# DIRECTOR DEALINGS AS AN INVESTMENT STRATEGY

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## Abstract

The Insider Trading Act of 1999 and Johannesburg Stock Exchange (JSE) regulations require transparency in director dealings. Directors are required to report all share trading in companies of which they are principals, and this information has been regarded as a signal to the market. We examine the value of this information, using 13 840 director trades and a portfolio time series approach from 2002 to 2013. Whereas most studies have used an event study methodology, we treat the problem primarily as an investment style, and using a trading rule approach we optimise the look-back and holding periods to show statistically and economically significant returns for investors who mimic director trades. When directors of companies report net acquisitions of shares over the preceding three months, investors who then purchase an equal weighted portfolio of the same shares, and hold these for four months, would have achieved an annualised return of 24.3% after transaction costs. When directors of companies report net disposals of shares over the preceding three months, investors who purchase a portfolio of the same shares, and hold these for three months, would have achieved an annualised return of 21.0% after transaction costs. Both of these strategies out-performed the comparable equal weighted benchmark return of 19.1% pa over the same period. We triangulate these results using an event-study methodology, and whilst we find similar results for investors following a directors' purchasing strategy, the event study methodology shows that investors who purchase shares following a directors' selling strategy would underperform. In both instances, the style analysis reveals that imitating directors' trading lacked persistence after the global financial crisis of 2008, and we would not recommend either strategy.

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## 1 Introduction and literature review

Information is a key determinant of investor returns. In addition to acquiring information, investors must interpret and implement appropriate trading strategies if they are to be successful. Markets distinguish between public information and insider information, and to ensure equity between parties and facilitate liquidity, regulators prohibit trading on the basis of insider information.

A board member who acquires/sells shares in a company to which they have been appointed as a director, provides an indirect signal to the market of positive/negative insider information. Since stock exchange rules require directors to publically report their dealings, investors are likely to trade on these buy/sell signals, even though they have no direct knowledge of the rationale underlying the director trades.

Uylangco, Easton and Faff (2010) in a study on the Australian Stock Exchange found that directors appeared to act as typical investors do, by purchasing (selling) shares when the price was low (high). They observed that directors achieved abnormal returns through trading in shares of their own companies, and that imitators adopting a strategy of purchasing (selling) when directors purchased (sold) shares were able to secure a small abnormal return, but insufficient to cover transaction costs and the bid/offer spread.

Chang and Chopra (2007) concluded that Australian directors' trades contained vital industry information and that an external imitator could experience positive results by investing in the relevant industry by following the same trading pattern as directors.

Similarly, Brown, Foo and Watson (2003) found that directors were able to achieve abnormal returns from sales of shares (particularly for resource companies) thereby avoiding future losses. They also established that directors' share purchases did not generate abnormal returns (Brown *et al.*, 2003).

Fidrmuc, Goergen and Renneboog (2006) found directors' purchases and sales of their company shares triggered significant immediate market reactions of 3.12% and −0.37%, respectively, measured over a two day post-announcement window period. They concluded that the lower market reaction to sales may have been due to liquidity needs and noted that when several directors traded on the same day, the announcement reaction was stronger. As a result, it could be concluded that multiple directors trading simultaneously gave more credibility to the signal conveyed to the market.

On the JSE, Nair (2008) noted the differing results of prior studies, and claimed this was consistent with international studies which were also often contradictory. He went on to suggest that the sell signal of directors selling shares, was not as credible

as a buy signal, because directors often sold shares to free up cash for personal needs, whereas when directors purchase shares it is always in pursuit of future profits.

Mordant and Muller (2003) argued that outsiders may more readily follow directors' sales than their purchases, and by selling their shares they might further depress share prices. They also showed that South African directors are better at exiting their positions prior to poor financial performance than at investing before good financial performance.

## 2 Research hypotheses

The purpose of this research study is to determine whether or not there is a statistically significant outperformance of a portfolio comprised of shares imitating directors' share dealings against a benchmark, being the Equal Weighted All Share Index (EWALSI).

The research proposition can be stated as: directors send a positive signal when they purchase shares in their company, and one would expect the subsequent share price to increase. The null hypothesis states that the value of a portfolio mimicking directors' purchases does not outperform a strategy of buy and hold the EWALSI over the relevant period (t).

$$H1_{0:}\ PVBUY_t \leq EWALSI_t$$
$$H1_{A:}\ PVBUY_t > EWALSI_t$$

where:

PVBUY refers to the Buy portfolio value which will be based on imitating an optimal director dealing investment style.

Similarly, directors send a negative signal when they sell shares in their company, and one would expect the subsequent share price to decrease. The null hypothesis states that the value of a short portfolio mimicking directors' sales will not outperform a strategy of holding the EWALSI over the relevant period (t).

$$H2_{0:}\ PVSELL_t \leq EWALSI_t$$
$$H2_{A:}\ PVSELL_t > EWALSI_t$$

where:

The term PVSELL refers to the Sell portfolio value which will be based on the optimal director dealing investment style.

## 3 Research methodology

Most prior studies on director or insider trading on the JSE have followed an event study methodology (for example, Mordant and Muller (2003), van der Plas (2007), Nair (2008), Baty (2008) and Mokale (2010)). However, event study methodology has inherent limitations including:

- The abnormal returns measured in event studies may not replicate actual investment returns or trading;
- abnormal returns are notoriously difficult to estimate; and
- event studies cannot easily identify the periods during which the investment strategy works or does not.

Although we do make use of an event study to triangulate our findings, our primary approach follows the portfolio time-series methodology described by Muller and Ward (2013) on JSE data.

Data on director dealings was obtained from Sharenet for the period 1 April 2002 to 20 September 2013. Of the population of around 400 shares listed over this time frame, only the largest 160 companies (at each point) were included in the sample as the illiquid nature of small shares was considered unsuited to the design of this study. The data included new listings, as well as any changes in share prices due to share splits or consolidations, which have been retrospectively adjusted in the time series data (Muller and Ward, 2013). The data did however suffer from survivorship bias as only those shares currently listed at the end of the sample frame (20th September 2013) were included. Corporate actions (consolidations, spin-offs, etc.) which impacted share returns were corrected appropriately. Dividends were included in the calculation of share returns. A total of 13,840 deals (purchases and sales) made by directors in their companies were analysed.

The director dealing portfolios were created on an equal weighted basis, and the EWALSI was used as a comparable benchmark to prevent any bias from company size affecting the interpretation of results.

The time-series research design followed that of Muller and Ward (2013), who showed that visual and graphical methods are easy to understand and analyse, particularly when conducting portfolio performance comparisons using different investment styles. The time series graph produced in this analysis has the added benefit of showing the periods in which the investment style worked and those in which it did not work. Commencing on 31 December 2002 at a base value of R1, equal weighted portfolios were constructed and re-balanced monthly.

The compound annual growth rate is a useful overall metric to compare the performance of portfolios over the time series range. The CAGR should not be confused with the actual growth of a portfolio but can be defined as an imaginary number that specifies the constant steady growth rate at which the portfolio would have grown over the period being reviewed (Guinan, 2009). The CAGR formula is provided in Equation 1 below.

$$CAGR = \left(\frac{Ending\ Value}{Beginning\ Value}\right)^{\left(\frac{1}{\#\ of\ years}\right)} - 1 \quad (1)$$

To examine the hypotheses, a paired sample *t*-test and the Wilcoxon signed-rank non-parametric equivalent were calculated to determine whether the population mean monthly return of the optimal director dealing portfolio and the EWALSI benchmark were different.

Bootstrapping was used as a confirmatory quantitative test in addition to the paired t-test and Wilcoxon signed-rank test. Bootstrapping can be regarded as a computer-based statistical method that can be used to obtain more precise measures of parameter estimates (Salkind, 2010).

Salkind (2010) states that the bootstrap method is suitably general for use in portfolio time-series analysis, such as in this study. Using the style analysis methodology, 100 random portfolios were created and returns calculated over the relevant holding periods. The CAGR's were compared to those of the director dealing style portfolios and tested against the respective bootstrap distribution generated by the random sampling.

The style based portfolio buy and hold analysis is fully described in Muller and Ward (2013). In essence, the methodology is designed to test trading rules by constructing portfolios in terms of a ranked, so-called 'style variable', and measuring each portfolio's performance as a time-series. In this study the largest 160 companies were ranked at each 'review period' in terms of the percentage value of their directors' share purchases/sales over the prior three-month 'look-back period'. Equal weighted portfolios were constructed based on the rank of the share. Their performance was then measured over a 'holding period', and the process repeated.

The style analysis requires a number of inputs as listed below:

| | |
|---|---|
| a) Director share purchases (R) | g) The holding period (months) |
| b) Director share sales (R) | h) The lookback period (months) |
| c) Daily share values (R) | i) The percentage of market capitalisation traded (%) |
| d) End of month share values (R) | j) EWALSI (Index Value) |
| e) Start date | k) Portfolio values (R) |
| f) End date | l) CAGR (%) |

A number of inter-related problems were identified:

- identification of the optimal holding period;
- identification of the optimal lookback period;
- identification of the optimal minimum percentage of market capitalisation traded by directors to constitute a useful signal; and
- Revert to step (a) to confirm that the optimal holding period still applies. If this holding period has changed then steps (b), (c) and then (a) again are to be repeated until it is evident that the result is constant and in a closed loop.

The start-up procedure required the value of the investment to be split into a number of equal portions according to the required holding period. So, for example, for a 4 month holding period the nominal R1 starting value was divided into quarters. Commencing 31 Dec 2002 one quarter (i.e. 25c) was invested equally across the shares constituting each portfolio, and these were held for the 4 month holding period. On 31 Jan 2003 the second quarter (i.e. 25c) was invested equally into an updated set of portfolios. The third and fourth quarters portions were invested on 28th Feb 2003 and 30 Mar 2003 respectively. At this stage four overlapping portfolios exist. On 30 Apr 2003 the closing value in the initial portfolio is re-invested equally by re-ranking the updated set of 160 shares, and the process repeated monthly for each portfolio.

Initially, costs relating to brokerage and transactional fees were excluded as these costs were envisaged to be approximately the same between the comparative portfolios. Once the optimal director dealing style was identified, these fees were included to assess their impact.

A benchmark portfolio (EWALSI) was also constructed[1]. Price relative indices were included in the time series results by dividing the value of the Buy portfolio by the EWALSI and the Sell portfolio by the EWALSI on a daily basis. Finally, a price relative index was also calculated for the quotient of the Buy portfolio over the Sell portfolio. The price relative indices compared these respective portfolios against each other and the resultant value specified the excess return over the study period. Importantly, a positive gradient of the price relative line is indicative of outperformance and a negative gradient indicates underperformance. The steepness of the gradient indicates the relative extent of over/under performance of the portfolio. Therefore, if the slope of the price relative line is flat for any portion of the time series graph, then this would show that there is no outperformance occurring between the respective portfolio and EWALSI, or between the Buy and Sell portfolios themselves, over this time period.

[1] Transaction costs were not included in the EWALSI at any stage, as investing in the benchmark was assumed to be a buy-and-hold strategy.

The unit of analysis was the monthly portfolio value based on the respective monthly closing share prices and any dividends paid and reinvested. The CAGR was a useful overall metric to compare the performance of portfolios over the time series range.

The key metric to be measured included identifying directors who traded in their company shares over the holding period, and the value of their net trading; and measuring this as a percentage of market capitalization of the company.

As indicated above, we triangulated our results using an event study methodology. The most important metric in an event study is the estimation of abnormal returns (ARs), and this is especially pertinent when the event window is more than a few days in length. For our purposes we follow the control portfolio approach of Ward and Muller (2010) and estimate the daily ARs using a 12 parameter regression model which accounts for company size (large (L), medium (M), small (S)), industry sector (resources (R), non-resources (N)) and value (V) versus growth (G) as shown in equation 2.

$$E(R_{it}) = \alpha_{i,}t + \beta_{i,1}SGN_t + \beta_{i,2}SGR_t + \beta_{i,3}SVN_t + \beta_{i,4}SVR_t + \beta_{i,5}MGN_t + \beta_{i,6}MGR_t + \beta_{i,7}MVN_t + \beta_{i,8}MVR_t + \beta_{i,9}LGN_t + \beta_{i,10}LGR_t + \beta_{i,11}LVN_t + \beta_{i,12}LVR_t \quad (2)$$

where:

$E(R_{it})$ = the expected return on security$_i$ on day$_t$;
$\alpha_{i,t}$ = the alpha intercept term of security$_i$ on day$_t$;
$\beta_{i,1} \ldots \beta_{i,12}$ = the beta coefficients on each control portfolio return;
$SGN_t \ldots SGR_t$ = the log-function share price returns on each of the twelve control portfolios on day t.

Daily abnormal returns (ARs) were calculated in terms of Equation 3, and then averaged across the sample to estimate daily average abnormal returns (AARs).

$$AR_{it} = R_{it} - E(R_{it}) \quad (3)$$

where:

$AR_{it}$ = the abnormal return of stock$_i$ in period$_t$;
$E(R_{it})$ = the expected share price return of stock$_i$ in period$_t$ determined in terms of Equation 2;
$R_{it}$ = actual return of stock$_i$ in period$_t$

Performance over an extended period was calculated by accumulating the AARs to obtain the Cumulative Average Abnormal Return (CAAR) over the event window

period. We 'centre' the event window (t0) as the last day of the month following directors' trades at zero, accumulating the average ARs (CAARs) after t0, and subtracting the average ARs prior to t0. Observations are equal-weighted, but to investigate whether the value of trades was a factor we also report a weighted CAAR by calculating the value traded as a percentage of the market capitalisation.

# 4 Results

The results are in two sections; a style analysis followed by an event study analysis

## 4.1 Style analysis

We initiated our analysis with two portfolios: a Buy portfolio containing those companies where directors' dealings were net positive over the look-back period, the prior three months, and a Sell portfolio containing those companies where directors' dealings were net negative over the prior three months. No limits were initially set with respect to the minimum percentage of market capitalisation traded by a director. Whilst director dealings data existed from April 2002, the relevant period over which the analysis was performed ranged from 31 December 2002 to 20 September 2013 to accommodate start-up issues as explained earlier.

Figure 1 depicts the CAGR returns of the Buy portfolio (23.5%) and the Sell portfolio (23.7%). Our expectation is that the Buy portfolio will out-perform the index, and that the Sell portfolio will underperform. What is surprising about these initial results is that the Sell portfolio achieved a (marginally) higher CAGR than the Buy portfolio and more so, that it followed a contrarian investment style. In other words, in order to achieve the 23.7% return on the Sell portfolio, an investor would need to buy those stocks that had been (net) sold by directors in the look-back period.

The EWALSI benchmark achieved a CAGR of 19.1% over the relevant period. The Buy relative to Sell index shows -0.1%, which indicates that there is no outperformance by the Buy portfolio over the Sell portfolio (as evidenced by the graph). The Buy relative to the EWALSI index shows +3.8%. The upward slope of the price relative shows that most of this outperformance occurred in the first five years and dipped over the global financial crisis in June 2008 when this ratio reduced to 1.06 before recovering.

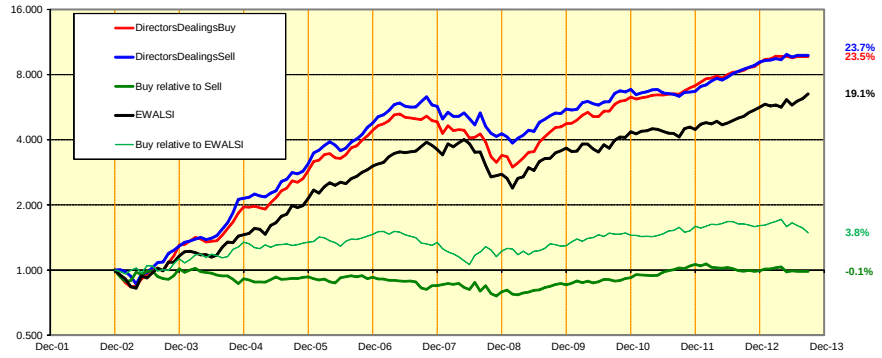


**Figure 1: Returns on initial buy and sell director dealing portfolios**

The next step in the process was to optimise the holding period for the Buy portfolio. Figure 2 shows the returns on cumulative monthly holding periods, which are optimised at 29.7% based on a cumulative four-month holding period.

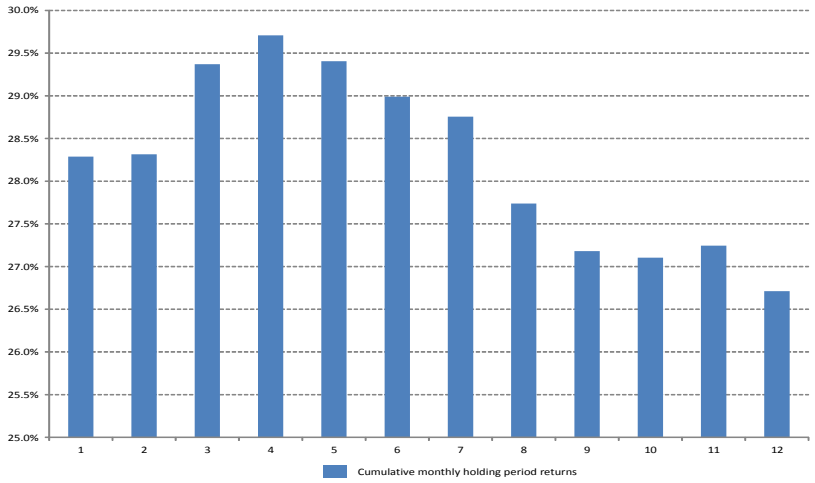


**Figure 2: Cumulative returns on monthly holding periods for buy portfolio**

Step three was to re-compute the data to optimise the look-back period, whilst keeping the holding period fixed at four months. Figure 3 shows the cumulative monthly returns peak at 29.7% if the preceding three months of director share purchases are used as the trading rule. For the Buy portfolio, the optimal investment style is to look-back three months, aggregate director purchases, buy an equal weighted portfolio of those shares which are net positive, and then hold these shares for four months before rebalancing.

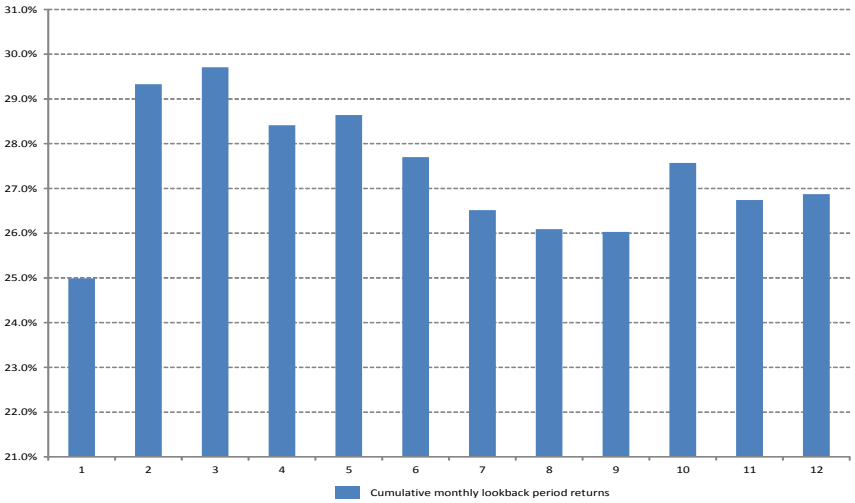


**Figure 3: Cumulative returns on monthly look-back periods for buy portfolio**

The fourth variable to optimise is the minimum percentage of market capitalisation traded by a director (i.e. we ignore small trades). Figure 4 shows that the portfolio returns peak and maintain a sustainable return of almost 30% if a minimum percentage of market capitalisation traded of around 0.0013% is applied.

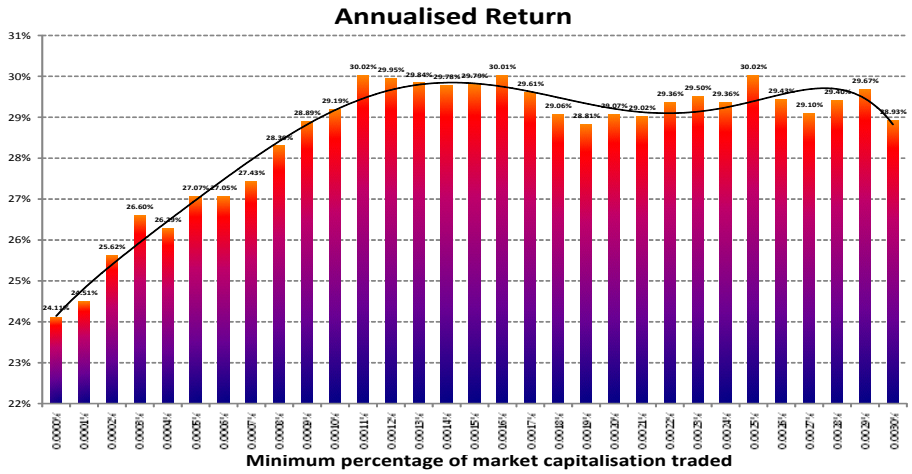


**Figure 4: Returns on cumulative market capitalisation % traded for buy portfolio**

The final step involved re-checking the optimal holding period[2]. The style analysis recomputed the data, keeping the look-back period and minimum percentage of market capitalisation traded constant at three months and 0.0013% respectively. The results indicated that a four-month holding period remained optimal. We conclude that an optimal Buy portfolio should be constructed on a holding period of four months, a look-back period of three months and a minimum percentage of market capitalisation traded of 0.0013%. This optimal Buy portfolio (abbreviated to DirectorDealingsBuyL3H4P13) yielded a CAGR of 29.5% over the time-series as reflected in Figure 5.

We repeated the above steps for the Sell portfolio (although we have not shown all the graphics) and concluded that an optimal Sell portfolio should be constructed with a holding period of three months, a look-back period of three months and a minimum percentage of market capitalisation traded of 0.005%. This optimal Sell portfolio (abbreviated to DirectorDealingsSellL3H3P5) yielded a CAGR of 27.8% over the time-series as reflected in Figure 5.

Figure 5 shows the maximum CAGR that could have been earned on a director dealing Buy and Sell portfolio, on the basis of our optimal investment style parameters. The Buy portfolio and Sell portfolio included an average of 13 shares and nine shares respectively over the 130 months of the analysis. The DirectorDealingsBuyL3H4P13 portfolio and DirectorDealingsSellL3H3P5 portfolio achieved a CAGR of 29.5% and 27.8% respectively.

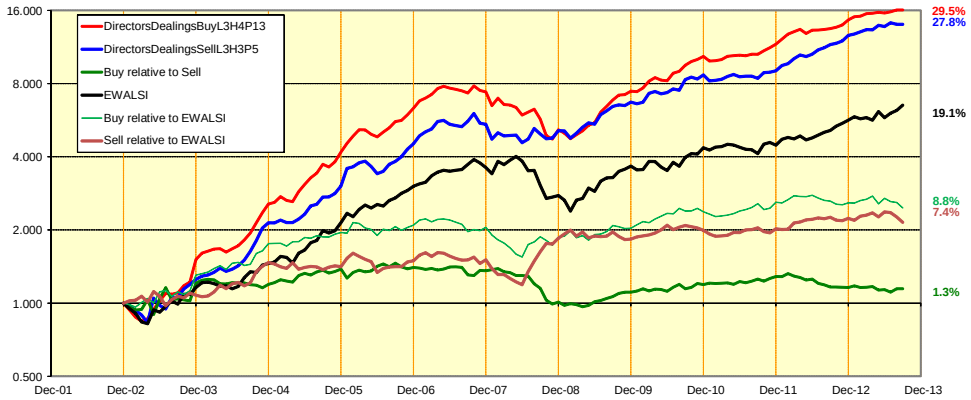


**Figure 5: Returns on optimal buy and sell director dealing portfolios (excluding fees)**

[2] NB The figures shown reflect the final results after optimising all three variables.

Of particular interest is the steep upwards gradient of the Sell relative to EWALSI line over the period from mid-2008 to early 2009. This period coincides with the global financial crisis and the slope of the graph suggests that the greatest portfolio profits were earned by following the optimal director dealing Sell portfolio style over the economic downturn.

Figure 6 shows a sensitivity analysis of the portfolios' performances with the inclusion of portfolio transactional fees at 0.5%. It should be noted that as the Buy portfolio has a longer holding period than the Sell portfolio, it incurs lower fees than the Sell portfolio. With the inclusion of fees, the Buy and Sell portfolios achieve a CAGR of 24.3% and 21.0% respectively, both outperforming the EWALSI at 19.1%.

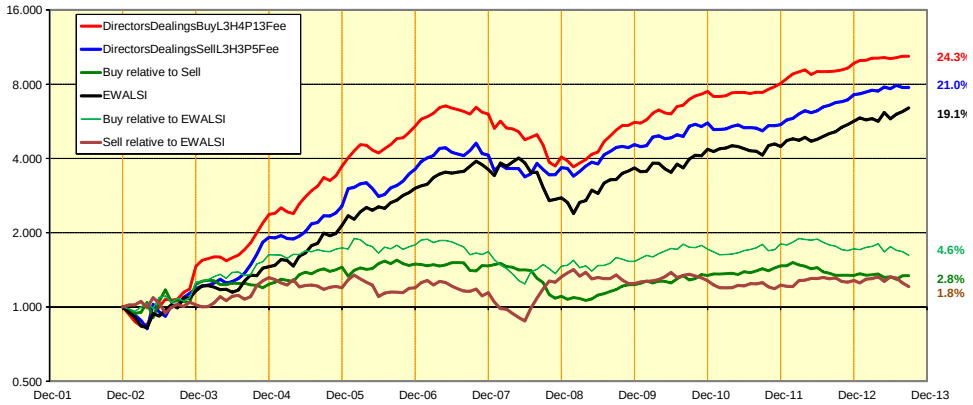


**Figure 6: Returns on buy and sell director dealing portfolios (including fees at 0.5%)**

## 5 Hypothesis testing

Table 1 shows the results of a paired sample *t*-test using monthly returns of the Buy and Sell portfolios against the EWALSI. Since the returns were not normally distributed, a more appropriate non-parametric Wilcoxon signed-rank test for paired samples was also computed and the results are included in table 2 below.

Table 2 shows the test statistics of the Wilcoxon signed-rank test. As both the hypotheses being tested are 1-tailed tests, the 2-tailed significance values in table 2 can be halved. Therefore, the relevant *p* value of the EWALSI-Buy test equates to 3.4% and the *p* value of the EWALSI-Sell test equates to 4.7%.

**Table 1: Paired sample *t*-test**

| | | Paired differences | | | | | t | df | Significance |
|---|---|---|---|---|---|---|---|---|---|
| | | Mean | Std deviation | Std error mean | 95 % confidence internal of the difference | | | | |
| | | | | | Lower | Upper | | | |
| Pair 1 | Buy-EWALSI | 3.99331 | 3.00566 | .26361 | 3.47174 | 4.51487 | 15.148 | 129 | **.000** |
| Pair 1 | Sell-EWALSI | 2.62438 | 2.29186 | .20101 | 2.22668 | 3.02209 | 13.056 | 129 | **.000** |

**Table 2: Wilcoxon signed-rank test statistics**

**Test Statistics[a,c]**

| | | | EWALSI-Buy | EWALSI-Sell |
|---|---|---|---|---|
| Z | | | -1.830[b] | -1.675[b] |
| Significance (2-tailed) | | | **.067** | **.094** |
| Monte Carlo Significance (2-tailed) | Significance | | .064 | .091 |
| | 95% Confidence Interval | Lower Bound | .059 | .085 |
| | | Upper Bound | .068 | .097 |
| Monte Carlo Significance (1-tailed) | Significance | | **.031** | **.044** |
| | 95% Confidence Interval | Lower Bound | .027 | .040 |
| | | Upper Bound | .034 | .048 |

a. Wilcoxon Signed Ranks Test
b. Based on positive ranks.
c. Based on 10000 sampled tables with starting seed 2000000.

The style analysis was used to create a boot-strap distribution of 100 random portfolios, which were based on the sample share data over the relevant period and included a holding period of four months and 13 shares in each portfolio. Figure 7 shows the distribution of the 100 random portfolios, with three portfolios achieving a maximum CAGR of 23.75% over the relevant period; whilst the mode of 20.25% was achieved by 20 different portfolios[3]. Since the actual Buy portfolio resulted in a

[3] For this analysis we excluded transaction costs (to improve the computation speed) on the grounds that these would be similar in all instances.

CAGR of 29.5% which was greater than the maximum in the boot-strap analysis, we conclude that the result is statistically significant.

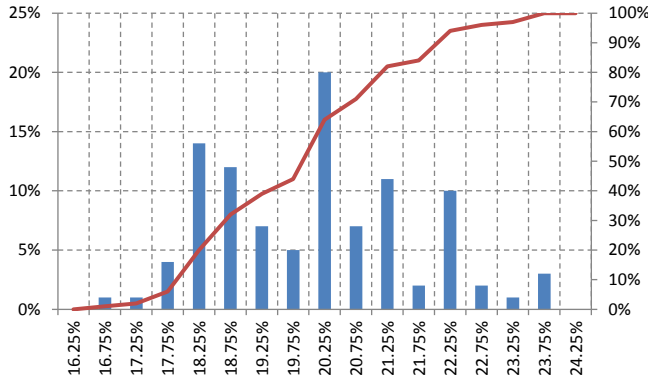


**Figure 7: Buy boot-strap distribution of 100 random portfolios (excluding transaction costs)**

We repeated this simulation to create 100 random Sell portfolios, which were based on the sample share data over the relevant period, using a holding period of three months and nine shares in each portfolio. Figure 8 shows the distribution of the 100 random portfolios, with one portfolio achieving a maximum CAGR of 25.25% over the relevant period; the mode of 20.75% was achieved by 18 different portfolios. Since the actual Sell portfolio showed a CAGR of 27.8%, we conclude that this result is significant.

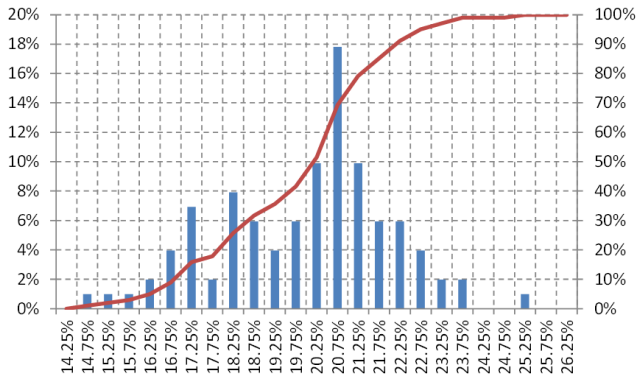


**Figure 8: Sell boot-strap sample of 100 random portfolios (excluding transaction costs)**

## 6 Event study

For the event study, we calculated the net value of directors' trading for each of the 357 companies in the sample for each quarter between 31 Dec 2000 and 31 Dec 2013. We then sorted the data into two sub-samples; director net purchases (Buy) and director net sales (Sell). After applying the minimum trade limits (determined above) of 0.0013% for purchases and 0.005% for sales, we had 2584 events in the Buy sample and 1749 events in the Sell sample, which we treated as two independent events. For each event we used the end of quarter date as the event date (t0). Using an event window from t-60 trading days (approximately the quarter in which the directors' trading occurred) to t+600 (approximately 2 years post the trades) we calculated the CAARs for the Buy and Sell samples. The results are shown in figure 9 below:

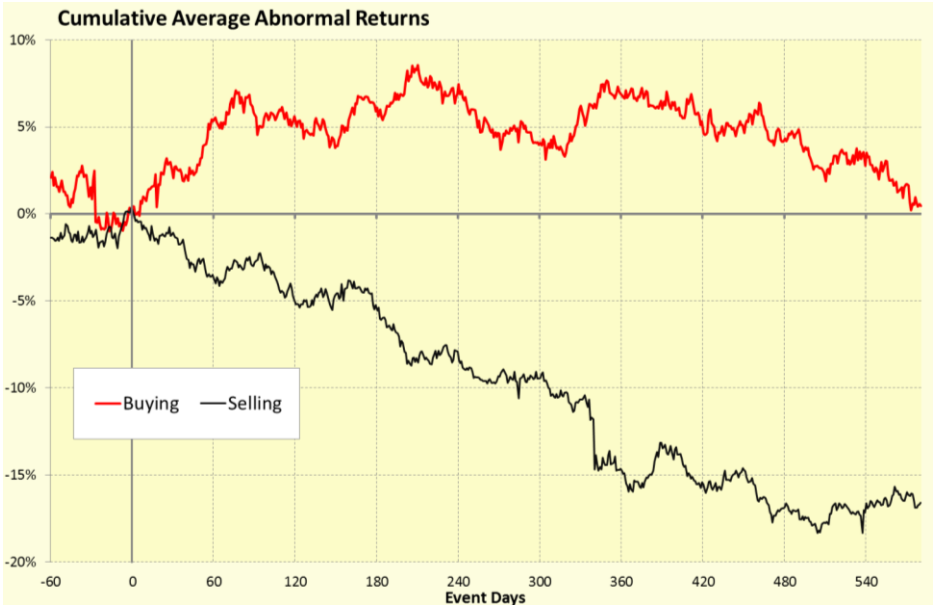


**Figure 9: Cumulative average abnormal returns for buy vs sell samples**

In the pre-event window we note that the CAAR for directors buying at t-60 is about +2%. At about t-30 the CAAR drops (marginally) below zero and remains in this range until about t-5. From t-5 to t+60 the CAAR increases to about 5%. The CAAR fluctuates around 5% until about t+420 before declining to zero.

In the pre-event window we note that the CAAR for directors selling at t-60 is about -1%. It remains at this level until approximately t-5, and is at zero at t0 (by design). From t0 the CAAR declines to about -17%, before levelling-off at around t+480.

# 7 Discussion of results

## 7.1 Buy portfolio

After optimising the look-back period to three months, the holding period to four months and the minimum net purchase level to 0.0013% of market capitalisation, the buy portfolio achieved a CAGR of 29.5%. After transaction costs of 0.5% were applied the CAGR dropped to 24.3%. The paired t-test, Wilcoxon signed ranked test and the bootstrap test all showed the performance of this portfolio to be statistically higher than the benchmark EWALSI.

Figure 6 shows the price-relative against the EWALSI. Over the entire sample period the out-performance against the EWALSI is 4.6%pa. However, a careful analysis of the price relative against the EWALSI shows that the gain from buying on director purchases was really only effective from 2002 until 2005. From 2006 until 2013 the price relative is essentially flat, dipping over the financial crisis. Over the past eight years the strategy has not out-performed the benchmark.

For the event study, we observe that investors who purchase shares on the basis of directors' buying in the previous quarter achieve a positive abnormal return of about 5% after 60 trading days. It is possible that the bulk of this positive effect is related to the period from 2002 to 2005, but after deleting all the events between 2002 and 2005 we did not get significantly different results to those shown in Figure 9.

For investors imitating directors buying shares, Chang and Chopra (2007) also found positive returns based on a general industry type investment style, but their results were less impressive, possibly on account of their methodology. Nair's (2008) use of an event study model over 252 days also showed a statistically significant (but economically insignificant) excess return of 0.33% from directors' purchases. Mokale (2010) demonstrated an economically insignificant 0.72% excess return on directors' purchases after five days. Similarly, Baty (2008) found that directors' purchases demonstrated a positive average abnormal return for most of the event window tested. Our results support all these views, and those of Korczak, Korczak and Lasfer (2010) and Lei and Wang (2012) and suggest that directors have the ability to tactically time the market, and that investors who imitate directors' purchases can obtain abnormal returns (Bodie, Kane & Marcus, 2011).

## 7.2 Sell portfolio

We were surprised to observe the result in our style analysis that investors should buy the shares that directors are selling. After optimising the look-back period to three months, the holding period to three months and the minimum selling level to 0.005% of market capitalisation, the sell portfolio achieved a CAGR of 21.0% after transaction costs of 0.5% were applied. The paired t-test, Wilcoxon signed ranked

test and the bootstrap test all showed the performance of this portfolio was statistically higher than the benchmark EWALSI.

Figure 6 shows the price-relative against the EWALSI. The upward slope of this line shows that the strategy worked in an almost identical pattern to the Buy portfolio described above, but with lower gains. An important observation of the Sell investment style was this portfolio's ability to withstand the global financial crisis. In the 12 months from 1 March 2008 to 28 February 2009 we observed the following: the Buy portfolio decreased by 36%, the EWALSI decreased by 44%, but the Sell portfolio only decreased by 3%.

A possible explanation for the phenomenon of buying the shares that directors are selling is that directors are selling their shares for personal reasons such as monetisation or portfolio rebalancing and not on the basis of negative insider information (Piotroski and Roulstone, 2004). A possible alternative explanation is that directors, being rational investors, are trying to maximise their investment return by selling at what they believe to be the peak price of their shares. However, directors are unknowingly selling their shares into a rising stock market. In fact, Figure 6 shows that the optimal Buy and Sell portfolios illustrate a consistent upward primary and secondary trend over most of the time series and this corresponds to the Dow Theory (Bodie *et al.*, 2011).

For the event study we observe that investors who bought on the basis of directors' sales in the previous quarter achieved a -17% abnormal return over the next 480 trading days. This contradicts the findings of the style analysis.

Mordant and Muller (2003) found that outside investors may more readily follow directors' sales than their purchases, and by selling their shares they might depress the share prices. Similarly, Brown *et al.* (2003) found that directors are able to achieve abnormal returns from sales of shares (particularly for resource companies) and thereby avoid future losses.

In comparison, Nair (2008) and Mokale (2010) identified economically insignificant abnormal returns for directors selling of 0.29% after 252 days and 0.44% after 15 days respectively. Both studies found that abnormal returns were lower for director sales than for director purchases.

## 8 Conclusions

The purpose of this study was to identify an optimal director dealings investment strategy which might yield returns greater than the EWALSI benchmark. The investment style analysis included optimising: the holding period, the look-back period and the minimum percentage of market capitalisation traded by directors. Dividends and transaction costs were included in the study.

The results of the analysis were statistically and economically significant. We find that directors' trades do convey insider information and that external investors who purchased shares following directors' purchases did achieve out-performance. However, in our style analysis we observe that the bulk of the effect occurred in the data prior to 2006, and we would be hesitant to follow this strategy in the future.

For directors' selling we found contradictory results. The style analysis indicated that investors who purchased the shares that directors sold would out-perform the benchmark, but the results were counterintuitive. The event study produced more intuitive results, indicating that investors, who bought shares that directors sold, would achieve abnormal returns of about minus 17% after 480 trading days. As above, in our style analysis we observe that the bulk of the effect occurred in the data prior to 2006 and we would be hesitant to follow this strategy in the future.

The literature reviewed in support of the Sell investment style suggested that directors sell for a much wider spread of reasons than merely the negative expectations of insiders. Therefore, this strategy provided a weaker signal of the future performance of the company.

In conclusion, although our findings are significant, we find a lack of persistence in the return to investors who imitate directors' purchases, and counterintuitive results for investors who imitate directors' sales. We cannot recommend either strategy.

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