope for future work in quantifying the impact of these transaction costs.

Because of constraints on market liquidity and capital availability, it may not be feasible to buy every stock in each relevant sector in order to match unit trust fund buying. An interesting avenue for exploration would be retesting the trading rules using a reduced amount of representative stocks from each sector, instead of attempting to replicate the weightings of the sector index.

The trading rule was tested over a relatively short period of 6.75 years, during which it matched the performance of the benchmark for the first 3.25 years. It was only over the second half of the period that it outperformed. This lack of consistency needs to be investigated further for longer periods of time.

Another limitation of this study was the survivorship bias introduced by reliance on the FTSE/JSE sector indices for calculating the historic trading rule returns. These indices excluded delisted shares which impacted the actual realisable returns. The use of a JSE database free of survivorship bias, as compiled by Cubbin *et al* (2006), would improve the authenticity of the calculated trading rule returns. Their database of all shares listed on the ALSI from 31 October 1983 to 31 December 2005 also included returns arising from dividend payouts. Adding these dividends to the calculated returns would further enhance their accuracy.

7.4 Significance of Findings

The most noteworthy finding from this study is the negative relationship between changes in South African Domestic General Equity unit trust sector holdings and returns. If this behaviour can be verified at the level of holdings of individual shares (as opposed to sectors), it would represent a deviation from established mutual fund trading behaviour.

The sector picking ability of unit trust funds has already been demonstrated by previous studies at the level of individual shares, although it has now been identified on the South African stock market.

The trading rule mimicking unit trust buying patterns requires further refinement to reduce the portfolio turnover ratio. The anticipated outcome would be a workable technique for generating abnormal returns on the JSE.

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9 Appendix

9.1 JSE Sector Indices

Table 9-1 ICB Economic Group Indices (FTSE Group, 2008)

Code	
J500	Oil & Gas
J510	Basic Materials
J520	Industrials
J530	Consumer Goods
J540	Health Care
J550	Consumer Services
J560	Telecommunication
J570	Utilities
J580	Financials
J590	Technology

Table 9-2 ICB Sector Indices (FTSE Group, 2008)

Code	
J055	Oil & Gas Producers
J057	Oil Equipment & Services
J135	Chemicals
J173	Forestry & Paper
J175	Industrial Metals
J177	Mining
J235	Construction & Materials
J271	Aerospace & Defense
J272	General Industrials
J273	Electronic & Electrical Equipment
J275	Industrial Engineering
J277	Industrial Transportation
J279	Support Services
J335	Automobiles & Parts
J353	Beverages
J357	Food Producers
J372	Household Goods
J374	Leisure Goods
J376	Personal Goods
J378	Tobacco
J453	Health Care Equipment & Services
J457	Pharmaceuticals & Biotechnology
J533	Food & Drug Retailers
J537	General Retailers
J555	Media
J575	Travel & Leisure
J653	Fixed Line Telecommunications
J657	Mobile Telecommunications
J753	Electricity
J757	Gas, Water & Multiutilities
J835	Banks
J853	Nonlife Insurance
J857	Life Insurance
J873	Real Estate
J877	General Financial
J898	Equity Investment Instruments
J953	Software & Computer Services
J957	Technology Hardware & Equipment

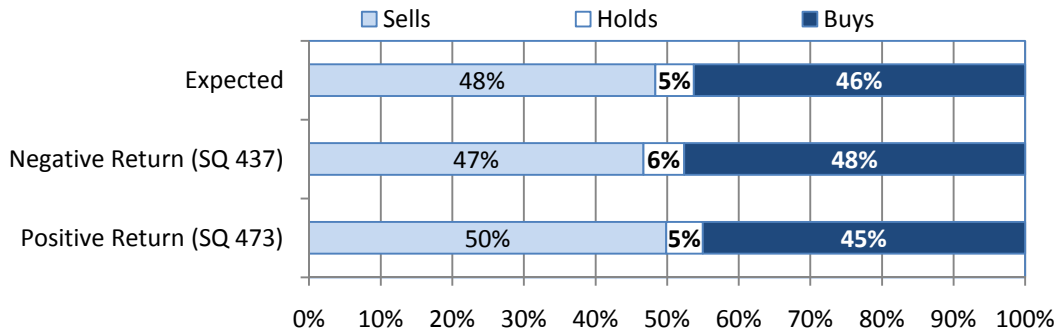**Figure 9-1 Value Weighted Changes in Holdings and Previous Quarter Returns**

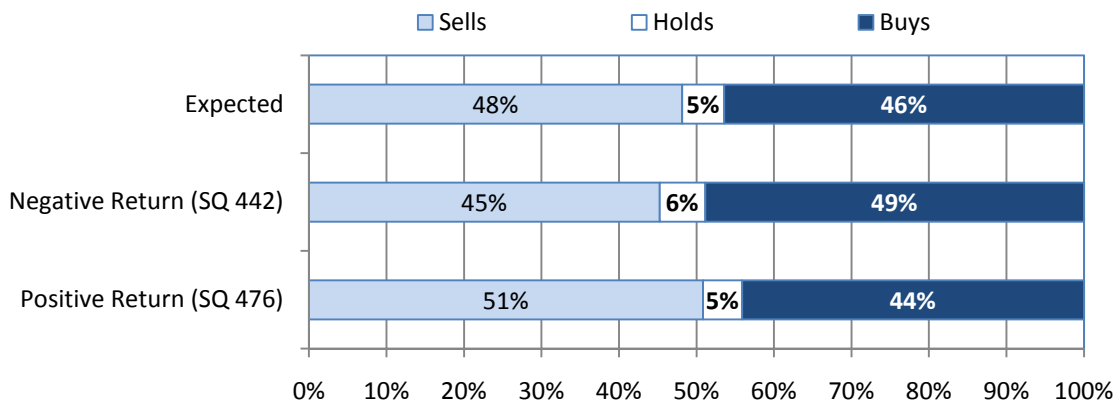**Figure 9-2 Value Weighted Changes in Holdings and Same Quarter Returns**

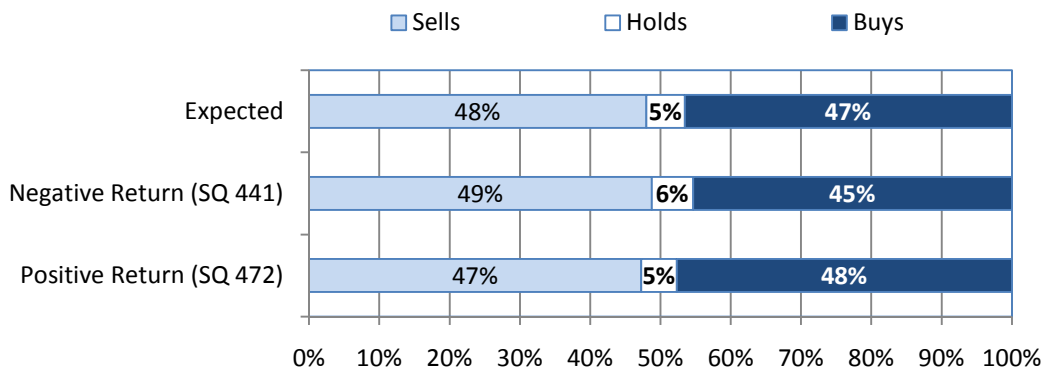**Figure 9-3 Value Weighted Changes in Holdings and Next Quarter Returns**

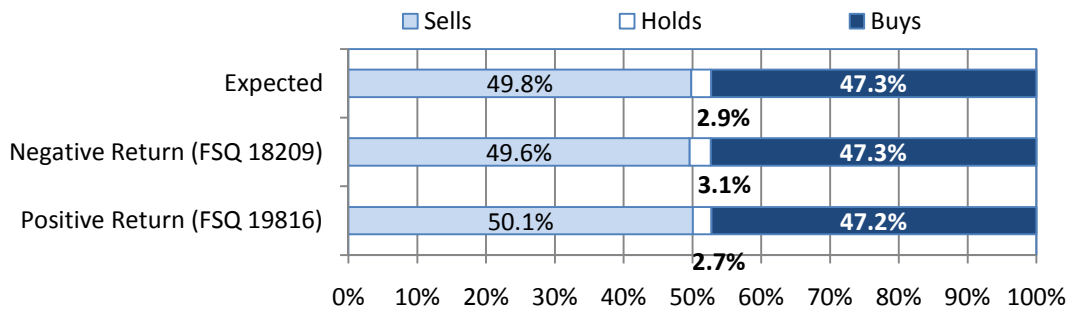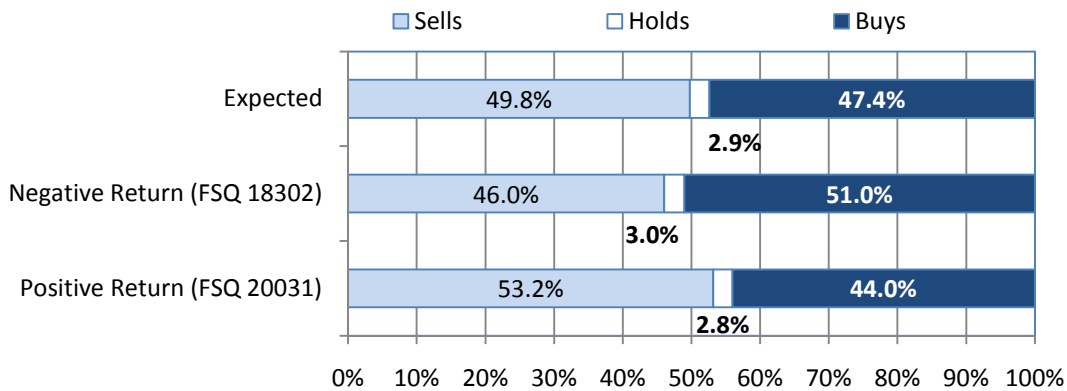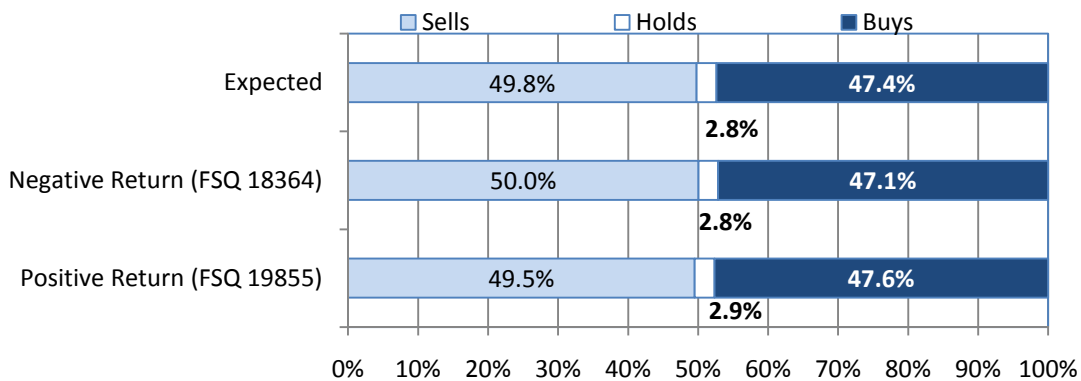**Figure 9-4 Equal Weighted Changes in Holdings and Previous Quarter Returns**

Legend: □ Sells □ Holds ■ Buys

Category	Sells	Holds	Buys
Expected	49.8%	2.9%	47.3%
Negative Return (FSQ 18209)	49.6%	3.1%	47.3%
Positive Return (FSQ 19816)	50.1%	2.7%	47.2%

Figure 9-5 Equal Weighted Changes in Holdings and Same Quarter Returns

Legend: □ Sells □ Holds ■ Buys

Category	Sells	Holds	Buys
Expected	49.8%	2.9%	47.4%
Negative Return (FSQ 18302)	46.0%	3.0%	51.0%
Positive Return (FSQ 20031)	53.2%	2.8%	44.0%

Figure 9-6 Equal Weighted Changes in Holdings and Next Quarter Returns

Legend: □ Sells □ Holds ■ Buys

Category	Sells	Holds	Buys
Expected	49.8%	2.8%	47.4%
Negative Return (FSQ 18364)	50.0%	2.8%	47.1%
Positive Return (FSQ 19855)	49.5%	2.9%	47.6%

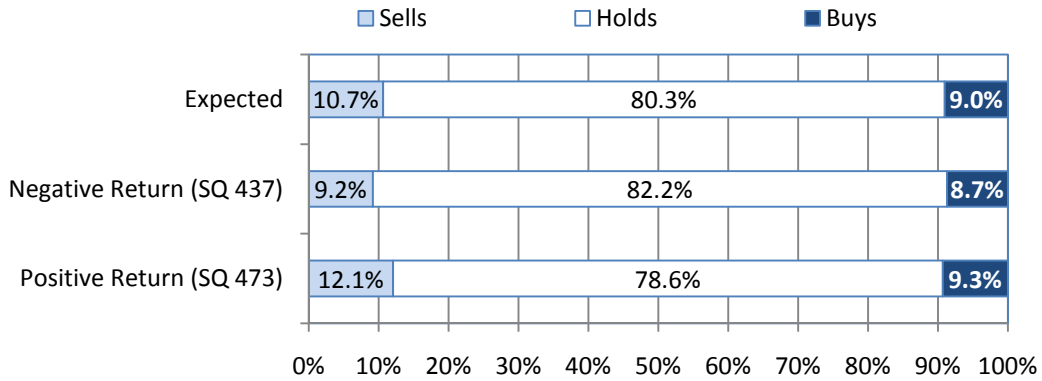**Figure 9-7 Value Weighted Changes in Holdings and Previous Quarter Returns**

Figure 9-8 Value Weighted Changes in Holdings and Same Quarter Returns
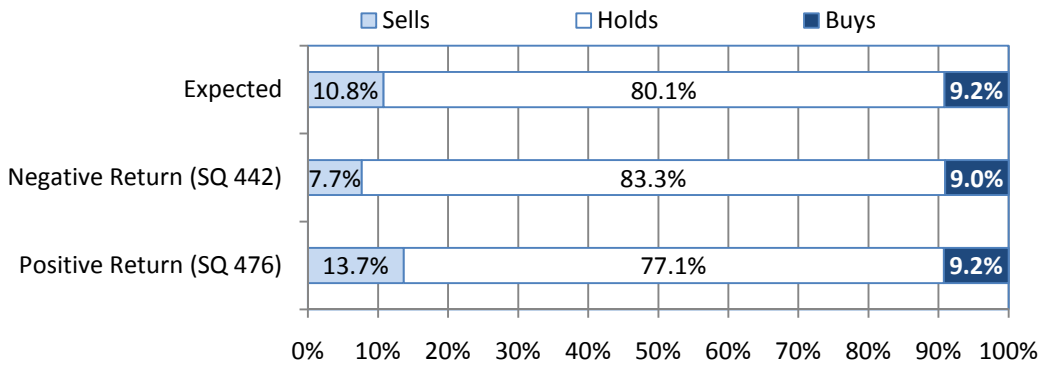

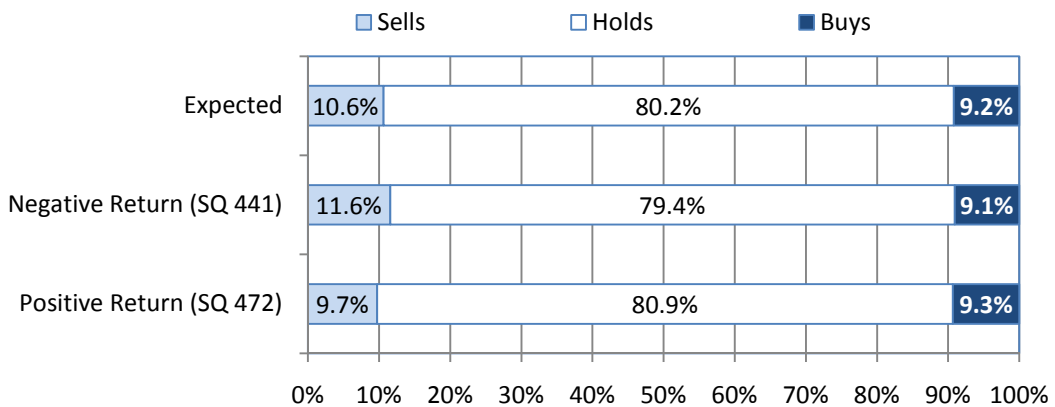**Figure 9-9 Value Weighted Changes in Holdings and Next Quarter Returns**

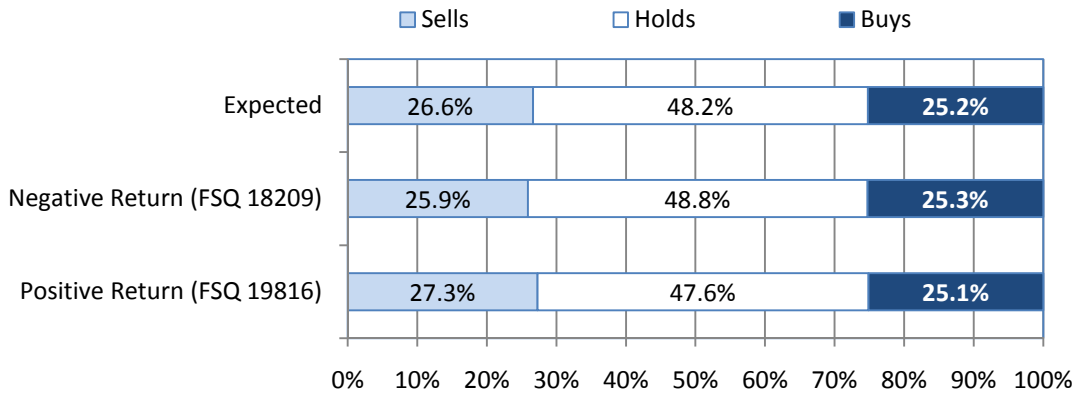**Figure 9-10 Equal Weighted Changes in Holdings and Previous Quarter Returns**

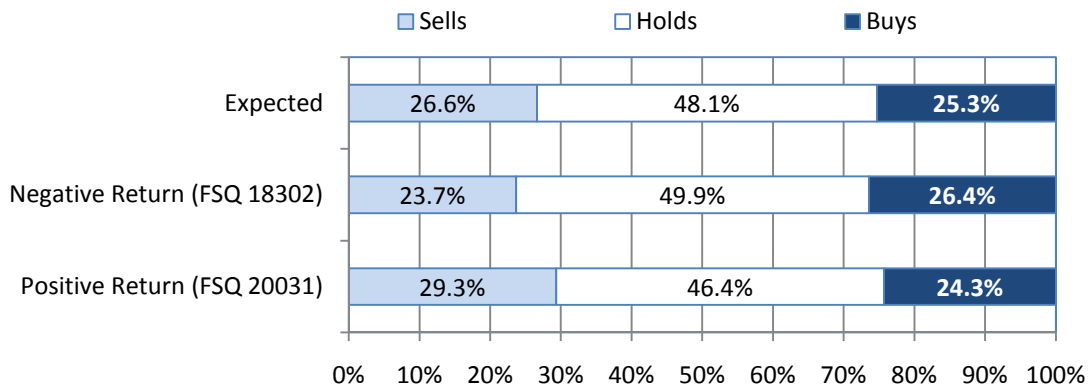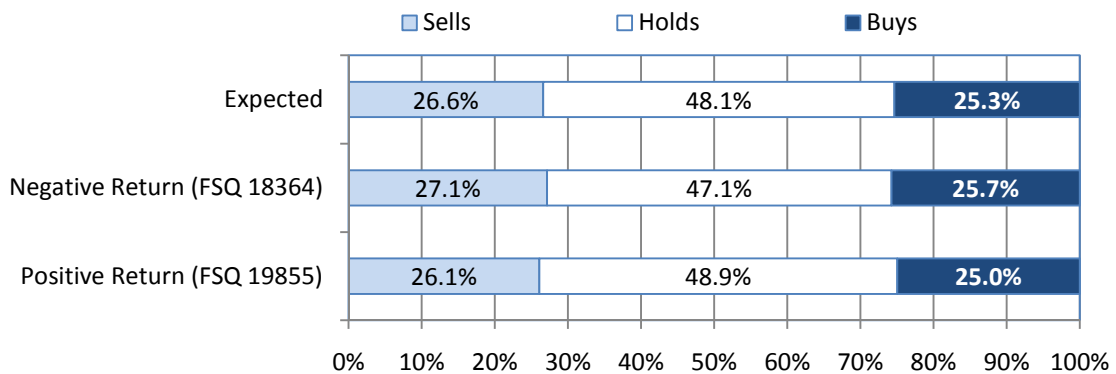**Figure 9-11 Equal Weighted Changes in Holdings and Same Quarter Returns**

Figure 9-12 Equal Weighted Changes in Holdings and Next Quarter Returns

9.6 Summary of Results using Different Threshold Criteria

Table 9-3 Summary of Findings using 0.01% Threshold between Buys, Holds and Sells

Sub-Hypothesis Number		Basis of Measurement			
		Equal Weighted Trading		Value Weighted Trading	
		Chi-Square Statistic	Spearman Correlation	Chi-Square Statistic	Spearman Correlation
1A Previous Quarter Returns	Reject H0?	No	No	No	No
	p-value	0.073	0.574	0.611	0.370
1B Same Quarter Returns	Reject H0?	**Yes**	**Yes. Negative relationship**	No	No
	p-value	**0.000**	**0.00**	0.235	0.107
1C Next Quarter Returns	Reject H0?	No	No	No	No
	p-value	0.568	0.296	0.724	0.553

Table 9-4 Summary of Findings using 0.5% Threshold between Buys, Holds and Sells

Sub-Hypothesis Number		Basis of Measurement			
		Equal Weighted Trading		Value Weighted Trading	
		Chi-Square Statistic	Spearman Correlation	Chi-Square Statistic	Spearman Correlation
1A Previous Quarter Returns	Reject H0?	**Yes**	**Yes. Negative relationship**	No	No
	p-value	**0.008**	**0.039**	0.328	0.437
1B Same Quarter Returns	Reject H0?	**Yes**	**Yes. Negative relationship**	**Yes**	**Yes. Negative relationship**
	p-value	**0.000**	**0.000**	**0.013**	**0.050**
1C Next Quarter Returns	Reject H0?	**Yes**	No	No	No
	p-value	**0.002**	0.728	0.483	0.672