Short-term return reversion on the JSE

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Abstract

This study explores the existence of mean reversion in returns on the Johannesburg Stock Exchange (JSE). Finding that most research on the JSE applies to the long term, this paper investigates mean reversion across relatively shorter periods. Thus investment horizons between 1 and 30 days are considered.

This paper finds that the standard short-term reversal strategy can be improved upon by a double application of the strategy. Furthermore, return reversal are found to be strongest when comparing prior 5 day returns with future 5 day returns. The best strategy is found to be the double application of the standard short-term reversal strategy using the 10th percentile of the 5 day prior returns and the 10th percentile of the 10 day prior returns. The long positions of this strategy still generated attractive returns over the market crash of 2008, making this a robust strategy. In general, long strategies outperform short strategies. However, over the crash period of 1 August 2008 to 1 April 2009 the short strategies offered more attractive returns and higher information ratios.

Other additions to the strategy, such as moving average and kicker rules, fail to add value or reduce risk. Extending the holding period of the standard short-term reversal strategy generally results in poorer performance across all percentiles.

The results in this paper pertain to the top 60 shares on the Johannesburg Stock Exchange ranked by market capitalisation on 10 August 2012. These cover a sample period ranging from 1 January 1998 to 10 August 2012. The analysis presented in this paper does not factor in the influence of trading costs. Such costs may be significant when portfolios are closed and opened frequently. An additional caveat is that many strategies lead to a small average number of positions, which is problematic for institutional traders.

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Contents

List of Tables

List of Figures

1 Introduction

1.1 Objectives

The aim of this study is to further explore the existence of mean-reverting returns, or price reversals, on the Johannesburg Stock Exchange (JSE) as well as the ability to profit from such phenomena. Literature on foreign markets applies to both short-term and long-term return reversals and trading strategies. The majority of literature applicable to the JSE takes a long-term focus when forming portfolios such as Bailey and Gilbert (2007). Though some papers applicable to the JSE take a short-term focus, this topic has not received sufficient attention.

The focus of this paper will be to gauge the existence of return reversals over the short term as well as identifying the optimal set(s) of lags over which return reversals take place. For the purposes of this study, short-term will mean any period between a day and one month. Subsequent to this, the profitability of strategies exploiting return reversals is tested. Finally, alternative approaches to portfolio construction are tested in order to account for practical considerations.

1.2 Overview

The approach taken involves several stages. The first of these will be to generate a grid of return correlations, where each cell contains the correlation between future returns and past returns. This will help identify over which lags (or set thereof) the return reversal effect is strongest. This grid will serve as a useful aid to select an appropriate formation period for the standard short-term return reversal strategy. Additionally, heatmaps are provided for different sectors within the sample such as financials, industrials and resources. These heatmaps are found in section 5.1 as well as appendix A. The heatmaps presented in section 5.1 cover the entire dataset. The heatmaps contained in appendix A cover several sub-periods.

The standard return reversal strategy is one where shares are ranked based on their prior returns and 'winner' and 'loser' portfolios are formed. The winner portfolio is shorted and the loser portfolio is bought, with weights selected so that a zero net investment is made. One then selects an appropriate percentile to decide how large winner and loser groups of shares will be. Several different formation periods, holding periods and percentiles are considered in the analysis. By construction, this is a contrarian strategy. This is similar to the approach adopted by De Bondt and Thaler (1985). A more detailed discussion of the methodology can be found in section 4.2.

In addition to the standard short-term return reversal strategy trading rules such as moving average, moving average crossover and kicker rules are also investigated in section 5.1. The standard moving average rule is that a long (short) should only be taken if the price of a security is above (below) its moving average. A moving average crossover rule is the same, except that it substitutes a relatively shorter term moving average for price. The kicker rule demands that a long position should have a positive return the day before it is bought and that a short have a negative return on the day before a short position is taken. Interaction effects between the moving average and kicker rules are also investigated in this study.

Once a general set of strategies has been investigated, selected strategies are chosen for further study. This is presented in section 5.2. These strategies are tested over different sample periods from 1 January 1998 to 23 August 2012, 1 August 2008 to 1 April 2009 and 1 April 2009 to 23 August 2012 respectively. Furthermore, these strategies are also examined over different holding periods for each sub-period. A longer holding period is potentially useful as it would lead to a reduction in portfolio turnover. A direct consequence of this would be lower trading costs. Returns to the strategy with next-day-execution are also considered for some selected strategies as this leads to more practical strategy and prevents look-ahead bias.

A portfolio consisting of an equally-weighted 'buy-and-hold' investment in the same set of shares used to form the winner and loser portfolios is also constructed as a benchmark. This serves as a market proxy. From this portfolio, t-stats can be formed to test whether a strategy beats the equally-weighted index with statistical significance or not. This is used to gauge the strategy's ability to earn abnormal returns over the duration of the study.

Lastly, findings are drawn in section 6.1 and suggestions for further research are provided in section 6.2. Appendix B gives two examples of the code written to test strategies. The first of these is for the standard short-term reversal strategy and the second combines the standard short-term reversal strategy with moving average and kicker rules. Appendix C illustrates the naming convention used for different series in eViews.

2 Theoretical Background

Fama (1965) gives significant evidence in support of the efficient market hypothesis (EMH). This notion of efficiency implies that prices adjust rapidly and in an unbiased manner as new information becomes available, with the only other variation in prices indistinguishable from a random walk or Brownian motion. This implies that certain sets of information will be insufficient in earning abnormal returns.

There are three forms of this hypothesis, varying solely on the set of information being considered. The weak form of the EMH states that markets are 'weak form efficient' and historical data alone cannot be used to earn abnormal returns. The semi-strong form states that publicly available information is insufficient and the strong form states that even insider information cannot be used to earn abnormal returns.

The EMH rests on the assumption that agents are rational. This means that market participants update their beliefs accordingly with Bayes' Law when new information is received. Furthermore, rational agents are expected to make choices which will maximise their expected utility. A large degree of current monetary and financial theory is rooted in the assumption that markets are at least efficient in some form (and thus also assumes utility maximising rational agents). However if this theory were true it would be impossible to devise any trading rule which generates abnormal and persistent profits.

There is both a large body of empirical evidence against the EMH as well as several opposing theories to the EMH. Many theories which are incompatible with the EMH come from the behavioural finance paradigm. Behavioural finance seeks to explain markets, finance and conventional economics through behavioural and cognitive psychological theory. As an example consider prospect theory, which states that people focus on gains and losses when faced with uncertain outcomes rather than expected utility. Prospect theory also finds that framing, or the way in which questions are posed, affects the decision-making process. In general, behavioural finance theories disprove the assumptions of the EMH.

The over-reaction hypothesis falls under this paradigm. De Bondt and Thaler (1985) define it as the disproportionate reaction exhibited by investors and traders to new information. This hypothesis suggests that shifts in prices do not always reflect a security's true value following the event that gave rise to this new information. This means that extreme price movements may often be followed by movements in the opposite direction. This hypothesis is testable as it implies that there should be patterns of negative autocorrelation in share returns. Furthermore, this hypothesis also implies relatively larger initial price changes are followed by larger 'corrections'. Several studies have found evidence of this phenomenon such as those by Shiller (1984), Black (1986), Stiglitz (1989), Summers and Summers (1989) and Subrahmayham (2005). Consequently, this means that contrarian portfolio strategies may be profitable.

Empirical evidence also shows that people suffer from confirmation bias. This bias claims that we are more likely to consider information in our decision-making processes when it supports a pre-exisiting opinion or hypothesis. Subsequently, this means that contradictory evidence is underweighted. Odean (1998) argues that selling a losing portfolio is equivalent to admitting a mistake for it means that the investor must have admitted that their original position was a mistake. This explains why some investors might be reluctant to sell losing portfolios. This implies that there may be under-reaction to bad news and over-reactions to good news regarding a security an investor already is long of.

There is also evidence of herd behaviour by investors in financial markets. Hsieh and Hodnett (2011) argues that since investors are most aggressive in the late stages of a bull market, strong market reversals are likely when speculative bubbles eventually burst. This can be tested for by examining time-variation in the amount of mean reversion across different durations.

Given evidence of investor irrationality in general (and the over-reaction hypothesis in particular) leads to a theoretical motivation for exploring short-term return reversals.

3 Literature Review

3.1 Long term empirical evidence of share return reversion in stock markets

De Bondt and Thaler (1985) used cumulative historical returns from January 1926 to December 1982 to rank shares on the New York Stock Exchange (NYSE). Non-overlapping winner and loser portfolios were formed using prior 36 month rankings with a 36 month holding periods. The winner portfolio consisted of the top 35 stocks in the set and the loser portfolio consisted of the bottom 35. De Bondt and Thaler (1985) presents evidence of long-run mean reversion and finds that the prior 36 month loser portfolios constructed in their study outperformed the 36 month winner portfolio by 24.6%. The authors attribute these results to biases in decision making by investors, such as the over-reaction hypothesis. Such biases may also manifest themselves in the short-term and thus motivate this study. This approach to constructing reversal portfolios has become the standard in much of the academic literature on this topic.

De Bondt and Thaler (1987) found similar results (albeit at a lower statistical significance) after adjusting for firm size and beta as a proxy for risk. Chopra *et al.* (1992), Lakonishok and Shleifer (1994) and Albert and Henderson (1995) all find further evidence in support of De Bondt and Thaler's original conclusions.

One cannot assume that different markets will behave in the same way. Different trading costs, differences in local and foreign regulation, market size, the number of arbitrageurs already employing a certain strategy on that market and the fact that some sectors may dominate certain markets ensure at least some degree of heterogeneity in how different markets react to events.

This means that results for the NYSE may not be relevant to a consideration of the JSE. However, the discovery of mean reversion in returns on the NYSE motivates a search for similar results on the JSE. This has been shown on the JSE in several papers over

the long term. Page and Way (1992) is one such study, finding similar results on the JSE to those of De Bondt and Thaler (1985) closely following the same methodology of the latter paper.

Cubbin, Eidne, Firer and Gilbert (2006) is a similar and more recent study. Similarly to Page and Way, the authors adopt the methodology of De Bondt and Thaler (1985), but rank shares by PE multiples (instead of prior returns) to form winner and loser portfolios. Additionally, their relatively short data set (which used monthly measurements) meant that they could not create non-overlapping portfolios when constructing their five year portfolios.

Their data included monthly price data for all shares listed on the ALSI of the JSE for the period 31 October 1983 to 31 December 2005 and made adjustments for delisted shares to limit the effect of survivorship bias. Their results are consistent with those of De Bondt and Thaler (1985) and Page and Way (1992).

There are various explanations as to why these inefficiencies are so well-documented and seemingly widespread. One of these is the theory that market prices may reflect investor over-reaction, which is discussed above. Bailey and Gilbert (2007) argue that another possible reason is the impact of liquidity on trading strategies. Da, Liu and Schaumburg (2011), amongst other authors, argue that such reversals in price serve as compensation for those providing liquidity. This is an important mechanism by which market makers are incentivised to provide liquidity.

This reasoning led Bailey and Gilbert (2007) to test the effects of liquidity on mean reversion by extending the methodology used by Cubbin *et al.* (2006) with the introduction of a liquidity cap measure. It is argued that this is an important practical consideration since fund managers are constrained by common sense and risk management models. In essence, one should be wary of taking a position that cannot be liquidated without relative ease.

The liquidity cap is a function of the amount available to be invested in each stock as well as the historical volume and price of stocks. Bailey and Gilbert (2007), with the input of several fund managers, devise the following rule: (large) investors would only invest if they can expect to be able to liquidate their position within ten trading days (i.e. half a month), given past volume data. This leads to 50% of the expected total volume traded in a month being used as the liquidity constraint. Their results found that the liquidity cap was restrictive to investors with portfolios in excess of R100 million and led to a reduction in the abnormal returns generated by such portfolios. Such a measure, with modifications based on the intended holding period, may also be significant in a short-term analysis and can be applied to this paper.

It is worth mentioning the work of Gilbert and Strugnell (2010), which investigates the effects of survivorship bias on the mean reversion of share returns on the JSE. Their work builds on the papers of Cubbin *et al.* (2006) and Bailey and Gilbert (2007) and uses the same algorithm to build portfolios. In both studies extensive efforts were made to include all delisted shares to avoid the effects of survivorship bias. Gilbert and Strugnell (2010) compare the mean reversion and returns earned by the same portfolios on two sets of data. The first of these studies extends the original dataset used in both studies by an additional 21 months. The second dataset consists only of currently listed shares. The methodology used to analyse both data sets is identical and hence it can be argued that any difference in results must necessarily arise from differences in the data. For this reason, Gilbert and Strugnell (2010) argue that this one of the best ways to isolate the effects of survivorship bias.

Gilbert and Strugnell (2010)'s results suggest that mean reversion is present on both data sets. However, the returns earned by portfolios on the set of currently listed shares are significantly higher than those selected from the set of all shares. (Gilbert and Strugnell, 2010:p. 41) concludes that: 'any research that excludes delisted shares is likely to be subject to survivorship bias.'

Cubbin *et al.* (2006) argue that the tendency for price to show positive autocorrela-

tion over short time periods and negative autocorrelation over long time periods as found in Poterba and Summers (1988) indicates the existence of structure in the error terms. This contradicts our expectations under the EMH and lends some support to behavioural finance theories. Furthermore, this implies that share prices may be better modelled with temporary as well as persistent components. In addition to this, Jegadeesh (1990) used data from the Center for Research in Security Pricing (CRSP) to perform ordinary least squares (OLS) regression on future returns using prior returns. He found that monthly returns displayed significantly negative first-order serial correlation and significantly positive higher-order autocorrelation. He also noted seasonality in the patterns of serial correlation, finding a significantly different pattern in January.

Given the above and further studies indicating that there is some predictability in equity returns, two competing explanations of this phenomenon have arisen. One could argue that required returns vary across time (and that markets retain efficiency, but with efficient and predictable mean reversion in prices) or that such predictability implies over-reaction or the existence of 'fads' or other cognitive misperceptions.

3.2 Short term share return reversion in stock markets

Lehmann (1990) examined returns over short time intervals on the New York and American Stock Exchanges. Lehmann cites Sims (1984), which shows that asset prices should resemble martingale processes over short intervals even if required returns are allowed to vary with time. Thus evidence against martingale behaviour over short horizons is evidence of an inefficient market with biases that lead to mispricings. Costless portfolios of winners and losers (i.e. such that there is a zero net investment) were formed using one-week returns at various lags. Under a martingale process, the expected returns of such a strategy should be zero. The results of Lehmann (1990) strongly suggest rejection of the efficient markets hypothesis. Portfolios of securities with positive returns in one week were found to typically have negative returns in the following week (between -0.35 to -0.55 per cent on average). Those with negative returns typically had positive returns the following week (between 0.68 to 1.24 per cent on average). As a whole, the costless port-

folio was found to have positive profits in roughly 90 per cent of the weeks. Furthermore, persistent statistical arbitrage profits were measured after adjusting for mismeasurement arising from the bid-ask spread and for transaction costs.

Empirical evidence of return reversals across both long- and short-term periods in foreign markets and long-term reversals on the JSE is well studied. In comparison, the literature related to short-term return reversals on the JSE is sparse.

3.2.1 Can any portfolio approach really attribute all excess returns to a single phenomenon?

As mentioned previously, any theory of investor over-reaction implies negative correlation in price changes over some lag(s). In particular, this implies that contrarian portfolio strategies (which exploit patterns of negative autocorrelation in shares) should be profitable.

(Lo and MacKinlay, 1990:p. 2) question the reverse implication, that 'the profitability of contrarian investment strategies necessarily implies stock market over-reaction.' They argue that this is not the case as a contrarian strategy may also exploit cross-autocorrelations between shares. This is illustrated by decomposing returns into those arising from autocorrelations and those arising from cross-autocorrelations. Lo's empirical finding show cross effects that are generally positive in sign with a pronounced lead-lag structure.

Cohen *et al.* (1986) shows that the 'nontrading problem', where prices of distinct securities are assumed to be sampled simultaneously can lead to spurious autocorrelation and cross-autocorrelation. This leads Lo and MacKinlay (1990) to create a model which focuses on nontrading as the sole source of autocorrelation in order to isolate its effects. They show that portfolios with higher nontrading probabilities tend to lag those with lower nontrading probabilities.

(Lo and MacKinlay, 1990:p. 6) also note that 'forecastability across asset returns is at least as important a source of contrarian profits both in principle and in fact.' This research also leads to another important implication for contrarian trading strategies, suggesting that such a strategy is robust since cross-autocorrelation between shares significantly contributes to the returns of such a strategy.

3.2.2 How can a seemingly profitable strategy still not work?

Return reversal strategies are not without criticism. Several authors argue that the short-term reversal anomaly is attributable to trading frictions (trading costs for example) in markets that weaken the arbitrage mechanism and therefore cannot in practice generate abnormal profits.
Avramov, Chordia and Goyal (2006) evaluates the profitability of return reversal strategies net of trading costs. They use the model of Keim and Madhaven (1997) to do so, adjusted using data provided by Nomura. They find that such strategies require frequent trading in high cost securities, thus preventing profitable execution.

These results might lead one to believe, consistently with the EMH, that the seemingly apparent opportunities to earn abnormal profits presented in return reversals are merely illusions dispelled by barriers to trading.

De Groot, Huji and Zhou (2012) shows that this is not necessarily the case. Their argument is twofold; firstly, they argue that the bulk of trading costs on reversal strategies can be attributed to trading in small capitalisation stocks; secondly, they argue that standard return reversal strategy used in prior literature is suboptimal and can be improved upon.

Small cap stocks typically have the highest volatility in American markets. Thus, these stocks are likely to end up in extreme quantiles when ranking shares on past returns. Therefore, any portfolio that takes long and short position in extreme quantiles is likely to have a significant portion invested in small cap stocks. Unfortunately, small cap stocks are also the most expensive to trade.

By testing the return reversal strategy on three market cap segments of the US stock market, the top 1500, top 500 and top 100 by market capitalisation. De Groot *et al.* (2012) show that the impact of trading costs on the strategy's profitability is much lower for samples of relatively larger cap stocks. They note that return reversal profits are observable amongst the largest stocks and that, when accounting for trading costs, such profits are highest for this sector.

The non-synchronous trading (or 'thin trading') problem, as discussed in Lo and MacKinlay (1990), predicts a size-related lead-lag effect in stock returns. Small cap stocks are traded less frequently and thus expected to follow large cap stocks. This implies that one should find higher reversal profits amongst small cap stocks. Therefore, the results of De Groot *et al.* (2012) are inconsistent with the notion that non-synchronous trading is a source of contrarian profits.

The way in which reversal portfolios are typically constructed in standard literature, especially across short-term portfolios, leads to a very large amount of turnover. De Groot *et al.* (2012) argues that replacing old winner and loser portfolios with new winners and losers should only be done if the difference in expected returns between the new and old portfolio is greater than the expected trading costs associated with the transactions to do so.

The authors thus alter the trading algorithm to take this consideration into account. The altered approach (De Groot *et al.*, 2012)[p. 20] 'waits to sell (buy back) stocks until they are ranked among the 50 percent of winner (loser) stocks ranked on past return'. Only at this point are new winner and loser portfolios formed using prior returns as usual. This approach effectively means that the holding period of each portfolio becomes very flexible and can potentially range from one day to (in theory only) infinity. Consequently, this approach leads to a substantially lower turnover compared to the standard approach.

The 'flexible holding approach' is compared to the results under the standard ap-

proach using the same set of 1500, 500 and 100 shares described above. On all data sets, the turnover of the strategy was substantially reduced (approximately halving in each case) and trading costs dropped significantly. Average gross returns on long plus short strategies under this approach were 59.8%, 65.0% and 77.9% for the top 1500, top 1000 and top 500 largest US stocks respectively. Net returns to these strategies after adjusting for trading costs using estimates from Nomura came to -17.6%, 30.5% and 53.1% respectively (De Groot *et al.*, 2012).

These considerations and arguments are integral to this study, motivating both choice of data set and providing possible grounds for extension.

4 Data and Methodology

4.1 Data

Historical data was obtained using DataStream, which is a market data source that maintains a database of historical data published by the JSE Securities Exchange. This entailed 20 years worth of daily data from 10 August 1992 to 10 August 2012. Some problems were found in the earlier years of the dataset such as a number of shares being far too thinly traded during this time. For this reason, the sample used for testing was restricted to all observations after 1 January 1998. The top 60 shares on the JSE ranked by market capitalisation on 10 August 2012 are considered only for the purposes of this paper. Potential biases that may arise as a result of such sample selection are discussed below and in section 6.2.

It is assumed that each trade can be made at the closing price for the day. This assumption is relaxed when testing strategies with next-day execution in section 5.2.

There are several motivating factors for selecting this subset of shares. As shown by De Groot *et al.* (2012), profitable execution of return reversal strategies in existing literature is severely impeded by excessive trading in small cap stocks. The top 60 ranked by market capitalisation excludes such shares from this analysis, preventing this problem of disproportionately high trading costs.

Furthermore, this subset has far more liquidity relative to the rest of the market owing to its relatively larger capitalisation. This motivates the *a priori* belief that liquidity constraints should not lead to a drastic reduction in performance for this particular study. As shown in Gilbert and Strugnell (2010), survivorship bias is an important consideration in any work that explores mean reversion of share returns on the JSE. There is an *a priori* reason to believe that using the top 60 shares would be less prone to survivorship bias as it is a more stable subset of all the shares on the JSE. However, selecting the top 60 only may create bias in other ways. Such a post-selection effect would result in an upward bias in returns, especially in the earliest years of the dataset. An alternative

methodology for selecting the sample of shares to be considered in proposed in section 6.2.

Measurements for each day included a closing price adjusted for dividends, bonuses and rights issues, an unadjusted closing price, an unadjusted high price of the day, an unadjusted low price of the day, an unadjusted opening price, the market value at the close and the turnover by value (volume * prices paid) for each day. By taking the ratio of prices on consecutive days, a daily return can be generated.

Over the sample period, the equally weighted portfolio has an annualised mean return of 20.04% and a standard deviation of 16.2%. Over the same period the annualised mean return of the JSE Total Return All-Share index (J203T), obtained via I-Net Bridge, was 54.6%.

4.2 Methodology

The first stage of this project will be to create a 'heat map' of reversals in order to examine the relative strength of reversals across different lags, i and j. This can be achieved by using the β's from multiple least squares regressions, using single day returns from i days prior to predict single day returns j days in the future. However, since $\beta_{i,j} = \frac{Covariance(r_{t+i}, r_{t-j})}{Variance(r^M)}$, optimal lags may also be obtained by producing a grid of return correlations.

To illustrate, this means calculating:

$$\rho_{t-i,t+j} = \frac{\sigma_{ij}}{\sigma_i \sigma_j} = \frac{(r_{t-i} - \overline{r_{t-i}})(r_{t+j} - \overline{r_{t+j)}}}{\sigma_i \sigma_j} \ \forall \text{ i from 1 to 30, j from 0 to 29}$$

where r_{t-i} is the prior i day's return and r_{t+j} represents the next j day's return.

Once this heat map of correlations is created, optimal lags, i^* and j^* can be identified. $k^* = i^* + j^*$ is defined as the total lag between returns. This is used to determine which prior return information is most suitable when portfolios are generated, since the optimal lag should lead to the greatest possible amount of mean reversion.

To test the short-term reversal effect a portfolio-based trading strategy is used, similar to that used by Lehmann (1990), Jegadeesh (1990), Lo and MacKinlay (1990), Cubbin *et al.* (2006) and Da *et al.* (2011). This is referred to as a standard short-term reversal strategy and is a zero net investment strategy where stocks are ranked according to prior returns. The losers (lowest ranked stocks) are bought and the winners (highest ranked stocks) are sold. This also means that, by construction, this strategy is a contrarian one. Since daily (as opposed to monthly) data is used for this study, it will be possible to construct these portfolios on non-overlapping periods.
To be comprehensive a wide range of percentiles are investigated. Formation and holding periods for the strategy are chosen according to the optimal lags as decided by the heat-map results; additionally alternative formation and holding periods are investigated too. Longer holding periods may be valuable as they would lead to a reduction in portfolio turnover and thus trading costs.

Let $w_{n,t}$ be the weight of the $n'th$ stock at time t and let N be the number of stocks meeting the strategies requirements. Weights are set on an equal weighting assumption. Equal amounts of shares that qualify according to the strategy are bought. Thus,

$$w_{n,t+i^*} = 1/N \text{ for } n = 1, ..., N.$$

By setting the amount of cash allocated to long and short strategies to be equal, this will be a zero-net investment strategy since $\sum w_{n,t} = 0$.

The reversal strategy return is:

$$\pi_{t,k^*} = \sum_{n=1}^{N} w_{n,t} * r_{n,t} = 1/N \sum_{n=1}^{N} r_{n,t}$$

To determine whether this approach adds value or not, it is necessary to compare returns relative to the market. Thus a market proxy will be required. For the purposes of this study, the 'market portfolio' is taken to be an equally weighted share index of the top 60 shares as ranked above. This market portfolio is bought-and-held throughout the study.

Additional trading rules are tested in conjunction with the standard short-term reversal strategy such as the moving average rules and a 'kicker' rule.

Let $ma(x, y)$ represent a moving average filter using x observations on series y. A moving average rule, using a moving average of x days requires that long positions meet the following criteria: $price_t > ma(x, price_t)$ and that shorts positions satisfy $price_t < ma(x, price_t)$.

The kicker rule requires that long positions satisfy $price_t > price_{t-1}$ and that shorts satisfy $price_t < price_{t-1}$. Such a rule may be able to capture positive momentum effects.

Lastly, a worthwhile robustness check of a strategy is to compare the returns generated to the returns that would be generated by the trading strategy with next day execution. The basic short-term reversal strategy relies on trading at close and may use the same day's return information in calculating expected future returns. This means that quick execution may be required as the price changes that signal trading rules occur in the very last minutes of a trading day. Assuming that execution takes place the following day after a trading signal leads to a more easily implementable strategy and prevents look-ahead bias. This is investigated for selected strategies in section 5.2.

5 Results

5.1 General results

In order to identify the optimal formation period for the standard short-term reversal strategy, heatmaps of correlations were calculated. These grids of return correlations in figures 1, 2, 3 and 4 are based on the Top 60 as well as industrial, resource and financial shares within the Top 60 on the JSE respectively. As rows (columns) increment one extra day is considered in the set of future (prior) returns upon which correlations are calculated. The heatmaps presented in this section cover the period 10 August 1992 to 10 August 2012.

This approach is valuable as one can identify minimum and maximum correlations from the heatmaps created. The most negative correlation within a given heatmap suggests appropriate formation and holding periods for the standard short-term return reversal strategy.

The following t-statistic can be used to test the statistical significance of the absolute magnitude of correlations (i.e. by testing the null hypothesis that $\rho = 0$ against the alternative hypothesis that $\rho \neq 0$):

$$t = \frac{\rho\sqrt{n-2}}{\sqrt{1-\rho^2}}$$

where $n = 5220$ is the number of days observed in the entire dataset for 1 day returns and ρ is the sample correlation. For 5 day returns, $n = 1044$ since non-overlapping periods are required.

T-statistics and p-values for 1 day and 5 day returns are presented in tables 1 and 2 respectively for correlations of 0.01, 0.02, 0.03, 0.04 and 0.05.

Correlation	1 day returns	5 day returns
0.01	0.7225	0.3231
0.02	1.4453	0.6463
0.03	2.1685	0.9698
0.04	2.8923	1.2935
0.05	3.6170	1.6176

Table 1: t-statistics for 1 and 5 day return correlations

Correlation	1 day returns	5 day returns
0.01	0.47000	0.74666
0.02	0.14844	0.51820
0.03	0.03017	0.33239
0.04	0.00384	0.19613
0.05	0.00030	0.10606

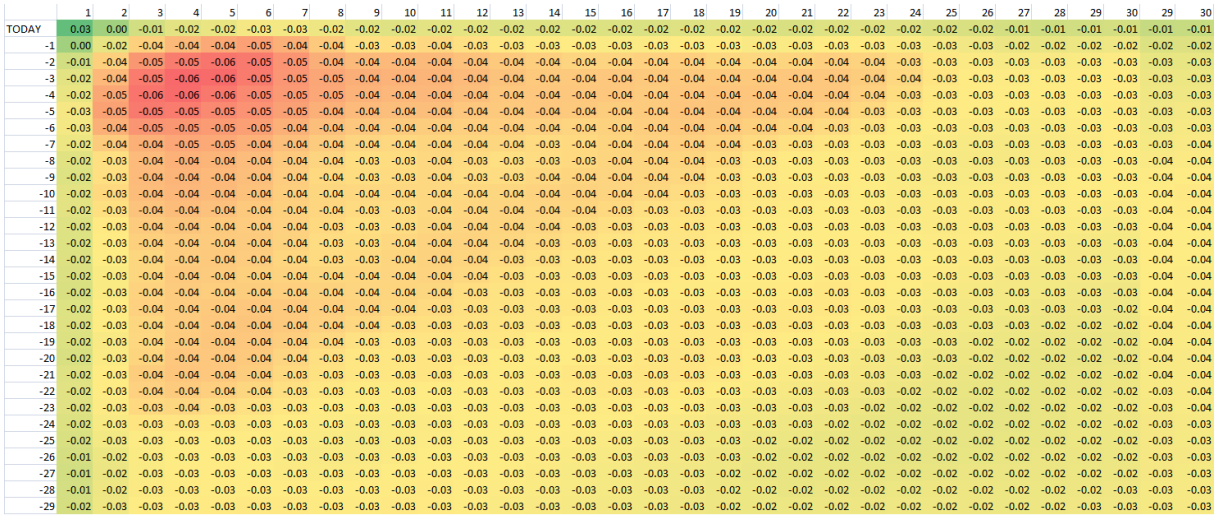
Table 2: p-values for 1 and 5 day return correlations

From the results in table 2, all correlations for 1 day returns in figures 1, 2, 3 and 4 that are equal to or less than -0.03 are significant at the 95% level or greater.

For five day returns, correlations equal to or less than -0.05 in the above-mentioned figures are significant at approximately the 90% level.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
TODAY	0.03	0.01	-0.01	-0.01	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.01	-0.02	-0.02	-0.02	-0.01	-0.02	-0.02	-0.02	-0.02	-0.01	-0.01	-0.01	-0.01	-0.01
-1	0.01	-0.02	-0.03	-0.03	-0.04	-0.04	-0.04	-0.03	-0.03	-0.03	-0.04	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.02	-0.02	-0.02	-0.02	-0.02
-2	-0.01	-0.03	-0.04	-0.04	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.04	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03
-3	-0.01	-0.03	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03
-4	-0.02	-0.04	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03
-5	-0.02	-0.04	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03
-6	-0.02	-0.04	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03
-7	-0.02	-0.04	-0.04	-0.05	-0.05	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.03	-0.03	-0.03	-0.03	-0.03	-0.04
-8	-0.02	-0.03	-0.04	-0.05	-0.05	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.03	-0.03	-0.03	-0.03	-0.04	-0.04
-9	-0.02	-0.03	-0.04	-0.05	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.03	-0.03	-0.04	-0.04	-0.04	-0.04
-10	-0.02	-0.04	-0.04	-0.05	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04
-11	-0.02	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04
-12	-0.02	-0.03	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04
-13	-0.02	-0.03	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04
-14	-0.02	-0.03	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04
-15	-0.02	-0.03	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04
-16	-0.02	-0.03	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04
-17	-0.02	-0.03	-0.04	-0.04	-0.04	-0.05	-0.05	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04
-18	-0.02	-0.03	-0.04	-0.04	-0.05	-0.05	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04
-19	-0.02	-0.03	-0.04	-0.04	-0.05	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04
-20	-0.02	-0.03	-0.04	-0.04	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04
-21	-0.02	-0.03	-0.04	-0.04	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.03	-0.04	-0.04
-22	-0.02	-0.03	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.03	-0.03	-0.03	-0.04
-23	-0.02	-0.03	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.03	-0.03	-0.03	-0.03	-0.03	-0.04
-24	-0.02	-0.03	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03
-25	-0.02	-0.03	-0.03	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03
-26	-0.02	-0.03	-0.03	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03
-27	-0.02	-0.03	-0.03	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03
-28	-0.02	-0.03	-0.03	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03
-29	-0.02	-0.03	-0.03	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03

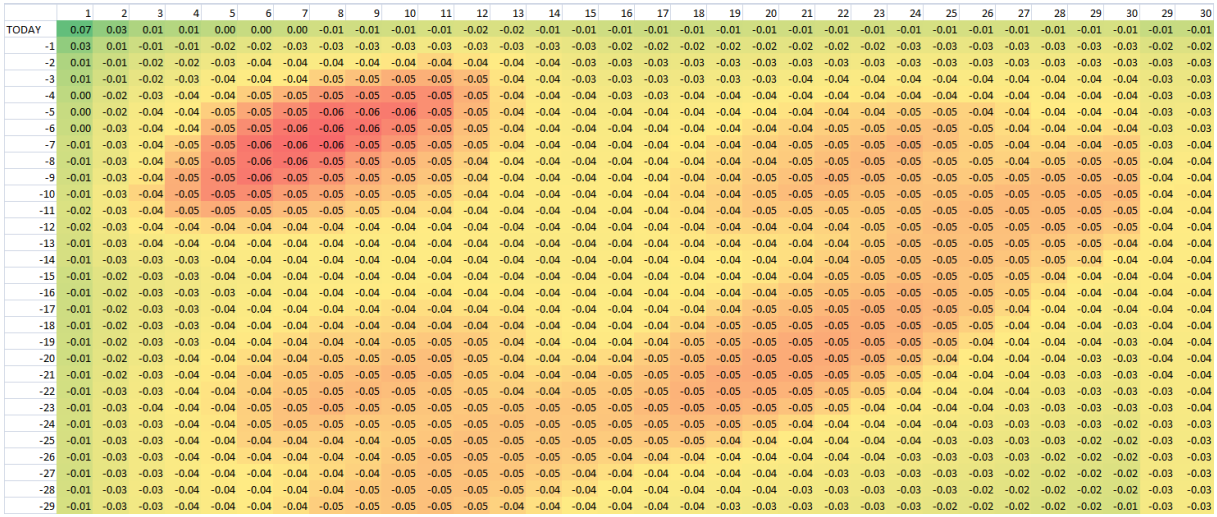
Figure 1: *Return correlations for all top 60 shares from 10 August 1992 to 10 August 2012*



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	29	30
TODAY	0.03	0.00	-0.01	-0.02	-0.02	-0.03	-0.03	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
-1	0.00	-0.02	-0.04	-0.04	-0.04	-0.05	-0.04	-0.04	-0.03	-0.03	-0.04	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02
-2	-0.01	-0.04	-0.05	-0.05	-0.06	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03
-3	-0.02	-0.04	-0.05	-0.06	-0.06	-0.05	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03
-4	-0.02	-0.05	-0.06	-0.06	-0.06	-0.05	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03
-5	-0.03	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03
-6	-0.03	-0.04	-0.05	-0.05	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03
-7	-0.02	-0.04	-0.04	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.03	-0.04	-0.04	-0.04	-0.04	-0.04	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.04	-0.04
-8	-0.02	-0.03	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.03	-0.03	-0.04	-0.03	-0.03	-0.03	-0.03	-0.04	-0.04	-0.04	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.04	-0.04
-9	-0.02	-0.03	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.03	-0.03	-0.04	-0.03	-0.03	-0.04	-0.04	-0.04	-0.04	-0.04	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.04	-0.04
-10	-0.02	-0.03	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.04	-0.04
-11	-0.02	-0.03	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.03	-0.03	-0.04	-0.04	-0.04	-0.04	-0.04	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.04	-0.04
-12	-0.02	-0.03	-0.04	-0.04	-0.04	-0.04	-0.04	-0.03	-0.03	-0.03	-0.04	-0.04	-0.04	-0.04	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.04	-0.04
-13	-0.02	-0.03	-0.04	-0.04	-0.04	-0.04	-0.04	-0.03	-0.03	-0.04	-0.04	-0.04	-0.04	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.04	-0.04
-14	-0.02	-0.03	-0.04	-0.04	-0.04	-0.04	-0.04	-0.03	-0.03	-0.04	-0.04	-0.04	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.04	-0.04
-15	-0.02	-0.03	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.04	-0.04
-16	-0.02	-0.03	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.04	-0.04
-17	-0.02	-0.03	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.02	-0.04	-0.04
-18	-0.02	-0.03	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.02	-0.02	-0.04	-0.04
-19	-0.02	-0.03	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.02	-0.02	-0.02	-0.02	-0.02	-0.04	-0.04
-20	-0.02	-0.03	-0.04	-0.04	-0.04	-0.04	-0.04	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.02	-0.02	-0.02	-0.02	-0.02	-0.04	-0.04
-21	-0.02	-0.03	-0.04	-0.04	-0.04	-0.04	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.04	-0.04
-22	-0.02	-0.03	-0.04	-0.04	-0.04	-0.04	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.03	-0.04
-23	-0.02	-0.03	-0.03	-0.04	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.03	-0.04
-24	-0.02	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.03	-0.03
-25	-0.02	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.03	-0.03
-26	-0.01	-0.02	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.03	-0.03
-27	-0.01	-0.02	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.03	-0.03
-28	-0.01	-0.02	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.03	-0.03	-0.03
-29	-0.02	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.03	-0.03	-0.03	-0.03

Figure 2: *Return correlations for industrials within top 60 shares from 10 August 1992 to 10 August 2012*

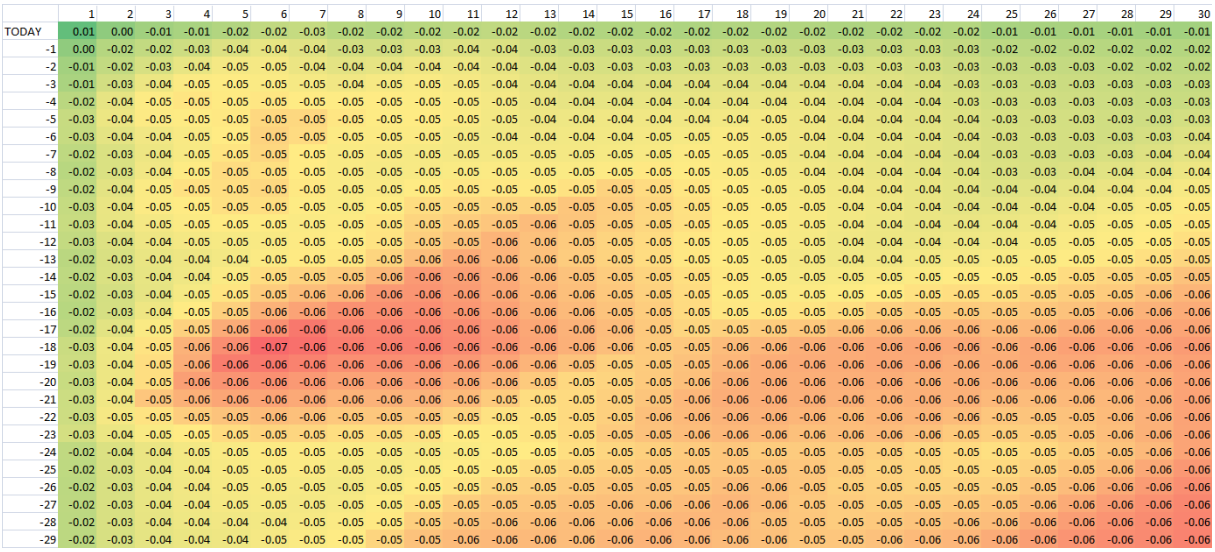
Figure 2 indicates that, for the industrial sector, the optimal formation and holding periods shift inwards slightly to 4 days.



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	29	30
TODAY	0.07	0.03	0.01	0.01	0.00	0.00	0.00	-0.01	-0.01	-0.01	-0.01	-0.02	-0.02	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
-1	0.03	0.01	-0.01	-0.01	-0.02	-0.02	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.02	-0.02
-2	0.01	-0.01	-0.02	-0.02	-0.03	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03
-3	0.01	-0.01	-0.02	-0.03	-0.04	-0.04	-0.04	-0.05	-0.05	-0.05	-0.05	-0.05	-0.04	-0.04	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.03	-0.03
-4	0.00	-0.02	-0.03	-0.04	-0.04	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.04	-0.04	-0.04	-0.03	-0.03	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.03	-0.03
-5	0.00	-0.02	-0.04	-0.04	-0.05	-0.05	-0.05	-0.06	-0.06	-0.06	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04	-0.04	-0.03	-0.03
-6	0.00	-0.03	-0.04	-0.04	-0.05	-0.05	-0.06	-0.06	-0.06	-0.05	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.05	-0.05	-0.05	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04	-0.03	-0.03
-7	-0.01	-0.03	-0.04	-0.05	-0.05	-0.06	-0.06	-0.06	-0.05	-0.05	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.04	-0.04	-0.04	-0.05	-0.03	-0.04
-8	-0.01	-0.03	-0.04	-0.05	-0.05	-0.06	-0.06	-0.05	-0.05	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.04	-0.05	-0.05	-0.05	-0.04	-0.04
-9	-0.01	-0.03	-0.04	-0.05	-0.05	-0.06	-0.05	-0.05	-0.05	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.04	-0.04
-10	-0.01	-0.03	-0.04	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.04	-0.04
-11	-0.02	-0.03	-0.04	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.04	-0.04
-12	-0.02	-0.03	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.04	-0.04
-13	-0.01	-0.03	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.04	-0.04	-0.04
-14	-0.01	-0.03	-0.03	-0.03	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04
-15	-0.01	-0.02	-0.03	-0.03	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04	-0.04
-16	-0.01	-0.02	-0.03	-0.03	-0.03	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04	-0.04
-17	-0.01	-0.02	-0.03	-0.03	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04	-0.04
-18	-0.01	-0.02	-0.03	-0.03	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.04	-0.04	-0.04	-0.03	-0.04	-0.04
-19	-0.01	-0.02	-0.03	-0.03	-0.04	-0.04	-0.04	-0.04	-0.04	-0.05	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04	-0.04	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04	-0.03	-0.04	-0.04
-20	-0.01	-0.02	-0.03	-0.04	-0.04	-0.04	-0.04	-0.05	-0.05	-0.05	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.04	-0.04	-0.04	-0.03	-0.03	-0.04	-0.04
-21	-0.01	-0.02	-0.03	-0.04	-0.04	-0.04	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.04	-0.04	-0.04	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.04	-0.04	-0.04	-0.03	-0.03	-0.03	-0.04	-0.04
-22	-0.01	-0.03	-0.03	-0.04	-0.04	-0.04	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.04	-0.04	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04	-0.03	-0.03	-0.03	-0.03	-0.04
-23	-0.01	-0.03	-0.04	-0.04	-0.04	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04	-0.03	-0.03	-0.03	-0.03	-0.03	-0.04
-24	-0.01	-0.03	-0.03	-0.04	-0.04	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04	-0.04	-0.03	-0.03	-0.03	-0.03	-0.02	-0.03	-0.03
-25	-0.01	-0.03	-0.03	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.03	-0.03	-0.03	-0.03	-0.02	-0.02	-0.03	-0.03
-26	-0.01	-0.03	-0.03	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.03	-0.03	-0.03	-0.03	-0.02	-0.02	-0.02	-0.03	-0.03
-27	-0.01	-0.03	-0.03	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.05	-0.05	-0.05	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.03	-0.03	-0.03	-0.03	-0.03	-0.02	-0.02	-0.02	-0.02	-0.03	-0.03
-28	-0.01	-0.03	-0.03	-0.04	-0.04	-0.04	-0.04	-0.04	-0.05	-0.05	-0.05	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.03	-0.03	-0.03	-0.03	-0.03	-0.02	-0.02	-0.02	-0.02	-0.02	-0.03	-0.03
-29	-0.01	-0.03	-0.03	-0.04	-0.04	-0.04	-0.04	-0.05	-0.05	-0.05	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.02	-0.02	-0.02	-0.02	-0.02	-0.01	-0.03	-0.03

Figure 3: *Return correlations for resources within top 60 shares from 10 August 1992 to 10 August 2012*

For the resources sector both the optimal formation and holding periods appear to shift out slightly to 7 days from 5 days.



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
TODAY	0.01	0.00	-0.01	-0.01	-0.02	-0.02	-0.03	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
-1	0.00	-0.02	-0.02	-0.03	-0.04	-0.04	-0.04	-0.03	-0.03	-0.03	-0.04	-0.04	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02
-2	-0.01	-0.02	-0.03	-0.04	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.02	-0.02	-0.02
-3	-0.01	-0.03	-0.04	-0.05	-0.05	-0.05	-0.05	-0.04	-0.05	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03
-4	-0.02	-0.04	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03
-5	-0.03	-0.04	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.05	-0.04	-0.04	-0.04	-0.04	-0.04	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03
-6	-0.03	-0.04	-0.04	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04	-0.05	-0.05	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04	-0.04	-0.03	-0.03	-0.03	-0.03	-0.03	-0.04
-7	-0.02	-0.03	-0.04	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04	-0.04	-0.03	-0.03	-0.03	-0.03	-0.04	-0.04
-8	-0.02	-0.03	-0.04	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04	-0.04	-0.03	-0.03	-0.04	-0.04	-0.04	-0.04
-9	-0.02	-0.04	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.05
-10	-0.03	-0.04	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.05	-0.05	-0.05
-11	-0.03	-0.04	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.06	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.05	-0.05	-0.05	-0.05
-12	-0.03	-0.04	-0.04	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.06	-0.06	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04	-0.04	-0.05	-0.05	-0.05	-0.05	-0.05
-13	-0.02	-0.03	-0.04	-0.04	-0.04	-0.05	-0.05	-0.05	-0.05	-0.06	-0.06	-0.06	-0.06	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.04	-0.04	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05
-14	-0.02	-0.03	-0.04	-0.04	-0.05	-0.05	-0.05	-0.05	-0.06	-0.06	-0.06	-0.06	-0.06	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05
-15	-0.02	-0.03	-0.04	-0.05	-0.05	-0.05	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.06	-0.06
-16	-0.02	-0.03	-0.04	-0.05	-0.05	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.06	-0.06	-0.06
-17	-0.02	-0.04	-0.05	-0.05	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.05	-0.05	-0.05	-0.05	-0.05	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06
-18	-0.03	-0.04	-0.05	-0.06	-0.06	-0.07	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.05	-0.05	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06
-19	-0.03	-0.04	-0.05	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.05	-0.05	-0.05	-0.05	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06
-20	-0.03	-0.04	-0.05	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.05	-0.05	-0.05	-0.05	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06
-21	-0.03	-0.04	-0.05	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.05	-0.05	-0.05	-0.05	-0.05	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06
-22	-0.03	-0.05	-0.05	-0.05	-0.05	-0.06	-0.06	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.05	-0.05	-0.05	-0.06	-0.06	-0.06
-23	-0.03	-0.04	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.05	-0.05	-0.05	-0.05	-0.06	-0.06	-0.06
-24	-0.02	-0.04	-0.04	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.06	-0.06
-25	-0.02	-0.03	-0.04	-0.04	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.06	-0.06	-0.06
-26	-0.02	-0.03	-0.04	-0.04	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.06	-0.06	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.06	-0.06	-0.06	-0.06
-27	-0.02	-0.03	-0.04	-0.04	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.06	-0.06	-0.06	-0.06	-0.06	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.06	-0.06	-0.06	-0.06	-0.06
-28	-0.02	-0.03	-0.04	-0.04	-0.04	-0.04	-0.05	-0.05	-0.05	-0.05	-0.05	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.05	-0.05	-0.05	-0.05	-0.05	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06
-29	-0.02	-0.03	-0.04	-0.04	-0.04	-0.05	-0.05	-0.05	-0.05	-0.05	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.05	-0.05	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06

Figure 4: *Return correlations for financials within top 60 shares from 10 August 1992 to 10 August 2012*

Relatively strong reversals still exist within the financial sector using 5 day prior and 5 day future returns. However, it appears that it would be optimal to use prior 18 day returns to form portfolios with 6 day holding periods if one was confined to financial stocks only as the reversal effect is strongest at this point.

Other heatmaps are included in appendix A. These are run using pre-crash, crash and post-crash sub-periods and considered separately for the full top 60 shares and by sectors (resources, industrials and finances) within the top 60 as well.
The results of the heatmaps above and in appendix A generally indicate that short-term return reversal is strongest when using 5 day prior returns on the next 5 day returns. This results holds fairly well across sectors as well as periods.

In all tables presented returns and standard deviations (represented by Std. Dev.) are annualised. Additionally, 'Avg. Shares' represents the mean number of shares held by each strategy on a day. IR is the information ratio, which is mean annualised return divided by standard deviation.

Below are the results for the above described standard short-term reversal strategy using 5 day, 7 day and 10 day formation periods in tables 3, 4 and 5 respectively. In each table different choices of percentiles are tabulated for each formation period.

Using a 5 day holding period				
Strategy (Long only)	**Returns**	**Std. Dev.**	**Avg. Shares**	**IR**
Equally Weighted Index	0.20	0.16	55.19	1.24
5 day's 5th percentile	0.70	0.36	2.85	1.91
5 day's 10th percentile	0.61	0.28	5.48	2.18
5 day's 15th percentile	0.53	0.24	8.22	2.24
5 day's 20th percentile	0.47	0.22	11.03	2.16
5 day's 25th percentile	0.45	0.21	13.69	2.13
5 day's 30th percentile	0.41	0.20	16.39	2.05
5 day's 40th percentile	0.37	0.19	21.90	2.00
Strategy (Short only)				
5 day's 5th percentile	0.16	0.37	2.85	0.43
5 day's 10th percentile	0.10	0.27	5.48	0.38
5 day's 15th percentile	0.04	0.23	8.23	0.19
5 day's 20th percentile	0.05	0.21	11.04	0.26
5 day's 25th percentile	0.00	0.20	13.69	0.00
5 day's 30th percentile	-0.03	0.19	16.46	-0.15
5 day's 40th percentile	-0.05	0.18	21.96	-0.30

The standard short-term reversal strategy is where stocks are ranked according to prior returns and positions are taken based on which percentile a stock is in. Some percentile of the losers (lowest ranked stocks) are bought and some percentile the winners (highest ranked stocks) are shorted. No position is taken on stocks that fall into neither category. The period of the prior returns selected to rank returns is termed the formation period of this strategy. Table 3 shows the results of this strategy when using a 5 day formation period and testing different percentiles for the period 1/1/1998 until 23/07/2012.

Table 3: 5 day prior percentile ranking method only

Using a 7 day holding period				
Strategy (Long only)	**Returns**	**Std. Dev.**	**Avg. Shares**	**IR**
7 day's 5th percentile	0.56	0.36	2.85	1.56
7 day's 10th percentile	0.48	0.28	5.48	1.73
7 day's 15th percentile	0.47	0.24	8.23	2.00
7 day's 20th percentile	0.43	0.22	11.03	1.97
Strategy (Short only)				
7 day's 5th percentile	0.14	0.37	2.85	0.38
7 day's 10th percentile	0.08	0.28	5.48	0.29
7 day's 15th percentile	0.04	0.23	8.23	0.16
7 day's 20th percentile	0.02	0.21	11.04	0.09

Table 4 shows the results of the standard short-term reversal strategy when using a 7 day formation and holding period and testing different percentiles for the period 1/1/1998 until 23/07/2012.

Table 4: 7 day prior percentile ranking method only

Using a 10 day holding period				
Strategy (Long only)	**Returns**	**Std. Dev.**	**Avg. Shares**	**IR**
10 day's 5th percentile	0.42	0.34	2.85	1.22
10 day's 10th percentile	0.45	0.28	5.47	1.63
10 day's 15th percentile	0.42	0.24	8.23	1.78
10 day's 20th percentile	0.40	0.22	11.03	1.79
Strategy (Short only)				
10 day's 5th percentile	0.08	0.37	2.85	0.23
10 day's 10th percentile	0.06	0.27	5.47	0.22
10 day's 15th percentile	0.03	0.23	8.23	0.15
10 day's 20th percentile	0.01	0.21	11.03	0.05

Table 5 shows the results of the standard short-term reversal strategy when using a 10 day formation and holding period and testing different percentiles for the period 1/1/1998 until 23/07/2012.

Table 5: 10 day prior percentile ranking method only

Comparing the results for the standard short-term reversal strategy using 5, 7 and 10 day prior returns suggest that the return reversal effect is strongest using prior 5 day returns as these strategies have the greatest information ratios across different percentiles. The maximum of these was the long strategy for the 5 day prior's 15th percentile using a 5 day holding period, with an information ratio of 2.24.

Testing the long strategies for the 5 day prior's 15th percentile using 4, 6, 7 and 10 day holding periods gives information ratios of 2.23, 2.16, 2.00 and 1.81 respectively.

This suggests that a 5 day holding period is optimal as it maximises the information ratio.

In additional unreported results the 7 day prior and 10 day prior's 15th percentile using a 5 day holding period yielded information ratios of 1.96 and 2.06 respectively. This supports choosing a 5 day formation period as it optimises the information ratio. This holds for both long and short strategies and supports the results of the heatmaps in appendix A.

It is also evident that returns and standard deviations increase as percentiles are made smaller across all formation periods. Furthermore, the choice of percentile has a direct impact on the number of positions held. The effect in returns of decreasing the chosen percentile is greatest for this strategy when using 5 day prior returns. Using the same prior returns, information ratios increase up to the 15th percentiles and then begin to drop off.

To consider additions to the standard short-term reversal strategy that may add value, moving average rules and moving average crossover rules are investigated below.

Using a 5 day holding period				
Strategy (Long only)	**Returns**	**Std. Dev.**	**Avg. Shares**	**IR**
Equally Weighted Index	0.20	0.16	55.19	1.24
50 day MA	0.06	0.20	32.73	0.32
100 day MA	0.13	0.18	34.47	0.72
150 day MA	0.14	0.17	35.63	0.81
200 day MA	0.16	0.17	36.34	0.90
250 day MA	0.17	0.18	36.82	0.96
300 day MA	0.16	0.18	37.18	0.92
Strategy (Short only)				
50 day MA	-0.35	0.20	22.24	-1.77
100 day MA	-0.32	0.21	20.28	-1.54
150 day MA	-0.30	0.23	18.89	-1.32
200 day MA	-0.26	0.23	17.94	-1.15
250 day MA	-0.26	0.23	17.22	-1.11
300 day MA	-0.26	0.24	16.62	-1.10

Table 6 shows the results of the strategy which goes long on shares that have a price above its moving average and shorts the shares with prices below the moving average for the period 1/1/1998 until 23/07/2012. Rebalancing is set to happen every 5 days. MA represents 'moving average'.

Table 6: Moving average rules only

The above results in Table 6 indicate that all moving average rules tested underperform the index, with poorer returns and greater standard deviations. All short strategies do worse than the shorting the index would have. As the number of days used for the moving average increases, the returns on the strategy converge to that of the equally weighted index.

The results of the short positions above imply that one should go long if price is less than the moving average. This is counter-intuitive to the expectations of most practitioners, but using this rule the long positions for the 50 day moving average would have a mean annualised return of 34.72%, a standard deviation of 20.0% and an information ratio of 1.74.

Using a 5 day holding period				
Strategy (Long only)	**Returns**	**Std. Dev.**	**Avg. Shares**	**IR**
Equally Weighted Index	0.20	0.16	55.19	1.24
50 day MA on 100 days	0.14	0.21	20.00	0.68
50 day MA on 150 days	0.15	0.22	18.75	0.69
50 day MA on 200 days	0.17	0.23	18.06	0.75
50 day MA on 250 days	0.17	0.23	17.35	0.73
100 day MA on 150 days	0.14	0.22	18.62	0.66
100 day MA on 200 days	0.18	0.22	17.78	0.80
100 day MA on 250 days	0.22	0.23	17.27	0.97
150 day MA on 200 days	0.18	0.22	17.60	0.84
150 day MA on 250 days	0.22	0.22	16.93	1.01
200 day MA on 250 days	0.21	0.23	17.07	0.92
Strategy (Short only)				
50 day MA on 100 days	-0.22	0.17	34.76	-1.29
50 day MA on 150 days	-0.23	0.17	35.77	-1.36
50 day MA on 200 days	-0.22	0.17	36.22	-1.30
50 day MA on 250 days	-0.23	0.17	36.69	-1.34
100 day MA on 150 days	-0.21	0.17	35.90	-1.25
100 day MA on 200 days	-0.21	0.17	36.51	-1.21
100 day MA on 250 days	-0.21	0.18	36.78	-1.16
150 day MA on 200 days	-0.21	0.18	36.69	-1.19
150 day MA on 250 days	-0.21	0.18	37.11	-1.18
200 day MA on 250 days	-0.20	0.19	37.00	-0.07

Another moving average rule is to long (short) a stock if a shorter term moving average is below (above) a longer term moving average. Table 7 shows the results of the strategy which uses these 'moving average crossover' rules for the period 1/1/1998 until 23/07/2012. Rebalancing is set to happen every 5 days.

Table 7: Moving average crossover rules only

Table 7 indicates that the moving average crossover rule generally underperform as well. Only the 100 days on 250 days, 150 days on 250 days and 200 days on 250 days moving average crossovers long strategies have marginally higher returns than the equally weighted-index.

Despite the relatively poor performance of the moving average rules it is possible that some positive interaction effect exists between the percentile ranking method and the moving average method. This leads to testing strategies which employ both rules in decision-making.

Using a 5 day holding period				
Strategy (Long only)	**Returns**	**Std. Dev.**	**Avg. Shares**	**IR**
Equally Weighted Index	0.20	0.16	55.19	1.24
5 day's 10th percentile, 50 day MA	0.38	0.33	1.72	1.15
5 day's 10th percentile, 100 day MA	0.52	0.39	2.30	1.32
5 day's 10th percentile, 150 day MA	0.55	0.40	2.61	1.38
5 day's 10th percentile, 200 day MA	0.61	0.41	2.78	1.49
5 day's 20th percentile, 50 day MA	0.34	0.32	4.07	1.05
5 day's 20th percentile, 100 day MA	0.45	0.36	5.09	1.25
5 day's 20th percentile, 150 day MA	0.43	0.31	5.62	1.37
5 day's 20th percentile, 200 day MA	0.51	0.37	5.92	1.40
5 day's 30th percentile, 50 day MA	0.27	0.31	6.70	0.88
5 day's 30th percentile, 100 day MA	0.31	0.29	8.06	1.06
5 day's 30th percentile, 150 day MA	0.37	0.29	8.80	1.24
5 day's 30th percentile, 200 day MA	0.42	0.31	9.22	1.34
Strategy (Short only)	**Returns**	**Std. Dev.**	**Avg. Shares**	**IR**
5 day's 10th percentile, 50 day MA	0.05	0.32	1.50	0.16
5 day's 10th percentile, 100 day MA	0.02	0.34	1.64	0.05
5 day's 10th percentile, 150 day MA	0.08	0.37	1.64	0.20
5 day's 10th percentile, 200 day MA	0.08	0.37	1.67	0.22
5 day's 20th percentile, 50 day MA	-0.09	0.30	2.72	-0.31
5 day's 20th percentile, 100 day MA	-0.04	0.31	2.97	-0.12
5 day's 20th percentile, 150 day MA	0.01	0.31	2.96	0.04
5 day's 20th percentile, 200 day MA	0.02	0.31	2.99	0.08
5 day's 30th percentile, 50 day MA	-0.18	0.29	4.08	-0.62
5 day's 30th percentile, 100 day MA	-0.10	0.29	4.36	-0.35
5 day's 30th percentile, 150 day MA	-0.11	0.30	4.31	-0.36
5 day's 30th percentile, 200 day MA	-0.09	0.30	4.32	-0.30

Table 8 shows the results of the strategy which combines the standard short-term reversal strategy with 'moving average' rules for the period 1/1/1998 until 23/07/2012. Now positions are only taken if they meet both criteria for a long or a short. A long is only taken if that share is in the bottom chosen percentile and has a price above its moving average. A short is only taken if that share is in the top percentile and has a price below its moving average.

Table 8: 5 day prior percentile ranking method and moving average rules

Comparing the results in table 8 with those in table 3, it is evident that adding the moving average rule to the standard short-term reversal strategy fails to add value or reduce risk. Using the rules of both strategies also leads to a decrease in the number of average shares held.

One strategy, the standard short-term reversal strategy using 5 day formation and holding periods at the 20th percentile combined with the rules for a 200 day moving

average offers greater returns than the equivalent standard short-term reversal strategy taken on its own. However, the combined strategy is riskier and reduces the information ratio from 2.16 to 1.4.

As the number of days used by the moving average increase the returns of the strategies above converge to those of just the standard short-term reversal strategy, but with higher standard deviations and fewer shares held at each percentile.

The results in tables 6 and 8 seem to indicate that moving average rules are not as effective over short holding periods. To examine this further, the long strategies for a strategy which combines the standard short-term reversal strategy with the opposite signals from moving average rules is presented below in table 9.

Using a 5 day holding period Strategy (Long only)	**Returns**	**Std. Dev.**	**Avg. Shares**	**IR**
Equally Weighted Index	0.20	0.16	55.19	1.24
5 day's 10th percentile, 50 day Opposite MA	0.66	0.32	3.74	2.08
5 day's 10th percentile, 100 day Opposite MA	0.64	0.34	3.13	1.92
5 day's 10th percentile, 150 day Opposite MA	0.61	0.36	2.80	1.70
5 day's 10th percentile, 200 day Opposite MA	0.54	0.37	2.61	1.48
5 day's 20th percentile, 50 day Opposite MA	0.53	0.25	6.91	2.12
5 day's 20th percentile, 100 day Opposite MA	0.55	0.27	5.84	2.03
5 day's 20th percentile, 150 day Opposite MA	0.55	0.29	5.28	1.92
5 day's 20th percentile, 200 day Opposite MA	0.49	0.29	4.92	1.67
5 day's 30th percentile, 50 day Opposite MA	0.49	0.24	9.63	2.09
5 day's 30th percentile, 100 day Opposite MA	0.51	0.25	8.19	2.00
5 day's 30th percentile, 150 day Opposite MA	0.52	0.27	7.39	1.90
5 day's 30th percentile, 200 day Opposite MA	0.44	0.27	6.90	1.60

Table 9 shows the results of the strategy which combines the standard short-term reversal strategy with opposite of conventional 'moving average' rules for the period 1/1/1998 until 23/07/2012. Positions are only taken if they meet the criteria of both strategies. For a long to be taken that share must be in the bottom chosen percentile and have a price that is **below** its moving average.

Table 9: 5 day prior percentile ranking method and opposite moving average rules

The strategies in table 9 outperform those in table 8 for every percentile and moving average examined. Although these strategies offer relatively greater returns than the standard short-term reversal strategy alone, they lead to a slight reduction in information ratios. Importantly these results suggest that moving average rules are ineffective over

short holding periods.

The kicker rule simply demands that the return from one day prior to rebalancing is positive for longs and negative for shorts. This could be useful as it may be able to capture a small momentum effect in addition to the reversal effect. This rule is only tested in combination with other trading rules.

Using a 5 day holding period				
Strategy (Long only)	**Returns**	**Std. Dev.**	**Avg. Shares**	**IR**
6 day's 10th percentile, with kicker	0.35	0.32	1.44	1.09
6 day's 20th percentile, with kicker	0.37	0.30	3.18	1.25
6 day's 25th percentile, with kicker	0.38	0.29	4.07	1.31
6 day's 30th percentile, with kicker	0.42	0.28	5.04	1.49
6 day's 35th percentile, with kicker	0.35	0.25	6.09	1.39
6 day's 40th percentile, with kicker	0.33	0.24	7.12	1.37
6 day's 45th percentile, with kicker	0.35	0.23	8.24	1.52
6 day's 50th percentile, with kicker	0.31	0.22	9.30	1.41
Strategy (Short only)	**Returns**	**Std Dev**	**Avg Shares.**	**IR**
6 day's 10th percentile, with kicker	0.02	0.32	1.30	0.05
6 day's 20th percentile, with kicker	-0.01	0.29	2.90	-0.02
6 day's 25th percentile, with kicker	-0.05	0.27	3.71	-0.19
6 day's 30th percentile, with kicker	-0.09	0.25	4.63	-0.35
6 day's 35th percentile, with kicker	-0.05	0.24	5.60	-0.19
6 day's 40th percentile, with kicker	-0.05	0.23	6.54	-0.20
6 day's 45th percentile, with kicker	-0.09	0.23	7.57	-0.40
6 day's 50th percentile, with kicker	-0.07	0.23	8.54	-0.32

Table 10 shows the results of the strategy which combines the standard short-term reversal strategy with this kicker rule for the period 1/1/1998 until 23/07/2012. Now positions are only taken if they meet both criteria for a long or a short. A long is only taken if that share is in the bottom chosen percentile of returns over the past 6 day prior returns and if it earned a positive return on the day prior to rebalancing. A short is only taken if the share is in the top percentile and earned a negative return on the day prior to rebalancing.

Table 10: 6 day prior percentile ranking method and kicker rules

The addition of the kicker rule detracts value from the standard short-term reversal strategy. Returns are reduced compared to using the standard short-term reversal strategy only. Furthermore, at a given percentile the standard deviation is increased despite the reduction in returns. This also approximately halves the number of shares in a portfolio at each percentile.

The effect of adding the moving average rule to the above strategy of using the stand-

ard short-term reversal strategy with a kicker is also tested. This is to investigate the possibility of positive interaction effects between the kicker and moving average rules.

Using a 5 day holding period				
Strategy (Long only)	**Returns**	**Std. Dev.**	**Avg. Shares**	**IR**
Equally Weighted Index	0.20	0.16	55.19	1.24
6 day's 20th percentile, 50 day MA, kicker	0.21	0.25	1.28	0.84
6 day's 20th percentile, 100 day MA, kicker	0.24	0.25	1.56	0.98
6 day's 20th percentile, 150 day MA, kicker	0.29	0.27	1.72	1.08
6 day's 20th percentile, 200 day MA, kicker	0.30	0.27	1.80	1.11
6 day's 30th percentile, 50 day MA, kicker	0.25	0.24	2.28	1.03
6 day's 30th percentile, 100 day MA, kicker	0.22	0.25	2.67	0.89
6 day's 30th percentile, 150 day MA, kicker	0.28	0.26	2.88	1.09
6 day's 30th percentile, 200 day MA, kicker	0.33	0.26	3.00	1.30
6 day's 40th percentile, 50 day MA, kicker	0.22	0.24	3.51	0.90
6 day's 40th percentile, 100 day MA, kicker	0.21	0.24	3.96	0.86
6 day's 40th percentile, 150 day MA, kicker	0.24	0.25	4.22	0.98
6 day's 40th percentile, 200 day MA, kicker	0.28	0.26	4.39	1.11
Strategy (Short only)				
6 day's 20th percentile, 50 day MA, kicker	0.01	0.25	0.76	0.04
6 day's 20th percentile, 100 day MA, kicker	0.00	0.27	0.80	0.02
6 day's 20th percentile, 150 day MA, kicker	0.00	0.28	0.79	0.01
6 day's 20th percentile, 200 day MA, kicker	-0.04	0.29	0.79	-0.14
6 day's 30th percentile, 50 day MA, kicker	-0.01	0.26	1.35	-0.03
6 day's 30th percentile, 100 day MA, kicker	-0.03	0.28	1.38	-0.12
6 day's 30th percentile, 150 day MA, kicker	-0.04	0.29	1.33	-0.15
6 day's 30th percentile, 200 day MA, kicker	-0.04	0.30	1.30	-0.15
6 day's 40th percentile, 50 day MA, kicker	-0.04	0.26	2.11	-0.15
6 day's 40th percentile, 100 day MA, kicker	-0.06	0.27	2.06	-0.21
6 day's 40th percentile, 150 day MA, kicker	-0.05	0.29	1.96	-0.18
6 day's 40th percentile, 200 day MA, kicker	-0.06	0.29	1.90	-0.22

Table 11 shows the results of the strategy which combines the standard short-term reversal strategy with the kicker rule and the moving average rule for the period 1/1/1998 until 23/07/2012. Now positions are only taken if they meet all criteria for a long or a short. A long is only taken if that share is in the bottom chosen percentile of returns over the past 6 day prior returns, if it earned a positive return on the day prior to rebalancing and if its price is above its moving average. A short is only taken if the share is in the top percentile, earned a negative return on the day prior to rebalancing and if the share's price is below its moving average.

Table 11: 6 day prior percentile ranking method,kicker and moving average rules

Blending the standard short-term reversal strategy with moving average rules and the kicker rule is not beneficial. Adding the moving average rule to the standard short-term reversal strategy led to worse results as shown in table 8. The results in table 11 are worse for all long strategies. Some of the short strategies have improved, but still remain

completely impractical. This indicates that there is a negative interaction effect between the moving average and kicker strategies. Furthermore, the results in tables 10 and 11 imply that it is better to buy on a day with negative returns.

Finding that neither moving average rules nor kicker rules help improve the standard short-term reversal strategy led to the consideration of a 'double application' of the rules of this strategy. This is outlined in tables 12 and 13 below.

Using a 5 day holding period Strategy (Long only)	**Returns**	**Std. Dev.**	**Avg. Shares**	**IR**
Equally Weighted Index	0.20	0.16	55.19	1.24
5 day's 10th percentile, 10 day's 10th percentile	0.75	0.39	2.53	1.91
5 day's 10th percentile, 10 day's 20th percentile	0.70	0.33	3.62	2.14
5 day's 10th percentile, 10 day's 30th percentile	0.64	0.31	4.23	2.08
5 day's 10th percentile, 10 day's 40th percentile	0.65	0.30	4.63	2.17
5 day's 10th percentile, 10 day's 50th percentile	0.62	0.29	4.88	2.15
5 day's 20th percentile, 10 day's 10th percentile	0.70	0.33	3.61	2.09
5 day's 20th percentile, 10 day's 20th percentile	0.58	0.27	6.03	2.16
5 day's 20th percentile, 10 day's 30th percentile	0.54	0.25	7.51	2.16
5 day's 20th percentile, 10 day's 40th percentile	0.52	0.24	8.70	2.22
5 day's 20th percentile, 10 day's 50th percentile	0.50	0.23	9.40	2.21
5 day's 30th percentile, 10 day's 10th percentile	0.65	0.31	4.25	2.10
5 day's 30th percentile, 10 day's 20th percentile	0.55	0.25	7.64	2.20
5 day's 30th percentile, 10 day's 30th percentile	0.50	0.23	10.08	2.16
5 day's 30th percentile, 10 day's 40th percentile	0.48	0.22	12.03	2.19
5 day's 30th percentile, 10 day's 50th percentile	0.45	0.21	13.35	2.15
5 day's 40th percentile, 10 day's 10th percentile	0.61	0.30	4.65	2.02
5 day's 40th percentile, 10 day's 20th percentile	0.52	0.24	8.74	2.20
5 day's 40th percentile, 10 day's 30th percentile	0.47	0.22	12.02	2.17
5 day's 40th percentile, 10 day's 40th percentile	0.45	0.20	14.86	2.22
5 day's 40th percentile, 10 day's 50th percentile	0.42	0.20	16.93	2.14

The standard short-term reversal strategy can be expanded to consider multiple sets of prior returns. Using two sets of prior returns, stocks are ranked according to prior returns as before and positions are taken based on which percentiles a stock is in. Now, longs and shorts must be in the appropriate percentiles for both sets of prior returns. No position is taken on stocks that fall into neither category. Table 12 shows the results of the long positions for this strategy when using a 5 day formation period and a 10 day formation period, testing different percentiles for the period 1/1/1998 until 23/07/2012. Essentially this strategy takes one standard short-term reversal strategy and combines with another standard short-term reversal strategy.

Table 12: Long strategies for 5 day prior and 10 day prior percentile ranking method

Using a 5 day holding period Strategy (Short only)	Returns	Std. Dev.	Avg. Shares	IR
5 day's 10th percentile, 10 day's 10th percentile	0.21	0.38	2.65	0.56
5 day's 10th percentile, 10 day's 20th percentile	0.21	0.32	3.70	0.68
5 day's 10th percentile, 10 day's 30th percentile	0.17	0.29	4.33	0.59
5 day's 10th percentile, 10 day's 40th percentile	0.15	0.29	4.71	0.54
5 day's 20th percentile, 10 day's 10th percentile	0.26	0.32	3.66	0.82
5 day's 20th percentile, 10 day's 20th percentile	0.18	0.24	6.08	0.74
5 day's 20th percentile, 10 day's 30th percentile	0.13	0.22	7.67	0.60
5 day's 20th percentile, 10 day's 40th percentile	0.10	0.21	8.57	0.46
5 day's 30th percentile, 10 day's 10th percentile	0.23	0.30	4.24	0.77
5 day's 30th percentile, 10 day's 20th percentile	0.14	0.23	7.59	0.63
5 day's 30th percentile, 10 day's 30th percentile	0.09	0.21	10.12	0.42
5 day's 30th percentile, 10 day's 40th percentile	0.04	0.20	12.09	0.20

Table 13 shows the results of the short positions for the short term reversal strategy applied twice when using a 5 day formation period and a 10 day formation period, testing different percentiles for the period 1/1/1998 until 23/07/2012.

Table 13: Short strategies for 5 day prior and 10 day prior percentile ranking method

It is clear that this is an improvement to only applying the standard short-term reversal strategy once. For example, the long positions standard short-term reversal strategy for the 10th percentile of 5 day prior returns had a 61.01% annualised return and a standard deviation of 27.93%. In comparison, the standard short-term using only the 10th percentile of 5 day returns had a annualised return of 61%, a standard deviation of 27.9% and on average held 5.476 shares over the same period.
Further filtering the shares that are qualifying under this strategy using the standard short-term reversal strategy for all tested percentiles of 10 day prior returns results in increased returns, increased standard deviations and a decrease in the number of shares held. Short strategies also benefit from this double application.

Having found that the double application of the standard short-term reversal strategy worked well, the influence of the addition of the kicker rule is again considered.

Using a 5 day holding period Strategy (Long only)	Returns	Std. Dev.	Avg. Shares	IR
6 day's 20th percentile, 11 day's 20th percentile, kicker	0.26	0.32	1.68	0.83
6 day's 20th percentile, 11 day's 30th percentile, kicker	0.31	0.31	2.13	1.00
6 day's 20th percentile, 11 day's 40th percentile, kicker	0.34	0.30	2.48	1.14
6 day's 20th percentile, 11 day's 50th percentile, kicker	0.36	0.29	2.68	1.22
6 day's 30th percentile, 11 day's 20th percentile, kicker	0.27	0.30	2.19	0.89
6 day's 30th percentile, 11 day's 30th percentile, kicker	0.32	0.29	2.94	1.09
6 day's 30th percentile, 11 day's 40th percentile, kicker	0.31	0.28	3.59	1.08
6 day's 30th percentile, 11 day's 50th percentile, kicker	0.39	0.30	4.05	1.32
6 day's 40th percentile, 11 day's 20th percentile, kicker	0.29	0.30	2.58	0.97
6 day's 40th percentile, 11 day's 30th percentile, kicker	0.33	0.28	3.70	1.17
6 day's 40th percentile, 11 day's 40th percentile, kicker	0.30	0.26	4.68	1.14
6 day's 40th percentile, 11 day's 50th percentile, kicker	0.34	0.26	5.45	1.33
6 day's 50th percentile, 11 day's 20th percentile, kicker	0.33	0.30	2.90	1.10
6 day's 50th percentile, 11 day's 30th percentile, kicker	0.35	0.27	4.27	1.28
6 day's 50th percentile, 11 day's 40th percentile, kicker	0.34	0.25	5.56	1.37
6 day's 50th percentile, 11 day's 50th percentile, kicker	0.36	0.24	6.63	1.50

Table 14 shows the results of the long positions for the short term reversal strategy applied twice when using a 5 day formation period and a 10 day formation period as well as the kicker rule for the period 1/1/1998 until 23/07/2012. Different percentiles are tested for the 5 day and 10 day returns.

Table 14: Long strategies for 6 day prior and 11 day prior percentile ranking method, with kicker rule

Comparing the returns above in table 14 to those in table 12, shows that the addition of the kicker to this strategy detracts value.

Using a 5 day holding period Strategy (Short only)	Returns	Std. Dev.	Avg. Shares	IR
6 day's 10th percentile, 11 day's 10th percentile, kicker	-0.03	0.29	0.61	-0.11
6 day's 10th percentile, 11 day's 20th percentile, kicker	0.00	0.30	0.89	0.01
6 day's 20th percentile, 11 day's 10th percentile, kicker	0.06	0.47	1.39	0.13
6 day's 20th percentile, 11 day's 20th percentile, kicker	0.09	0.57	1.91	0.16
6 day's 30th percentile, 11 day's 10th percentile, kicker	-0.09	0.31	1.12	-0.29
6 day's 30th percentile, 11 day's 20th percentile, kicker	0.03	0.29	2.07	0.09

Table 15 shows the results of the short positions for the short term reversal strategy applied twice when using a 5 day formation period and a 10 day formation period as well as the kicker rule for the period 1/1/1998 until 23/07/2012. Different percentiles are tested for the 5 day and 10 day returns.

Table 15: Short strategies for 6 day prior and 11 day prior percentile ranking method, with kicker rule

The addition of the kicker detracts from short strategies in this case as well and is not recommended. Thus the addition of the kicker fails to enhance neither longs nor shorts when combined with the standard short-term reversal strategy applied both once and twice.

5.2 Selected strategies

In this section selected strategies have been chosen for further consideration. The effects of extending the holding period are considered as this would lead to reduced turnover and transaction costs and the strategies are tested to see if they are statistically significantly different from the market proxy, the equally-weighted index. 10, 20 and 30 day holding periods are investigated in addition to the 5 day holding period previously tested.

Note that in all tables presented below, Returns represent annualised mean returns, Std. Dev. represent the standard deviation, Avg. Shares represents the average number of shares held on a day and IR represents the information ratio. This is the same convention adopted in section 5.1. Two additional columns are added for the purposes of this section. t.e. represents the tracking error (which is the standard deviation of the series of returns under consideration less the returns of the equally weighted index). This is needed to calculate t-statistics. Note that a t-statistic$>$1.96 is significant at the 95% level.

These selected strategies are considered over three different periods. The first of these is a broad period from 1 January 1998 to 23 August 2012. The second is the crash period from 1 August 2008 to 1 April 2009 and, thirdly, a post-crash period from 1 April 2009 to 23 August 2012. Long and short strategies are presented in tables 16 and 17 respectively over the first above-mentioned period.

Strategy (Long only 5 day holding period)	Returns	Std. Dev.	Avg. Shares	IR	t.e.	t-stat
Equally Weighted Index	0.20	0.16	55.19	1.24	0.00	0.00
5 day's 10th percentile	0.61	0.28	5.48	2.18	0.20	4.83
5 day's 10th percentile, 10 day's 10th percentile	0.75	0.39	2.53	1.91	0.33	2.64
5 day's 10th percentile, 10 day's 20th percentile	0.70	0.33	3.62	2.14	0.26	3.70
5 day's 20th percentile, 10 day's 10th percentile	0.70	0.33	3.61	2.09	0.26	3.59
5 day's 20th percentile, 10 day's 20th percentile	0.58	0.27	6.03	2.16	0.19	4.93
6 day's 30th percentile, with kicker	0.42	0.28	5.04	1.49	0.23	2.10
5 day's 20th percentile, with kicker	0.48	0.37	2.73	1.32	0.33	1.43
Strategy (Long only 10 day holding period)						
5 day's 10th percentile	0.49	0.27	5.47	1.80	0.19	3.57
5 day's 10th percentile, 10 day's 10th percentile	0.48	0.37	2.58	1.29	0.31	1.45
5 day's 10th percentile, 10 day's 20th percentile	0.47	0.32	3.63	1.47	0.25	2.07
5 day's 20th percentile, 10 day's 10th percentile	0.48	0.32	3.70	1.48	0.25	2.10
5 day's 20th percentile, 10 day's 20th percentile	0.43	0.26	6.04	1.63	0.18	3.09
6 day's 30th percentile, with kicker	0.39	0.28	5.06	1.38	0.23	1.85
5 day's 20th percentile, with kicker	0.30	0.30	2.51	0.99	0.26	0.58
Strategy (Long only 20 day holding period)						
5 day's 10th percentile	0.34	0.26	5.47	1.27	0.18	1.74
5 day's 10th percentile, 10 day's 10th percentile	0.30	0.36	2.57	0.83	0.30	0.53
5 day's 10th percentile, 10 day's 20th percentile	0.32	0.30	3.65	1.06	0.23	1.00
5 day's 20th percentile, 10 day's 10th percentile	0.33	0.32	3.66	1.04	0.24	1.02
5 day's 20th percentile, 10 day's 20th percentile	0.31	0.26	5.95	1.23	0.17	1.62
6 day's 30th percentile, with kicker	0.27	0.25	5.27	1.09	0.19	0.87
5 day's 20th percentile, with kicker	0.23	0.30	2.60	0.77	0.26	0.17
Strategy (Long only 30 day holding period)						
5 day's 10th percentile	0.31	0.26	5.44	1.19	0.17	1.43
5 day's 10th percentile, 10 day's 10th percentile	0.40	0.37	2.65	1.10	0.30	1.08
5 day's 10th percentile, 10 day's 20th percentile	0.39	0.33	3.60	1.18	0.26	1.36
5 day's 20th percentile, 10 day's 10th percentile	0.41	0.33	3.81	1.24	0.26	1.57
5 day's 20th percentile, 10 day's 20th percentile	0.32	0.26	5.98	1.23	0.18	1.63
6 day's 30th percentile, with kicker	0.26	0.25	5.26	1.04	0.20	0.66
5 day's 20th percentile, with kicker	0.21	0.29	2.58	0.73	0.25	0.06

Table 16: Selected longs from 1 January 1998 to 23 August 2012

The strategy offering the greatest return over this period is the double application of the standard short-term reversal strategy using the 10th percentile of the 5 day prior returns and the 10th percentile of the 10 day prior returns using a 5 day holding period. This strategy has an annualised return of 74.9%, a standard deviation of 39.3%, an information ratio of 1.91 and, on average, held 2.535 shares. Testing this strategy with a one day implementation lag to simulate next day execution leads to a reduced return of 41.4% and a standard deviation of 37.1%. However if one also reduces the holding period

by a day to 4 when factoring in the implementation lag, returns only reduce to 57.7% with a standard deviation of 36.7%.

The strategy offering the greatest information ratio (of 2.18) is the single application of the standard short-term reversal strategy using only the 10th percentile of 5 day prior returns.

For the strategies above, extending the holding period generally results in smaller returns, smaller information ratios and less significant t-statistics. This is most noticeable when extending the holding period from 5 to 10 days. Also of note is that extending holding periods from 20 to 30 days does not lead to worse performance in all cases.

Strategy (Short only 5 day holding period)	**Returns**	**Std. Dev.**	**Avg. Shares**	**IR**	**t.e.**	**t-stat**
5 day's 10th percentile	0.10	0.27	5.48	0.38	6.30	-0.04
5 day's 20th percentile	0.05	0.21	11.04	0.26	0.35	-1.41
5 day's 10th percentile, 10 day's 10th percentile	0.21	0.38	2.65	0.56	0.47	0.03
5 day's 20th percentile, 10 day prior's 10th percentile	0.26	0.32	3.66	0.82	0.43	0.26
Strategy (Short only 10 day holding period)						
5 day's 10th percentile	-0.02	0.27	5.47	-0.06	0.40	-1.28
5 day's 20th percentile	-0.01	0.21	11.03	-0.07	0.35	-2.03
5 day's 10th percentile, 10 day's 10th percentile	0.06	0.37	2.64	0.15	0.47	-0.50
5 day's 20th percentile, 10 day's 10th percentile	0.07	0.32	3.70	0.22	0.44	-0.57
Strategy (Short only 20 day holding period)						
5 day's 10th percentile	-0.08	0.26	5.47	-0.30	0.18	-3.58
5 day's 20th percentile	-0.08	0.20	11.04	-0.40	0.11	-8.27
5 day's 10th percentile, 10 day's 10th percentile	0.03	0.36	2.55	0.07	0.30	-0.94
5 day's 20th percentile, 10 day's 10th percentile	0.04	0.32	3.59	0.12	0.24	-1.27
Strategy (Short only 30 day holding period)						
5 day's 10th percentile	-0.18	0.29	5.45	-0.63	0.17	-5.13
5 day's 20th percentile	-0.16	0.21	11.02	-0.75	0.11	-10.46
5 day's 10th percentile, 10 day's 10th percentile	-0.15	0.40	2.67	-0.38	0.30	-1.89
5 day's 20th percentile, 10 day's 10th percentile	-0.16	0.35	3.72	-0.46	0.26	-2.68

Table 17: Selected shorts from 1 January 1998 to 23 August 2012

The short strategies fail to perform as well as the longs. One strategy, the double application of the standard short-term reversal strategy using the 20th percentile of 5 day prior returns and the 10th percentile of 10 day prior returns, is able to beat the index returns. This strategy has an information ratio of 0.82, which is the highest for short strategies. However, this strategy only has a t-statistic of 0.264, which is not significant

at any standard level.

Extending the holding period of the short strategies results in decreased returns and is thus not advisable. The information ratio of all short strategies decreases as the holding period is extended. At a holding period of 30 days, all the short strategies above will produce negative returns and have negative information ratios.

The same sets of long and short strategies are also considered over the crash period from 1 August 2008 to 1 April 2009 in tables 18 and 19.

Strategy (Long only 5 day holding period)	Returns	Std. Dev.	Avg. Shares	IR	t.e.	t-stat
Equally Weighted Index	-0.02	0.31	58.59	-0.05	0.00	0.00
5 day's 10th percentile	0.47	0.51	6.00	0.92	0.33	3.60
5 day's 10th percentile, 10 day's 10th percentile	0.84	0.69	2.93	1.21	0.55	2.66
5 day's 10th percentile, 10 day's 20th percentile	0.58	0.62	4.20	0.92	0.47	2.60
5 day's 20th percentile, 10 day's 10th percentile	0.58	0.59	4.15	0.97	0.42	2.86
5 day's 20th percentile, 10 day's 20th percentile	0.58	0.53	6.88	1.10	0.34	4.60
6 day's 30th percentile, with kicker	0.68	0.50	6.25	1.38	0.42	4.15
5 day's 20th percentile, with kicker	0.02	0.55	2.92	0.04	0.43	0.15
Strategy (Long only 10 day holding period)						
5 day's 10th percentile	-0.06	0.48	6.00	-0.12	0.28	-0.34
5 day's 10th percentile, 10 day's 10th percentile	-0.75	0.65	2.95	-1.16	0.48	-2.62
5 day's 10th percentile, 10 day's 20th percentile	-0.63	0.60	4.06	-1.05	0.42	-2.93
5 day's 20th percentile, 10 day's 10th percentile	0.20	0.56	4.26	0.36	0.37	1.21
5 day's 20th percentile, 10 day's 20th percentile	-0.10	0.50	6.92	-0.21	0.30	-0.78
6 day's 30th percentile, with kicker	0.46	0.48	6.58	0.95	0.38	3.17
5 day's 20th percentile, with kicker	0.61	0.57	2.90	1.07	0.47	2.28
Strategy (Long only 20 day holding period)						
5 day's 10th percentile	0.04	0.44	6.00	0.09	0.05	2.45
5 day's 10th percentile, 10 day's 10th percentile	-0.50	0.57	2.98	-0.87	0.43	-1.94
5 day's 10th percentile, 10 day's 20th percentile	-0.24	0.53	3.98	-0.45	0.36	-1.24
5 day's 20th percentile, 10 day's 10th percentile	-0.30	0.51	3.89	-0.60	0.34	-1.66
5 day's 20th percentile, 10 day's 20th percentile	0.14	0.47	6.29	0.29	0.27	1.41
6 day's 30th percentile, with kicker	0.37	0.44	5.06	0.83	0.29	2.95
5 day's 20th percentile, with kicker	0.29	0.54	3.82	0.55	0.36	1.67
Strategy (Long only 30 day holding period)						
5 day's 10th percentile	-0.52	0.48	6.00	-1.08	0.29	-4.25
5 day's 10th percentile, 10 day's 10th percentile	-0.71	0.58	3.39	-1.23	0.42	-3.06
5 day's 10th percentile, 10 day's 20th percentile	-0.63	0.57	4.24	-1.10	0.39	-3.24
5 day's 20th percentile, 10 day's 10th percentile	-0.39	0.56	4.45	-0.69	0.38	-2.06
5 day's 20th percentile, 10 day's 20th percentile	-0.17	0.48	7.00	-0.36	0.27	-1.53
6 day's 30th percentile, with kicker	0.29	0.45	7.24	0.66	0.24	3.40
5 day's 20th percentile, with kicker	0.02	0.57	3.52	0.04	0.41	0.18

Table 18: Selected longs from 1 August 2008 to 1 April 2009

Comparing the results of table 18 with table 16, there is an improvement in returns for the standard short-term reversal strategy using the 10th percentile of the 5 day prior returns and the 10th percentile of the 10 day prior returns from 74.9% to 83.8%. However, the information ratio has decreased from 1.91 to 1.21 as a result of the increase in standard deviation.

This remains a very good result, considering the poor performance of the equally weighted index which had a mean return of -1.6% and a standard deviation of 30.7% over

this period. The J203T index, which is the JSE All Shares total return index, did even worse over this period, yielding an annualised return of -36.5%.

Extending the holding period of the strategies during this period to 10 days results in drastic losses in all cases, with the exception of the standard short-term reversal strategy on the 20th percentile of 5 day prior returns combined with the kicker rule. In this case returns increased significantly.

Strategy (Short only 5 day holding period)	**Returns**	**Std. Dev.**	**Avg. Shares**	**IR**	**t.e.**	**t-stat**
5 day's 10th percentile	0.88	0.41	6.00	2.17	0.67	3.29
5 day's 20th percentile	0.58	0.35	12.00	1.65	0.63	3.25
5 day's 10th percentile, 10 day's 10th percentile	1.38	0.63	2.92	2.20	0.83	2.87
5 day's 20th percentile, 10 day prior's 10th percentile	1.17	0.49	4.05	2.39	0.73	3.26
Strategy (Short only 10 day holding period)						
5 day's 10th percentile	0.44	0.46	6.00	0.95	0.72	1.54
5 day's 20th percentile	0.44	0.37	12.00	1.18	0.66	2.40
5 day's 10th percentile, 10 day's 10th percentile	0.32	0.59	3.24	0.54	0.82	0.74
5 day's 20th percentile, 10 day's 10th percentile	0.52	0.51	4.25	1.02	0.75	1.45
Strategy (Short only 20 day holding period)						
5 day's 10th percentile	0.48	0.45	6.00	1.05	0.72	1.68
5 day's 20th percentile	0.32	0.36	12.00	0.88	0.65	1.79
5 day's 10th percentile, 10 day's 10th percentile	1.05	0.60	3.21	1.75	0.84	2.28
5 day's 20th percentile, 10 day prior's 10th percentile	0.95	0.51	4.30	1.89	0.76	2.66
Strategy (Short only 30 day holding period)						
5 day's 10th percentile	0.43	0.43	6.00	1.02	0.68	1.62
5 day's 20th percentile	0.13	0.36	12.00	0.36	0.65	0.79
5 day's 10th percentile, 10 day's 10th percentile	0.76	0.54	3.06	1.40	0.76	1.80
5 day's 20th percentile, 10 day's 10th percentile	0.43	0.50	4.30	0.86	0.72	1.27

Table 19: Selected shorts from 1 August 2008 to 1 April 2009

Over this period short strategies did extremely well, with all strategies statistically significant at the 97.5% level or greater (t-statistics > 2.645) when using a 5 day holding period. These strategies come with increased volatility over this period, however they produce very good information ratios. The best information ratio of 2.39 pertains to the short positions of the standard short-term reversal strategy using the 20th percentile of 5 day prior returns and the 10th percentile of 10 day prior returns.

Extending the holding period to 10 days resulted in a large drop in returns for all short strategies. As the holding period is extended from 10 to 20 days all strategies that

use the 10th percentile of at least one formation period do better, but given the market conditions at the time no explanation is provided for this. Extending the holding period further, from 20 to 30 days results in poorer results across all short strategies.

These strategies are also examined in a 'post-crash' period of 1 April 2009 to 23 August 2012 in tables 20 and 21.

Strategy (Long only 5 day holding period)	**Returns**	**Std. Dev.**	**Avg. Shares**	**IR**	**t.e.**	**t-stat**
Equally Weighted Index	0.21	0.14	59.96	1.45	0.00	0.00
5 day's 10th percentile	0.42	0.21	6.00	2.04	0.12	4.36
5 day's 10th percentile, 10 day's 10th percentile	0.50	0.27	2.80	1.87	0.20	2.37
5 day's 10th percentile, 10 day's 20th percentile	0.43	0.23	4.09	1.85	0.15	2.95
5 day's 20th percentile, 10 day's 10th percentile	0.46	0.23	4.40	2.01	0.16	3.37
5 day's 20th percentile, 10 day's 20th percentile	0.41	0.21	6.69	2.01	0.12	4.62
6 day's 30th percentile, with kicker	0.19	0.20	6.07	0.99	0.14	-0.22
5 day's 20th percentile, with kicker	0.27	0.21	3.41	1.29	0.15	0.75
Strategy (Long only 10 day holding period)						
5 day's 10th percentile	0.29	0.19	6.00	1.48	0.12	1.62
5 day's 10th percentile, 10 day's 10th percentile	0.38	0.25	2.92	1.54	0.19	1.57
5 day's 10th percentile, 10 day's 20th percentile	0.33	0.22	4.17	1.49	0.15	1.63
5 day's 20th percentile, 10 day's 10th percentile	0.34	0.22	4.23	1.57	0.14	1.92
5 day's 20th percentile, 10 day's 20th percentile	0.31	0.19	6.88	1.61	0.11	2.54
6 day's 30th percentile, with kicker	0.25	0.19	5.95	1.31	0.13	0.83
5 day's 20th percentile, with kicker	0.20	0.21	3.00	0.96	0.16	-0.07
Strategy (Long only 20 day holding period)						
5 day's 10th percentile	0.24	3.00	6.00	0.08	0.12	0.69
5 day's 10th percentile, 10 day's 10th percentile	0.31	0.25	2.68	1.25	0.20	0.87
5 day's 10th percentile, 10 day's 20th percentile	0.26	0.22	4.05	1.19	0.15	0.72
5 day's 20th percentile, 10 day's 10th percentile	0.31	0.21	3.95	1.49	0.14	1.47
5 day's 20th percentile, 10 day's 20th percentile	0.26	0.19	6.54	1.38	0.11	1.29
6 day's 30th percentile, with kicker	0.30	0.17	6.56	1.75	0.11	2.20
5 day's 20th percentile, with kicker	0.21	0.18	2.95	1.15	0.14	0.03
Strategy (Long only 30 day holding period)						
5 day's 10th percentile	0.28	0.19	6.00	1.46	0.12	1.57
5 day's 10th percentile, 10 day's 10th percentile	0.33	0.23	2.98	1.43	0.17	1.27
5 day's 10th percentile, 10 day's 20th percentile	0.34	0.22	4.04	1.54	0.15	1.81
5 day's 20th percentile, 10 day's 10th percentile	0.35	0.21	4.41	1.67	0.14	2.18
5 day's 20th percentile, 10 day's 20th percentile	0.33	0.19	6.99	1.70	0.11	3.02
6 day's 30th percentile, with kicker	0.30	0.19	6.56	1.59	0.13	1.82
5 day's 20th percentile, with kicker	0.24	0.22	2.67	1.10	0.15	0.34

Table 20: Selected longs from 1 April 2009 to 23 August 2012

The long strategies over the post-crash period do not perform as well as the same strategies when considering the returns from 1 January 1998 to 23 August 2012 in table 16. The best performing strategy is still the double application of the standard short-term reversal strategy using the 10th percentile of 5 day prior returns and the 10th percentile of 10 day prior returns with a 5 day holding period. The mean annualised return of this strategy is 49.6%, the standard deviation is 26.5%, leading to an information ratio of 1.87 and the average number of shares held is 2.795 over the post-crash period.

However, the single application of the standard short-term strategy using 5 day formation and holding periods and the 10th percentile still offers the highest information ratio of 2.04.

Long strategies perform worse when the holding period is extended to 10 days in this period as well, with the exception of the standard short-term reversal strategy using the 30th percentile of 6 day prior returns and the kicker rule. This strategy also offers the best information ratio (at 1.75) when using a 20 day holding period.

Strategy (Short only 5 day holding period)	Returns	Std. Dev.	Avg. Shares	IR	t.e.	t-stat
5 day's 10th percentile	-0.07	0.20	6.00	-0.34	0.32	-2.10
5 day's 20th percentile	-0.06	0.17	12.00	-0.38	0.30	-3.11
5 day's 10th percentile, 10 day's 10th percentile	-0.06	0.24	2.77	-0.24	0.35	-1.26
5 day's 20th percentile, 10 day prior's 10th percentile	-0.05	0.22	4.06	-0.24	0.33	-1.57
Strategy (Short only 10 day holding period)						
5 day's 10th percentile	-0.12	0.20	6.00	-0.59	0.32	-2.45
5 day's 20th percentile	-0.14	0.17	12.00	-0.78	0.31	-3.85
5 day's 10th percentile, 10 day's 10th percentile	-0.03	0.23	2.96	-0.14	0.34	-1.20
5 day's 20th percentile, 10 day prior's 10th percentile	-0.12	0.20	4.23	-0.57	0.32	-2.07
Strategy (Short only 20 day holding period)						
5 day's 10th percentile	-0.18	0.20	6.00	-0.91	0.33	-2.89
5 day's 20th percentile	-0.15	0.18	12.00	-0.85	0.31	-3.96
5 day's 10th percentile, 10 day's 10th percentile	-0.21	0.24	3.00	-0.88	0.35	-2.06
5 day's 20th percentile, 10 day prior's 10th percentile	-0.17	0.21	4.16	-0.80	0.33	-2.31
Strategy (Short only 30 day holding period)						
5 day's 10th percentile	-0.07	0.19	6.00	-0.37	0.32	-2.14
5 day's 20th percentile	-0.09	0.17	12.00	-0.51	0.31	-3.32
5 day's 10th percentile, 10 day's 10th percentile	-0.03	0.24	2.95	-0.12	0.35	-1.17
5 day's 20th percentile, 10 day prior's 10th percentile	-0.06	0.21	4.16	-0.27	0.33	-1.63

Table 21: Selected shorts from 1 April 2009 to 23 August 2012

The short strategies investigated do not perform well over the post-crash period and see a further decline in performance when the holding period is extended to 10 days. Only the short positions of the standard short-term return reversal strategy using the 10th percentile of both 5 day and 10 day prior returns improves when the holding period is increased, although this is marginal. As the holding period is extended from 10 to 20 days all short strategies worsen. Extending the holding period further from 20 to 30 days improves the returns of the short strategies. This however is inconsistent with tables 17 and 19 and is most likely a consequence of sub-period selection.

Given these results, the standard short-term reversal strategy using the 10th percentile for both 5 day and 10 day prior returns and a 5 day holding period is optimal when considered over the full sample period. The log of the cumulative long and short positions of this strategy are shown in figures 5 and 6. Both long and short portfolios are set to have a value of 1 on 1 January 1998. _CL5D10Q_10D10Q5D and _CL5D10Q_10D10Q5D

are the naming codes for the cumulative longs and shorts of this strategy respectively.[1]

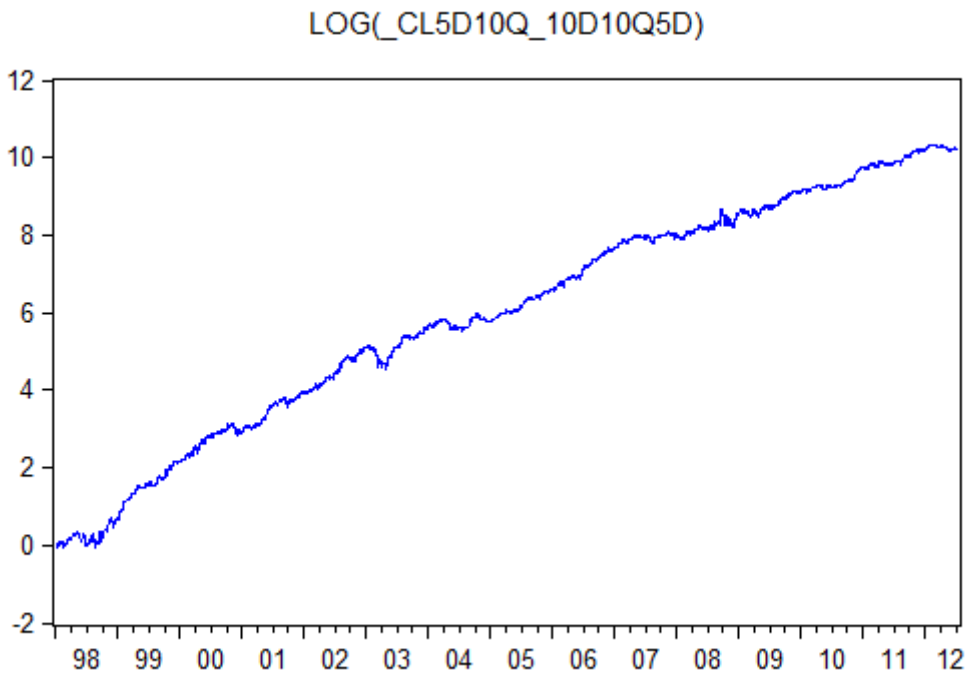


Figure 5: *The log of cumulative returns to the longs of the standard short-term reversal strategy using the 10th percentile for both 5 day and 10 day prior returns and a 5 day holding period*

The long positions of the standard short-term reversal strategy using the 10th percentile for both 5 day and 10 day prior returns and a 5 day holding period do well throughout the entire period. Draw-downs are never severe (the worst of these began in late 2002 and ended in early 2003).Furthermore, the strategy made positive profits during the 2008 crash, indicating the robustness of this strategy's longs.

[1]See appendix C on the naming code used in eViews.

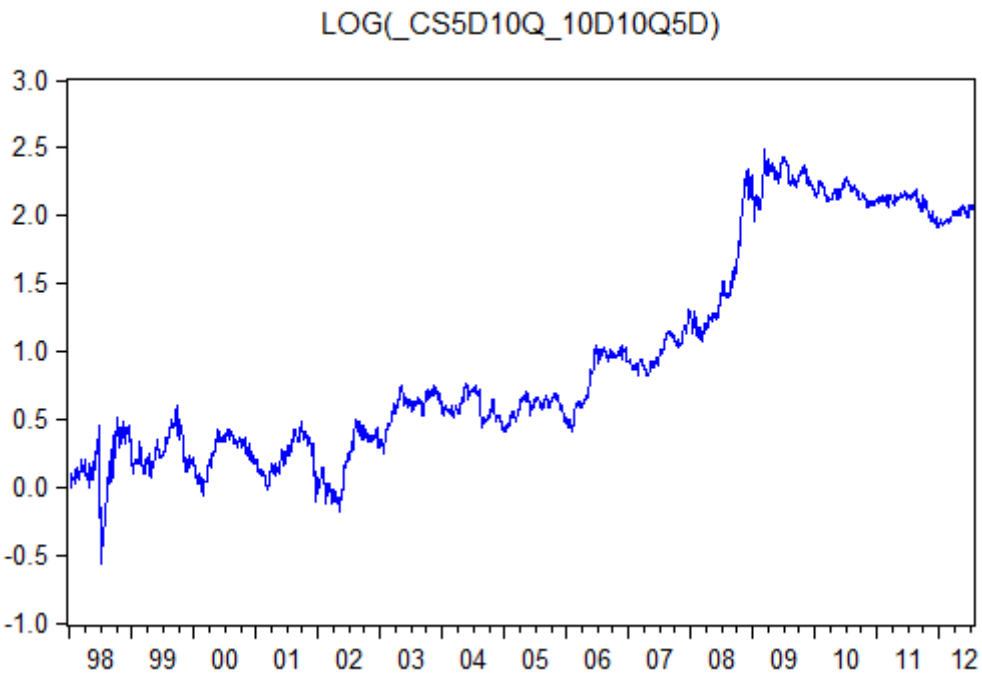


Figure 6: *The log of cumulative returns to the shorts of the standard short-term reversal strategy using the 10th percentile for both 5 day and 10 day prior returns and a 5 day holding period*

Figure 6 highlights the extremely good performance of the short positions of the standard short-term reversal strategy using the 10th percentile for both 5 day and 10 day prior returns and a 5 day holding period during the crash period. A persistent draw-down in the post-crash period is also evident for this strategy.

6 Conclusion

6.1 Findings

The results in section 5 support the existence of mean-reverting returns over short durations. The return reversal effect is strongest when using 5 day prior returns on the next 5 day returns. This is also supported by the additional heatmaps of return correlations presented in appendix A.

The standard short-term reversal strategy, which takes advantage of the return reversal effect, can generate positive profits. The performance of this strategy improves as the percentiles are reduced, but this also decreases the number of shares in the portfolio and increases the standard deviation.

Neither the addition of moving average rules nor the kicker rule has any improvement on this strategy. In particular it was found that the opposite signals for conventional moving average rules may be more appropriate for short holding periods. This further supports return reversion over short intervals.

However, the standard short-term reversal strategy is further improved by applying the method twice. Filtering results again using 10 day prior returns resulted in improved performance across percentiles. In particular, the best long and short strategies selected were the double application of the standard short-term reversal strategy using the 10th percentile of the 5 day prior returns and the 10th percentile of the 10 day prior returns over a holding period of 5 days.

The longs of the double application of the standard short-term reversal strategy using the 10th percentile of the 5 day prior returns and the 10th percentile of the 10 day prior returns had an annualised return of 74.9%, a standard deviation of 39.3%, an information ratio of 1.91 and, on average, held 2.535 shares over the period 1 January 1998 to 23 August 2012. Furthermore, this strategy produced greater returns during the crash period of 1 August 2008 to 1 April 2009. Over this period this strategy had an annualised re-

turn of 83.8%, a standard deviation of 69% and, on average, held 2.663 shares. However, resulting from the increased standard deviation this strategy's information ratio reduced to 1.21.

Over the same crash period, the short positions of the same strategy produced a mean annualised return of 137.6% and had a standard deviation of 62.7%, leading to an information ratio of 2.2, with 2.92 shares held on average. Using the 20th percentile instead of the 10th percentile on 5 day prior returns for the same strategy would lead to a more stable strategy with a lower return of 117.0% and a lower standard deviation of 48.9%. This leads to an information ratio of 2.39. These results suggest that this strategy could be extremely useful in times of market turmoil.

For practical purposes one may wish to use larger percentiles than the results suggest is optimal and then apply one's own subjective filters to exclude shares from the portfolio. The strategies outlined in this paper also could potentially have great value as a market timing tool. One would need to select longs and shorts based on other methods, but would only enter into positions when the criteria of the standard short-term reversal strategy are met.

6.2 Suggestions for further research

Lo and MacKinlay (1990) show that stock returns are often postively cross-autocorrelated. These cross effects display a lead-lag relation, with the returns of larger stocks generally leading small stocks. Since this means that a contarian strategy exploits several phenomena, this serves as motivation to explore patterns of autocorellation and cross-autocorellation in the data.

Let 1 be a vector of 1's, μ_M represent the market return and let $tr()$ denote the trace operator. Then, given vectors of t-period return data, $R_t = [R_{1t} \cdots R_{Nt}]$ for N securities assume that R_t is a jointly covariance-stationary stochastic process with expectation

$E[R_t] = \mu \equiv [\mu_1 \cdots \mu_N]'$ and autocovariance matrices $\Gamma_{k^*} = E[(R_{t-k^*} - \mu)(R_t - \mu)']$.

Under these assumptions Lo and MacKinlay (1990) shows that:

$$E[\pi_t(k^*)] = C_{k^*} + O_{k^*} - \sigma^2(\mu)$$

where

$$C_{k^*} = 1/N^2 * (1'\Gamma_{k^*}1 - tr(\Gamma_{k^*}), \qquad O_{k^*} = -(N-1)/N^2 * tr(\Gamma_{k^*})$$

and, independent of all autocovariances,

$$\sigma^2(\mu) \equiv 1/N \sum_{n=1}^{N} (\mu_n - \mu_M)$$

This allows expected profits to be decomposed into those due to cross-autocovariances of returns, C_{k^*}, and those due to own autocovariances, O_{k^*}, of returns.

This methodology can be applied to this study to measure the influence of cross-autocovariances relative to those of own autocorrelations on the profitability of the short term reversal strategy.

Further possible extensions to this thesis include the addition of a liquidity cap measure and its effects on portfolios as outlined by Bailey and Gilbert (2007). However, limiting the share set to the top 60 help improve liquidity of the sample.

It would be of interest to conduct the same analysis on a different sample of shares, especially if that sample avoids selection bias. One possible approach would be to recalculate the highest market cap shares on a monthly basis and run strategies using only those shares for the month. Recalculating the top 60 on a yearly basis could also prove to be valuable. Either approach should reduce selection bias significantly.

Rinne and Suominem (2010) states that mean reversion in stocks' excess returns takes an exponential shape. This suggests, they argue, that a stock's weekly return reversal (i.e. in the next 5 trading days) should be estimated using a regression on the each of the stock's past 5 days' returns. Using prior notation this can be expressed as,

$$r_{t+5} = \alpha + \sum_{\tau=0}^{4} \beta_{t-\tau} * r_{t-\tau} + \epsilon_t$$

This is useful as it allows an estimate of the amount of mean reversion within a week, denoted L, to be obtained by summing the estimated β's for the past excess returns.

$$L = \sum_{\tau=0}^{4} \beta_{t-\tau}$$

L thus can also serve as a proxy for liquidity.

One could also factor the effects of introducing liquidity cap as presented in Bailey and Gilbert (2007) and outlined in section 3. The short-term holding periods of this paper mean that there should be a modification to the rule of thumb Bailey used to create his liquidity cap measure: (large) investors would only invest if they can expect to be able to liquidate their position within one half of the holding period, given past volume data. For a portfolio with a holding period of a month, this leads to exact same liquidity cap measure as Bailey. However, over shorter holding periods this leads to a stronger constraint.

Additionally, the 'flexible holding' approach of De Groot *et al.* (2012) to constructing portfolios of winner and losers is a worthwhile grounds for extension as it has substantial potential to reduce turnover and trading costs, thereby improving performance net of fees.

The analysis presented in this paper takes no account for trading costs. A worthwhile extension would be to factor trading costs into the analysis using an appropriate model. The model used by Keim and Madhaven (1997) is worth consideration, provided accurate cost estimates of trades on the JSE are used to update it.

Lastly, van Rensburg (1999) shows that market models for the JSE have more explanatory power using a two-factor approach. This motivates a further comparison of returns for the strategies presented where adjustments for beta are made using FINDI and RESI indicies as opposed to an equally weighted top 60 index.

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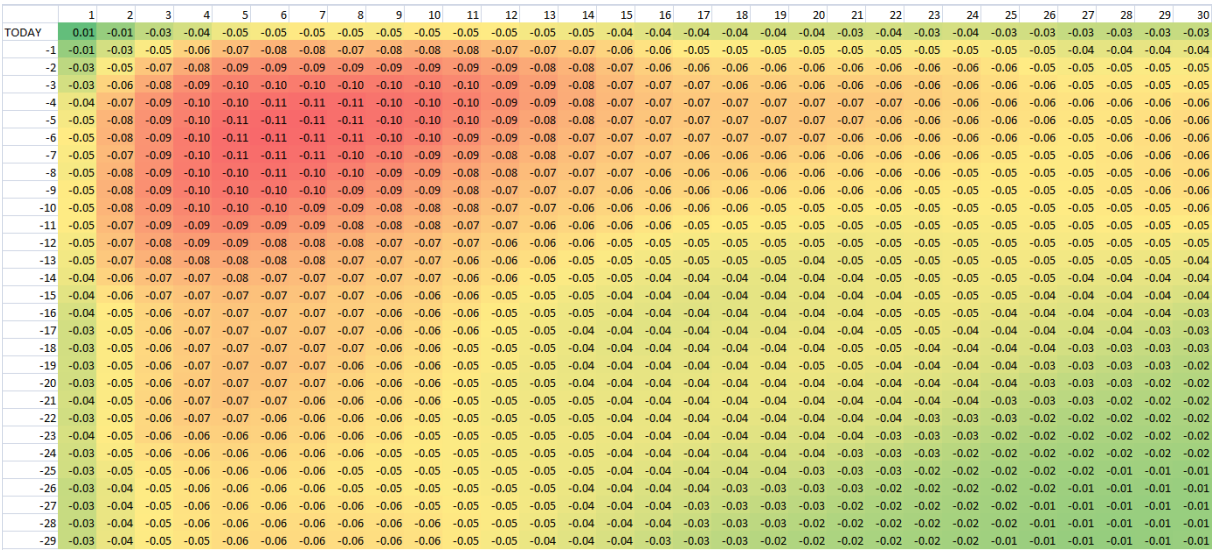
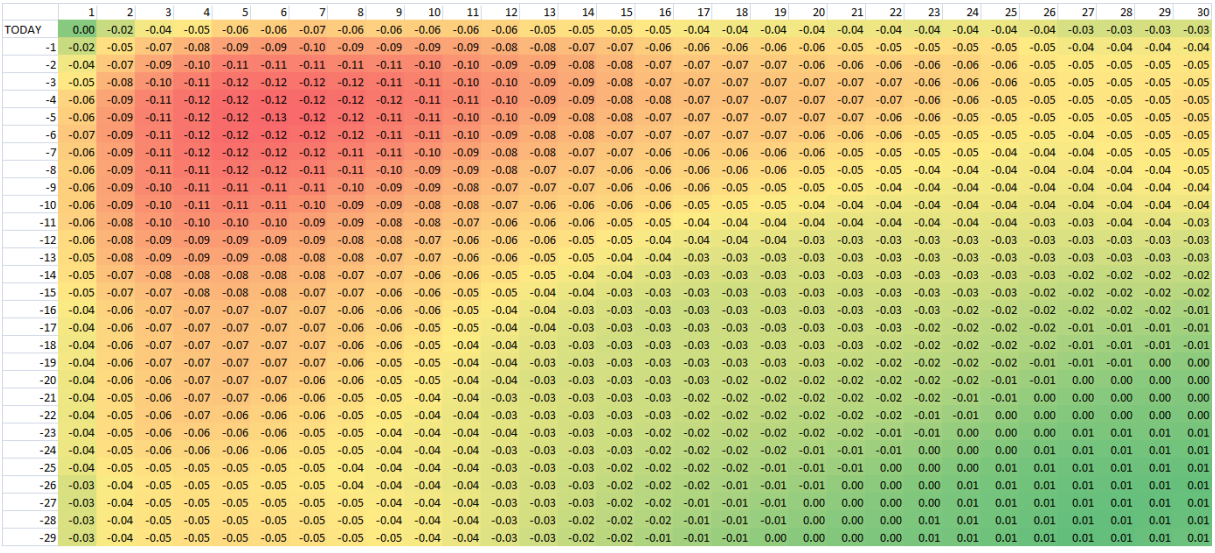
A Heatmaps of Return Correlations

These heatmaps have also been created over various periods. The first set of heatmaps in section 5.1 cover the entire dataset from 10 August 1992 to 10 August 2012. The same heatmaps have been generated for the a 'pre-crash' period of 1 January 2003 to 31 May 2008.



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
TODAY	0.01	-0.01	-0.03	-0.04	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.03	-0.04	-0.03	-0.04	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03
-1	-0.01	-0.03	-0.05	-0.06	-0.07	-0.08	-0.08	-0.07	-0.08	-0.08	-0.08	-0.07	-0.07	-0.07	-0.06	-0.06	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04
-2	-0.03	-0.05	-0.07	-0.08	-0.09	-0.09	-0.09	-0.09	-0.09	-0.09	-0.09	-0.09	-0.08	-0.08	-0.07	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.05	-0.05	-0.05	-0.05	-0.05
-3	-0.03	-0.06	-0.08	-0.09	-0.10	-0.10	-0.10	-0.10	-0.10	-0.10	-0.10	-0.09	-0.09	-0.08	-0.07	-0.07	-0.07	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.05	-0.05	-0.05	-0.05
-4	-0.04	-0.07	-0.09	-0.10	-0.10	-0.11	-0.11	-0.11	-0.10	-0.10	-0.10	-0.09	-0.09	-0.08	-0.07	-0.07	-0.07	-0.07	-0.07	-0.07	-0.07	-0.07	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06
-5	-0.05	-0.08	-0.09	-0.10	-0.11	-0.11	-0.11	-0.11	-0.10	-0.10	-0.10	-0.09	-0.08	-0.08	-0.07	-0.07	-0.07	-0.07	-0.07	-0.07	-0.07	-0.06	-0.06	-0.06	-0.06	-0.06	-0.05	-0.05	-0.06	-0.06
-6	-0.05	-0.08	-0.09	-0.10	-0.11	-0.11	-0.11	-0.11	-0.10	-0.10	-0.09	-0.09	-0.08	-0.07	-0.07	-0.07	-0.07	-0.07	-0.07	-0.07	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.05	-0.06	-0.06	-0.06
-7	-0.05	-0.07	-0.09	-0.10	-0.11	-0.11	-0.11	-0.10	-0.10	-0.09	-0.09	-0.08	-0.08	-0.07	-0.07	-0.07	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.05	-0.05	-0.05	-0.06	-0.06	-0.06
-8	-0.05	-0.08	-0.09	-0.10	-0.10	-0.11	-0.10	-0.10	-0.09	-0.09	-0.08	-0.08	-0.07	-0.07	-0.07	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.05	-0.05	-0.05	-0.05	-0.05	-0.06	-0.06
-9	-0.05	-0.08	-0.09	-0.10	-0.10	-0.10	-0.10	-0.09	-0.09	-0.09	-0.08	-0.07	-0.07	-0.07	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.06	-0.06
-10	-0.05	-0.08	-0.09	-0.10	-0.10	-0.10	-0.09	-0.09	-0.08	-0.08	-0.08	-0.07	-0.07	-0.06	-0.06	-0.06	-0.06	-0.06	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.06
-11	-0.05	-0.07	-0.09	-0.09	-0.09	-0.09	-0.09	-0.08	-0.08	-0.08	-0.07	-0.07	-0.06	-0.06	-0.06	-0.06	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05
-12	-0.05	-0.07	-0.08	-0.09	-0.09	-0.08	-0.08	-0.08	-0.07	-0.07	-0.07	-0.06	-0.06	-0.06	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05
-13	-0.05	-0.07	-0.08	-0.08	-0.08	-0.08	-0.08	-0.07	-0.07	-0.07	-0.06	-0.06	-0.06	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.04	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.04
-14	-0.04	-0.06	-0.07	-0.07	-0.08	-0.07	-0.07	-0.07	-0.07	-0.06	-0.06	-0.06	-0.05	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.05	-0.05	-0.05	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04
-15	-0.04	-0.06	-0.07	-0.07	-0.07	-0.07	-0.07	-0.07	-0.06	-0.06	-0.06	-0.05	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.05	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04	-0.04
-16	-0.04	-0.05	-0.06	-0.07	-0.07	-0.07	-0.07	-0.07	-0.06	-0.06	-0.06	-0.05	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.05	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04	-0.04	-0.03
-17	-0.03	-0.05	-0.06	-0.07	-0.07	-0.07	-0.07	-0.07	-0.06	-0.06	-0.06	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04	-0.04	-0.03	-0.03
-18	-0.03	-0.05	-0.06	-0.07	-0.07	-0.07	-0.07	-0.07	-0.06	-0.06	-0.05	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04	-0.03	-0.03	-0.03	-0.03
-19	-0.03	-0.05	-0.06	-0.07	-0.07	-0.07	-0.07	-0.06	-0.06	-0.06	-0.05	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04	-0.03	-0.03	-0.03	-0.03	-0.02
-20	-0.03	-0.05	-0.06	-0.07	-0.07	-0.07	-0.07	-0.06	-0.06	-0.06	-0.05	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.03	-0.03	-0.03	-0.02	-0.02
-21	-0.04	-0.05	-0.06	-0.07	-0.07	-0.07	-0.06	-0.06	-0.06	-0.06	-0.05	-0.05	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.03	-0.03	-0.03	-0.02	-0.02	-0.02
-22	-0.03	-0.05	-0.06	-0.07	-0.07	-0.06	-0.06	-0.06	-0.06	-0.05	-0.05	-0.05	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.03	-0.03	-0.03	-0.02	-0.02	-0.02	-0.02	-0.02
-23	-0.04	-0.05	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.05	-0.05	-0.05	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.03	-0.03	-0.03	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02
-24	-0.03	-0.05	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.03	-0.03	-0.03	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02
-25	-0.03	-0.05	-0.05	-0.06	-0.06	-0.06	-0.06	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.03	-0.03	-0.03	-0.02	-0.02	-0.02	-0.02	-0.01	-0.01	-0.01
-26	-0.03	-0.04	-0.05	-0.06	-0.06	-0.06	-0.06	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04	-0.03	-0.03	-0.03	-0.03	-0.02	-0.02	-0.02	-0.02	-0.02	-0.01	-0.01	-0.01	-0.01
-27	-0.03	-0.04	-0.05	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.05	-0.05	-0.05	-0.05	-0.04	-0.04	-0.04	-0.03	-0.03	-0.03	-0.03	-0.02	-0.02	-0.02	-0.02	-0.02	-0.01	-0.01	-0.01	-0.01	-0.01
-28	-0.03	-0.04	-0.05	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.05	-0.05	-0.05	-0.04	-0.04	-0.04	-0.03	-0.03	-0.03	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.01	-0.01	-0.01	-0.01	-0.01
-29	-0.03	-0.04	-0.05	-0.05	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.05	-0.05	-0.04	-0.04	-0.04	-0.03	-0.03	-0.03	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01

Figure 7: *Return correlations for all top 60 shares from 1 January 2003 to 31 May 2008*



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
TODAY	0.00	-0.02	-0.04	-0.05	-0.06	-0.06	-0.07	-0.06	-0.06	-0.06	-0.06	-0.06	-0.05	-0.05	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.03	-0.03	-0.03	-0.03
-1	-0.02	-0.05	-0.07	-0.08	-0.09	-0.09	-0.10	-0.09	-0.09	-0.09	-0.09	-0.08	-0.08	-0.07	-0.07	-0.06	-0.06	-0.06	-0.06	-0.06	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04
-2	-0.04	-0.07	-0.09	-0.10	-0.11	-0.11	-0.11	-0.11	-0.11	-0.10	-0.10	-0.09	-0.09	-0.08	-0.08	-0.07	-0.07	-0.07	-0.07	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.05	-0.05	-0.05	-0.05	-0.05
-3	-0.05	-0.08	-0.10	-0.11	-0.12	-0.12	-0.12	-0.12	-0.11	-0.11	-0.10	-0.10	-0.09	-0.09	-0.08	-0.07	-0.07	-0.07	-0.07	-0.07	-0.07	-0.07	-0.06	-0.06	-0.06	-0.05	-0.05	-0.05	-0.05	-0.05
-4	-0.06	-0.09	-0.11	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.11	-0.11	-0.10	-0.09	-0.09	-0.08	-0.08	-0.07	-0.07	-0.07	-0.07	-0.07	-0.07	-0.06	-0.06	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05
-5	-0.06	-0.09	-0.11	-0.12	-0.12	-0.13	-0.12	-0.12	-0.11	-0.11	-0.10	-0.10	-0.09	-0.08	-0.08	-0.07	-0.07	-0.07	-0.07	-0.07	-0.07	-0.06	-0.06	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05
-6	-0.07	-0.09	-0.11	-0.12	-0.12	-0.12	-0.12	-0.12	-0.11	-0.11	-0.10	-0.09	-0.08	-0.08	-0.07	-0.07	-0.07	-0.07	-0.07	-0.06	-0.06	-0.06	-0.05	-0.05	-0.05	-0.05	-0.04	-0.05	-0.05	-0.05
-7	-0.06	-0.09	-0.11	-0.12	-0.12	-0.12	-0.12	-0.11	-0.11	-0.10	-0.09	-0.08	-0.08	-0.07	-0.07	-0.06	-0.06	-0.06	-0.06	-0.06	-0.05	-0.05	-0.05	-0.05	-0.04	-0.04	-0.04	-0.05	-0.05	-0.05
-8	-0.06	-0.09	-0.11	-0.11	-0.12	-0.12	-0.11	-0.11	-0.10	-0.09	-0.09	-0.08	-0.07	-0.07	-0.06	-0.06	-0.06	-0.06	-0.06	-0.05	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.05
-9	-0.06	-0.09	-0.10	-0.11	-0.11	-0.11	-0.11	-0.10	-0.09	-0.09	-0.08	-0.07	-0.07	-0.07	-0.06	-0.06	-0.06	-0.05	-0.05	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04
-10	-0.06	-0.09	-0.10	-0.11	-0.11	-0.11	-0.10	-0.09	-0.09	-0.08	-0.08	-0.07	-0.06	-0.06	-0.06	-0.06	-0.05	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04
-11	-0.06	-0.08	-0.10	-0.10	-0.10	-0.10	-0.09	-0.09	-0.08	-0.08	-0.07	-0.06	-0.06	-0.06	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.03	-0.03	-0.04	-0.04	-0.03
-12	-0.06	-0.08	-0.09	-0.09	-0.09	-0.09	-0.09	-0.08	-0.08	-0.07	-0.06	-0.06	-0.06	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03
-13	-0.05	-0.08	-0.09	-0.09	-0.09	-0.08	-0.08	-0.08	-0.07	-0.07	-0.06	-0.06	-0.05	-0.05	-0.04	-0.04	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03
-14	-0.05	-0.07	-0.08	-0.08	-0.08	-0.08	-0.08	-0.07	-0.07	-0.06	-0.06	-0.05	-0.05	-0.04	-0.04	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.02	-0.02	-0.02	-0.02
-15	-0.05	-0.07	-0.07	-0.08	-0.08	-0.08	-0.07	-0.07	-0.06	-0.06	-0.05	-0.05	-0.04	-0.04	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.02	-0.02	-0.02	-0.02	-0.02
-16	-0.04	-0.06	-0.07	-0.07	-0.07	-0.07	-0.07	-0.06	-0.06	-0.06	-0.05	-0.04	-0.04	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.01
-17	-0.04	-0.06	-0.07	-0.07	-0.07	-0.07	-0.07	-0.06	-0.06	-0.05	-0.05	-0.04	-0.04	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.02	-0.02	-0.02	-0.02	-0.01	-0.01	-0.01	-0.01
-18	-0.04	-0.06	-0.07	-0.07	-0.07	-0.07	-0.07	-0.06	-0.06	-0.05	-0.04	-0.04	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.01	-0.01	-0.01	-0.01
-19	-0.04	-0.06	-0.07	-0.07	-0.07	-0.07	-0.07	-0.06	-0.05	-0.05	-0.04	-0.04	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.02	-0.02	-0.02	-0.02	-0.02	-0.01	-0.01	-0.01	0.00	0.00
-20	-0.04	-0.06	-0.06	-0.07	-0.07	-0.07	-0.06	-0.06	-0.05	-0.05	-0.04	-0.04	-0.03	-0.03	-0.03	-0.03	-0.03	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.01	-0.01	0.00	0.00	0.00	0.00
-21	-0.04	-0.05	-0.06	-0.07	-0.07	-0.06	-0.06	-0.05	-0.05	-0.04	-0.04	-0.03	-0.03	-0.03	-0.03	-0.03	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.01	-0.01	0.00	0.00	0.00	0.00	0.00
-22	-0.04	-0.05	-0.06	-0.07	-0.06	-0.06	-0.06	-0.05	-0.05	-0.04	-0.04	-0.03	-0.03	-0.03	-0.03	-0.03	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.01	-0.01	0.00	0.00	0.00	0.00	0.00	0.00
-23	-0.04	-0.05	-0.06	-0.06	-0.06	-0.06	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04	-0.03	-0.03	-0.03	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.01	-0.01	0.00	0.00	0.00	0.01	0.01	0.01	0.01
-24	-0.04	-0.05	-0.06	-0.06	-0.06	-0.06	-0.05	-0.05	-0.04	-0.04	-0.04	-0.03	-0.03	-0.03	-0.03	-0.02	-0.02	-0.02	-0.02	-0.01	-0.01	-0.01	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01
-25	-0.04	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04	-0.03	-0.03	-0.03	-0.02	-0.02	-0.02	-0.02	-0.01	-0.01	-0.01	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01
-26	-0.03	-0.04	-0.05	-0.05	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04	-0.04	-0.03	-0.03	-0.03	-0.02	-0.02	-0.02	-0.01	-0.01	-0.01	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01
-27	-0.03	-0.04	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.04	-0.04	-0.04	-0.03	-0.03	-0.03	-0.02	-0.02	-0.01	-0.01	-0.01	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01
-28	-0.03	-0.04	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.04	-0.04	-0.04	-0.03	-0.03	-0.02	-0.02	-0.02	-0.01	-0.01	-0.01	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
-29	-0.03	-0.04	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.04	-0.04	-0.03	-0.03	-0.02	-0.02	-0.01	-0.01	-0.01	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01

Figure 8: *Return correlations for industrials within top 60 shares from 1 January 2003 to 31 May 2008*

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
TODAY	0.04	0.03	0.01	0.01	0.00	0.00	0.00	0.00	0.00	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	0.00	0.00	0.00	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.02	-0.01	-0.02
-1	0.03	0.01	0.00	-0.01	-0.01	-0.01	-0.01	-0.01	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.01	-0.01	-0.01	-0.01	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.03	-0.03	-0.03	-0.03
-2	0.01	0.00	-0.01	-0.01	-0.02	-0.02	-0.02	-0.02	-0.02	-0.03	-0.03	-0.03	-0.03	-0.03	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03
-3	0.01	-0.01	-0.01	-0.02	-0.02	-0.02	-0.03	-0.03	-0.03	-0.03	-0.03	-0.04	-0.03	-0.03	-0.03	-0.02	-0.02	-0.02	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04
-4	0.00	-0.01	-0.02	-0.02	-0.02	-0.03	-0.03	-0.03	-0.03	-0.04	-0.04	-0.04	-0.03	-0.03	-0.03	-0.02	-0.02	-0.03	-0.03	-0.03	-0.03	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04
-5	0.00	-0.01	-0.02	-0.02	-0.03	-0.03	-0.03	-0.03	-0.04	-0.04	-0.04	-0.04	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04
-6	0.00	-0.01	-0.02	-0.03	-0.03	-0.03	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.04	-0.04	-0.04	-0.04	-0.04	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05
-7	0.00	-0.01	-0.02	-0.03	-0.03	-0.03	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.04	-0.04	-0.04	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05
-8	0.00	-0.02	-0.02	-0.03	-0.03	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.04	-0.04	-0.04	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05
-9	-0.01	-0.02	-0.03	-0.03	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.03	-0.04	-0.04	-0.04	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05
-10	-0.01	-0.02	-0.03	-0.03	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05
-11	-0.01	-0.02	-0.03	-0.04	-0.04	-0.04	-0.04	-0.03	-0.03	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.06	-0.06	-0.05	-0.05	-0.05
-12	-0.01	-0.02	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.06	-0.06	-0.06	-0.05	-0.05	-0.05
-13	-0.01	-0.02	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.06	-0.06	-0.06	-0.06	-0.05	-0.05	-0.05
-14	-0.01	-0.02	-0.02	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.06	-0.06	-0.06	-0.06	-0.05	-0.05	-0.05	-0.05
-15	-0.01	-0.01	-0.02	-0.02	-0.02	-0.03	-0.03	-0.03	-0.03	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.05	-0.05	-0.05	-0.05	-0.05	-0.06	-0.06	-0.06	-0.06	-0.06	-0.05	-0.05	-0.05	-0.05
-16	0.00	-0.01	-0.02	-0.02	-0.03	-0.03	-0.03	-0.03	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.06	-0.06	-0.06	-0.06	-0.06	-0.05	-0.05	-0.05	-0.05	-0.05
-17	0.00	-0.01	-0.02	-0.02	-0.03	-0.03	-0.03	-0.04	-0.04	-0.04	-0.04	-0.04	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.05	-0.05	-0.05	-0.05	-0.05
-18	0.00	-0.01	-0.02	-0.03	-0.03	-0.03	-0.04	-0.04	-0.04	-0.04	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.05	-0.05	-0.05	-0.05	-0.04
-19	-0.01	-0.02	-0.03	-0.03	-0.03	-0.04	-0.04	-0.04	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.05	-0.05	-0.05	-0.05	-0.04
-20	-0.01	-0.02	-0.03	-0.03	-0.04	-0.04	-0.04	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.05	-0.05	-0.05	-0.05	-0.04
-21	-0.01	-0.02	-0.03	-0.03	-0.04	-0.04	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.05	-0.05	-0.05	-0.05	-0.04	-0.04
-22	-0.01	-0.02	-0.03	-0.04	-0.04	-0.04	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.05	-0.05	-0.05	-0.05	-0.05	-0.04	-0.04	-0.04
-23	-0.01	-0.02	-0.03	-0.04	-0.04	-0.04	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.04	-0.04	-0.04
-24	-0.01	-0.02	-0.03	-0.04	-0.04	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04
-25	-0.01	-0.03	-0.03	-0.04	-0.04	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.06	-0.06	-0.06	-0.06	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04	-0.04
-26	-0.02	-0.03	-0.03	-0.04	-0.04	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.06	-0.06	-0.06	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.03
-27	-0.02	-0.03	-0.03	-0.04	-0.04	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.03	-0.03
-28	-0.02	-0.03	-0.03	-0.04	-0.04	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.03	-0.03
-29	-0.02	-0.03	-0.03	-0.04	-0.04	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.03	-0.03	-0.03

Figure 9: *Return correlations for resources within top 60 shares from 1 January 2003 to 31 May 2008*

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
TODAY	-0.01	-0.03	-0.05	-0.07	-0.08	-0.09	-0.09	-0.09	-0.09	-0.10	-0.09	-0.09	-0.09	-0.08	-0.08	-0.07	-0.07	-0.07	-0.07	-0.06	-0.06	-0.06	-0.06	-0.07	-0.06	-0.06	-0.05	-0.05	-0.05	-0.05
-1	-0.03	-0.05	-0.08	-0.10	-0.12	-0.12	-0.12	-0.12	-0.13	-0.13	-0.13	-0.12	-0.12	-0.11	-0.10	-0.10	-0.10	-0.09	-0.09	-0.09	-0.09	-0.09	-0.09	-0.09	-0.08	-0.08	-0.07	-0.07	-0.07	-0.07
-2	-0.05	-0.08	-0.11	-0.13	-0.14	-0.15	-0.15	-0.15	-0.16	-0.16	-0.15	-0.15	-0.14	-0.13	-0.12	-0.12	-0.11	-0.11	-0.10	-0.10	-0.10	-0.10	-0.10	-0.10	-0.10	-0.09	-0.08	-0.08	-0.09	-0.08
-3	-0.06	-0.10	-0.13	-0.15	-0.16	-0.16	-0.17	-0.17	-0.17	-0.17	-0.17	-0.16	-0.15	-0.14	-0.13	-0.13	-0.12	-0.12	-0.11	-0.11	-0.11	-0.11	-0.11	-0.11	-0.10	-0.10	-0.09	-0.09	-0.09	-0.09
-4	-0.08	-0.12	-0.14	-0.16	-0.17	-0.18	-0.18	-0.18	-0.18	-0.18	-0.17	-0.16	-0.15	-0.14	-0.13	-0.13	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.11	-0.11	-0.10	-0.10	-0.10	-0.09	-0.09	-0.09
-5	-0.09	-0.12	-0.15	-0.16	-0.18	-0.18	-0.19	-0.18	-0.18	-0.18	-0.17	-0.16	-0.15	-0.14	-0.13	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.11	-0.11	-0.11	-0.10	-0.10	-0.09	-0.09	-0.09	-0.10
-6	-0.09	-0.12	-0.15	-0.17	-0.18	-0.19	-0.19	-0.18	-0.18	-0.17	-0.16	-0.15	-0.14	-0.13	-0.13	-0.12	-0.12	-0.12	-0.12	-0.12	-0.11	-0.11	-0.10	-0.10	-0.10	-0.09	-0.09	-0.09	-0.10	-0.10
-7	-0.09	-0.12	-0.15	-0.17	-0.18	-0.19	-0.18	-0.18	-0.17	-0.17	-0.16	-0.15	-0.14	-0.13	-0.12	-0.12	-0.12	-0.12	-0.12	-0.11	-0.11	-0.10	-0.10	-0.10	-0.09	-0.09	-0.09	-0.09	-0.10	-0.10
-8	-0.09	-0.13	-0.16	-0.17	-0.18	-0.18	-0.18	-0.17	-0.17	-0.16	-0.15	-0.14	-0.13	-0.13	-0.12	-0.12	-0.12	-0.11	-0.11	-0.10	-0.10	-0.10	-0.10	-0.09	-0.09	-0.09	-0.09	-0.09	-0.10	-0.10
-9	-0.09	-0.13	-0.16	-0.17	-0.18	-0.18	-0.17	-0.17	-0.16	-0.15	-0.14	-0.13	-0.13	-0.12	-0.12	-0.11	-0.11	-0.11	-0.10	-0.10	-0.10	-0.10	-0.09	-0.09	-0.09	-0.09	-0.09	-0.09	-0.10	-0.11
-10	-0.09	-0.13	-0.15	-0.16	-0.17	-0.17	-0.16	-0.16	-0.15	-0.14	-0.13	-0.13	-0.12	-0.12	-0.11	-0.11	-0.10	-0.10	-0.09	-0.09	-0.09	-0.09	-0.08	-0.08	-0.08	-0.08	-0.09	-0.09	-0.10	-0.10
-11	-0.09	-0.12	-0.15	-0.16	-0.16	-0.16	-0.15	-0.15	-0.14	-0.14	-0.13	-0.12	-0.11	-0.11	-0.10	-0.10	-0.09	-0.09	-0.09	-0.09	-0.08	-0.08	-0.08	-0.08	-0.08	-0.08	-0.09	-0.09	-0.10	-0.10
-12	-0.09	-0.12	-0.14	-0.15	-0.15	-0.15	-0.14	-0.14	-0.13	-0.13	-0.12	-0.11	-0.11	-0.10	-0.10	-0.09	-0.09	-0.08	-0.08	-0.08	-0.08	-0.08	-0.08	-0.08	-0.08	-0.08	-0.09	-0.09	-0.09	-0.09
-13	-0.08	-0.11	-0.13	-0.14	-0.14	-0.14	-0.14	-0.13	-0.13	-0.12	-0.12	-0.11	-0.10	-0.09	-0.09	-0.08	-0.08	-0.08	-0.07	-0.07	-0.07	-0.07	-0.07	-0.08	-0.08	-0.09	-0.09	-0.09	-0.09	-0.09
-14	-0.08	-0.10	-0.12	-0.13	-0.13	-0.13	-0.13	-0.12	-0.12	-0.12	-0.11	-0.10	-0.10	-0.09	-0.08	-0.08	-0.08	-0.07	-0.07	-0.07	-0.07	-0.07	-0.08	-0.08	-0.08	-0.08	-0.08	-0.08	-0.08	-0.08
-15	-0.07	-0.10	-0.11	-0.12	-0.13	-0.12	-0.12	-0.12	-0.12	-0.11	-0.11	-0.10	-0.09	-0.08	-0.08	-0.07	-0.07	-0.07	-0.07	-0.07	-0.07	-0.07	-0.08	-0.08	-0.08	-0.08	-0.08	-0.08	-0.08	-0.08
-16	-0.07	-0.09	-0.11	-0.12	-0.12	-0.12	-0.12	-0.12	-0.11	-0.11	-0.10	-0.09	-0.08	-0.08	-0.07	-0.07	-0.07	-0.06	-0.07	-0.07	-0.07	-0.08	-0.08	-0.08	-0.08	-0.08	-0.08	-0.08	-0.07	-0.07
-17	-0.06	-0.09	-0.11	-0.11	-0.12	-0.12	-0.12	-0.12	-0.11	-0.11	-0.10	-0.09	-0.08	-0.08	-0.07	-0.07	-0.06	-0.07	-0.07	-0.07	-0.08	-0.08	-0.08	-0.08	-0.08	-0.08	-0.07	-0.07	-0.07	-0.06
-18	-0.06	-0.09	-0.10	-0.11	-0.12	-0.12	-0.12	-0.11	-0.11	-0.10	-0.09	-0.09	-0.08	-0.07	-0.07	-0.07	-0.07	-0.07	-0.07	-0.07	-0.08	-0.08	-0.08	-0.08	-0.08	-0.07	-0.07	-0.07	-0.06	-0.06
-19	-0.06	-0.08	-0.10	-0.11	-0.12	-0.12	-0.12	-0.11	-0.10	-0.10	-0.09	-0.08	-0.08	-0.07	-0.07	-0.07	-0.07	-0.07	-0.07	-0.08	-0.08	-0.08	-0.08	-0.08	-0.07	-0.07	-0.06	-0.06	-0.06	-0.06
-20	-0.06	-0.09	-0.10	-0.11	-0.12	-0.12	-0.11	-0.11	-0.10	-0.10	-0.09	-0.08	-0.07	-0.07	-0.07	-0.07	-0.07	-0.07	-0.08	-0.08	-0.08	-0.08	-0.08	-0.07	-0.07	-0.06	-0.06	-0.06	-0.06	-0.06
-21	-0.06	-0.08	-0.10	-0.11	-0.12	-0.11	-0.11	-0.10	-0.10	-0.10	-0.09	-0.08	-0.07	-0.07	-0.07	-0.07	-0.07	-0.08	-0.08	-0.08	-0.08	-0.07	-0.07	-0.07	-0.06	-0.06	-0.05	-0.05	-0.05	-0.06
-22	-0.06	-0.09	-0.10	-0.11	-0.11	-0.11	-0.10	-0.10	-0.10	-0.09	-0.08	-0.08	-0.07	-0.07	-0.07	-0.07	-0.08	-0.08	-0.08	-0.07	-0.07	-0.07	-0.07	-0.06	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05
-23	-0.06	-0.09	-0.10	-0.11	-0.11	-0.10	-0.10	-0.10	-0.09	-0.09	-0.08	-0.08	-0.08	-0.08	-0.08	-0.08	-0.08	-0.08	-0.07	-0.07	-0.07	-0.07	-0.06	-0.06	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05
-24	-0.06	-0.08	-0.09	-0.10	-0.10	-0.10	-0.10	-0.09	-0.09	-0.08	-0.08	-0.08	-0.08	-0.08	-0.08	-0.08	-0.07	-0.07	-0.07	-0.07	-0.06	-0.06	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05
-25	-0.06	-0.07	-0.09	-0.09	-0.10	-0.10	-0.09	-0.09	-0.09	-0.09	-0.08	-0.08	-0.08	-0.08	-0.08	-0.07	-0.07	-0.07	-0.06	-0.06	-0.05	-0.05	-0.05	-0.05	-0.04	-0.04	-0.05	-0.05	-0.05	-0.05
-26	-0.05	-0.07	-0.08	-0.09	-0.09	-0.09	-0.09	-0.09	-0.09	-0.09	-0.08	-0.08	-0.08	-0.08	-0.07	-0.07	-0.07	-0.06	-0.06	-0.05	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04	-0.04	-0.05	-0.05	-0.05
-27	-0.05	-0.07	-0.08	-0.09	-0.09	-0.09	-0.09	-0.09	-0.09	-0.09	-0.09	-0.09	-0.08	-0.08	-0.07	-0.07	-0.06	-0.06	-0.05	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04	-0.04	-0.05	-0.05	-0.04	-0.04
-28	-0.05	-0.07	-0.08	-0.09	-0.09	-0.09	-0.09	-0.09	-0.10	-0.10	-0.10	-0.09	-0.08	-0.08	-0.07	-0.07	-0.06	-0.05	-0.05	-0.05	-0.04	-0.04	-0.04	-0.05	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04
-29	-0.05	-0.07	-0.08	-0.09	-0.09	-0.09	-0.10	-0.10	-0.10	-0.10	-0.10	-0.09	-0.08	-0.08	-0.07	-0.06	-0.05	-0.05	-0.05	-0.04	-0.04	-0.04	-0.05	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04	-0.04

Figure 10: *Return correlations for financials within top 60 shares from 1 January 2003 to 31 May 2008*

These heatmaps were also generated over the crash period of 1 July 2008 to 31 March 2009.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
TODAY	0.02	-0.03	-0.06	-0.06	-0.06	-0.08	-0.07	-0.06	-0.04	-0.04	-0.05	-0.05	-0.05	-0.05	-0.05	-0.04	-0.03	-0.03	-0.03	-0.02	-0.02	-0.03	-0.05	-0.05	-0.04	-0.03	-0.03	-0.03	-0.03	-0.03
-1	-0.03	-0.08	-0.10	-0.10	-0.11	-0.11	-0.09	-0.07	-0.06	-0.07	-0.08	-0.08	-0.07	-0.07	-0.07	-0.05	-0.05	-0.05	-0.04	-0.04	-0.04	-0.06	-0.07	-0.07	-0.06	-0.05	-0.05	-0.05	-0.04	-0.05
-2	-0.06	-0.10	-0.11	-0.12	-0.12	-0.12	-0.09	-0.08	-0.07	-0.08	-0.09	-0.08	-0.08	-0.08	-0.07	-0.06	-0.05	-0.05	-0.04	-0.04	-0.06	-0.07	-0.08	-0.07	-0.06	-0.06	-0.05	-0.05	-0.05	-0.06
-3	-0.06	-0.10	-0.12	-0.12	-0.12	-0.10	-0.08	-0.08	-0.07	-0.08	-0.08	-0.09	-0.08	-0.07	-0.06	-0.05	-0.05	-0.04	-0.04	-0.05	-0.06	-0.07	-0.08	-0.07	-0.06	-0.05	-0.05	-0.05	-0.06	-0.06
-4	-0.06	-0.11	-0.12	-0.11	-0.10	-0.09	-0.08	-0.07	-0.07	-0.08	-0.08	-0.08	-0.07	-0.06	-0.06	-0.04	-0.04	-0.04	-0.05	-0.06	-0.07	-0.07	-0.07	-0.07	-0.05	-0.05	-0.05	-0.05	-0.05	-0.06
-5	-0.08	-0.11	-0.12	-0.10	-0.09	-0.09	-0.08	-0.07	-0.07	-0.08	-0.08	-0.07	-0.06	-0.06	-0.05	-0.04	-0.03	-0.04	-0.05	-0.06	-0.06	-0.07	-0.07	-0.06	-0.05	-0.05	-0.05	-0.06	-0.06	-0.07
-6	-0.07	-0.09	-0.09	-0.08	-0.08	-0.08	-0.07	-0.06	-0.07	-0.07	-0.06	-0.06	-0.05	-0.04	-0.03	-0.03	-0.03	-0.04	-0.05	-0.05	-0.06	-0.06	-0.06	-0.05	-0.05	-0.05	-0.05	-0.06	-0.06	-0.07
-7	-0.06	-0.07	-0.08	-0.07	-0.07	-0.07	-0.06	-0.06	-0.06	-0.06	-0.05	-0.05	-0.04	-0.03	-0.03	-0.03	-0.04	-0.04	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.06	-0.06	-0.07
-8	-0.04	-0.06	-0.07	-0.07	-0.07	-0.07	-0.06	-0.06	-0.05	-0.05	-0.05	-0.04	-0.03	-0.03	-0.03	-0.03	-0.04	-0.04	-0.04	-0.04	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.06	-0.07	-0.07
-9	-0.04	-0.07	-0.08	-0.08	-0.08	-0.08	-0.07	-0.06	-0.05	-0.05	-0.04	-0.04	-0.03	-0.03	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.05	-0.06	-0.06	-0.05	-0.05	-0.06	-0.07	-0.07	-0.08
-10	-0.05	-0.08	-0.08	-0.08	-0.08	-0.08	-0.06	-0.05	-0.05	-0.04	-0.04	-0.03	-0.03	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.05	-0.06	-0.06	-0.06	-0.06	-0.06	-0.07	-0.07	-0.08
-11	-0.05	-0.08	-0.08	-0.08	-0.08	-0.07	-0.05	-0.05	-0.04	-0.03	-0.03	-0.03	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.05	-0.05	-0.06	-0.06	-0.06	-0.06	-0.06	-0.07	-0.07	-0.08
-12	-0.05	-0.07	-0.08	-0.08	-0.07	-0.06	-0.05	-0.04	-0.03	-0.03	-0.03	-0.04	-0.04	-0.04	-0.04	-0.03	-0.03	-0.03	-0.03	-0.04	-0.04	-0.05	-0.06	-0.06	-0.06	-0.06	-0.07	-0.07	-0.08	-0.09
-13	-0.05	-0.07	-0.08	-0.07	-0.06	-0.05	-0.04	-0.03	-0.02	-0.03	-0.04	-0.04	-0.04	-0.04	-0.04	-0.03	-0.03	-0.03	-0.03	-0.04	-0.04	-0.05	-0.06	-0.06	-0.06	-0.06	-0.07	-0.07	-0.08	-0.09
-14	-0.05	-0.07	-0.07	-0.06	-0.05	-0.05	-0.03	-0.02	-0.03	-0.04	-0.04	-0.04	-0.04	-0.04	-0.03	-0.02	-0.03	-0.03	-0.03	-0.04	-0.04	-0.05	-0.06	-0.06	-0.06	-0.06	-0.07	-0.08	-0.08	-0.09
-15	-0.04	-0.05	-0.05	-0.05	-0.04	-0.03	-0.02	-0.02	-0.03	-0.04	-0.04	-0.04	-0.03	-0.03	-0.02	-0.02	-0.02	-0.03	-0.03	-0.04	-0.05	-0.05	-0.06	-0.06	-0.06	-0.07	-0.07	-0.08	-0.09	-0.09
-16	-0.03	-0.05	-0.05	-0.04	-0.03	-0.03	-0.03	-0.03	-0.04	-0.04	-0.04	-0.04	-0.03	-0.03	-0.02	-0.02	-0.03	-0.03	-0.03	-0.04	-0.05	-0.06	-0.06	-0.06	-0.07	-0.07	-0.08	-0.08	-0.09	-0.10
-17	-0.03	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.04	-0.05	-0.05	-0.06	-0.07	-0.07	-0.07	-0.08	-0.08	-0.09	-0.09	-0.10
-18	-0.03	-0.04	-0.04	-0.04	-0.04	-0.05	-0.04	-0.04	-0.04	-0.04	-0.04	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.04	-0.04	-0.05	-0.06	-0.06	-0.07	-0.08	-0.08	-0.08	-0.09	-0.09	-0.09	-0.10
-19	-0.02	-0.03	-0.04	-0.04	-0.05	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04	-0.03	-0.03	-0.03	-0.03	-0.03	-0.04	-0.04	-0.05	-0.05	-0.06	-0.07	-0.08	-0.08	-0.08	-0.09	-0.09	-0.09	-0.10	-0.11
-20	-0.02	-0.04	-0.05	-0.06	-0.06	-0.06	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.05	-0.05	-0.05	-0.06	-0.07	-0.08	-0.09	-0.09	-0.09	-0.09	-0.09	-0.10	-0.11	-0.12
-21	-0.03	-0.05	-0.07	-0.07	-0.07	-0.06	-0.06	-0.05	-0.04	-0.04	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.06	-0.06	-0.07	-0.08	-0.09	-0.09	-0.10	-0.10	-0.10	-0.10	-0.11	-0.12	-0.13
-22	-0.04	-0.07	-0.07	-0.07	-0.07	-0.06	-0.05	-0.05	-0.04	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.06	-0.06	-0.07	-0.08	-0.09	-0.09	-0.10	-0.10	-0.10	-0.10	-0.11	-0.11	-0.12	-0.14
-23	-0.05	-0.07	-0.07	-0.07	-0.06	-0.06	-0.05	-0.04	-0.04	-0.05	-0.05	-0.05	-0.05	-0.05	-0.06	-0.06	-0.06	-0.07	-0.07	-0.08	-0.09	-0.10	-0.10	-0.10	-0.10	-0.11	-0.11	-0.12	-0.13	-0.15
-24	-0.04	-0.06	-0.06	-0.06	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04	-0.05	-0.05	-0.05	-0.05	-0.06	-0.06	-0.06	-0.07	-0.08	-0.08	-0.09	-0.10	-0.10	-0.10	-0.11	-0.11	-0.12	-0.13	-0.14	-0.15
-25	-0.03	-0.05	-0.06	-0.05	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.05	-0.05	-0.05	-0.05	-0.06	-0.06	-0.07	-0.07	-0.08	-0.09	-0.09	-0.10	-0.10	-0.11	-0.11	-0.12	-0.13	-0.14	-0.15	-0.16
-26	-0.04	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.05	-0.05	-0.05	-0.06	-0.06	-0.06	-0.07	-0.07	-0.08	-0.09	-0.09	-0.09	-0.10	-0.11	-0.12	-0.12	-0.13	-0.14	-0.15	-0.16	-0.17
-27	-0.03	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.05	-0.05	-0.06	-0.06	-0.06	-0.07	-0.07	-0.08	-0.08	-0.09	-0.09	-0.10	-0.11	-0.11	-0.12	-0.13	-0.14	-0.15	-0.15	-0.16	-0.18
-28	-0.03	-0.04	-0.04	-0.04	-0.04	-0.05	-0.04	-0.05	-0.05	-0.06	-0.06	-0.07	-0.07	-0.07	-0.08	-0.08	-0.09	-0.09	-0.09	-0.09	-0.10	-0.11	-0.12	-0.13	-0.14	-0.15	-0.16	-0.16	-0.17	-0.18
-29	-0.02	-0.04	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.06	-0.06	-0.07	-0.07	-0.08	-0.08	-0.09	-0.09	-0.09	-0.10	-0.10	-0.11	-0.12	-0.13	-0.14	-0.15	-0.15	-0.16	-0.17	-0.18	-0.19

Figure 11: *Return correlations for all top 60 shares from 1 July 2008 to 31 March 2009*

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
TODAY	0.01	-0.02	-0.06	-0.07	-0.07	-0.09	-0.07	-0.06	-0.04	-0.04	-0.05	-0.06	-0.05	-0.05	-0.06	-0.04	-0.04	-0.04	-0.04	-0.03	-0.03	-0.04	-0.05	-0.06	-0.05	-0.04	-0.04	-0.04	-0.03	-0.03
-1	-0.02	-0.07	-0.10	-0.11	-0.12	-0.12	-0.10	-0.08	-0.06	-0.07	-0.08	-0.08	-0.08	-0.08	-0.07	-0.06	-0.05	-0.06	-0.05	-0.05	-0.05	-0.07	-0.08	-0.08	-0.07	-0.06	-0.06	-0.05	-0.05	-0.06
-2	-0.06	-0.10	-0.12	-0.14	-0.13	-0.13	-0.10	-0.08	-0.07	-0.08	-0.09	-0.09	-0.10	-0.09	-0.08	-0.06	-0.06	-0.06	-0.06	-0.06	-0.07	-0.09	-0.09	-0.09	-0.07	-0.07	-0.06	-0.06	-0.06	-0.07
-3	-0.07	-0.11	-0.14	-0.14	-0.13	-0.11	-0.09	-0.08	-0.08	-0.09	-0.09	-0.10	-0.09	-0.08	-0.07	-0.06	-0.06	-0.05	-0.06	-0.07	-0.08	-0.09	-0.09	-0.08	-0.07	-0.06	-0.06	-0.06	-0.07	-0.08
-4	-0.07	-0.12	-0.13	-0.13	-0.11	-0.09	-0.08	-0.08	-0.08	-0.08	-0.09	-0.09	-0.08	-0.07	-0.07	-0.06	-0.05	-0.05	-0.06	-0.07	-0.08	-0.09	-0.09	-0.08	-0.07	-0.06	-0.06	-0.07	-0.07	-0.08
-5	-0.09	-0.12	-0.13	-0.11	-0.09	-0.09	-0.08	-0.08	-0.07	-0.08	-0.09	-0.08	-0.07	-0.07	-0.06	-0.05	-0.05	-0.06	-0.07	-0.08	-0.08	-0.09	-0.08	-0.07	-0.06	-0.06	-0.07	-0.07	-0.08	-0.09
-6	-0.07	-0.10	-0.10	-0.09	-0.08	-0.08	-0.07	-0.07	-0.07	-0.07	-0.07	-0.07	-0.06	-0.05	-0.04	-0.04	-0.05	-0.06	-0.07	-0.07	-0.07	-0.08	-0.07	-0.07	-0.06	-0.06	-0.07	-0.07	-0.08	-0.09
-7	-0.06	-0.08	-0.08	-0.08	-0.07	-0.07	-0.07	-0.07	-0.06	-0.06	-0.06	-0.06	-0.05	-0.04	-0.04	-0.04	-0.05	-0.06	-0.06	-0.07	-0.07	-0.07	-0.07	-0.07	-0.07	-0.07	-0.07	-0.07	-0.08	-0.09
-8	-0.04	-0.06	-0.07	-0.08	-0.07	-0.07	-0.07	-0.06	-0.05	-0.05	-0.06	-0.05	-0.04	-0.04	-0.04	-0.05	-0.05	-0.06	-0.06	-0.06	-0.06	-0.06	-0.07	-0.07	-0.07	-0.07	-0.07	-0.08	-0.08	-0.09
-9	-0.04	-0.07	-0.08	-0.08	-0.08	-0.08	-0.07	-0.06	-0.05	-0.05	-0.05	-0.05	-0.04	-0.05	-0.05	-0.05	-0.06	-0.06	-0.06	-0.06	-0.06	-0.07	-0.07	-0.07	-0.07	-0.07	-0.08	-0.08	-0.09	-0.10
-10	-0.05	-0.08	-0.09	-0.09	-0.09	-0.08	-0.07	-0.06	-0.05	-0.05	-0.05	-0.05	-0.05	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.07	-0.08	-0.08	-0.08	-0.08	-0.08	-0.08	-0.09	-0.10
-11	-0.06	-0.08	-0.09	-0.10	-0.09	-0.08	-0.06	-0.06	-0.05	-0.05	-0.05	-0.05	-0.06	-0.06	-0.06	-0.06	-0.06	-0.05	-0.05	-0.06	-0.06	-0.07	-0.08	-0.08	-0.08	-0.08	-0.08	-0.09	-0.09	-0.10
-12	-0.05	-0.08	-0.09	-0.09	-0.08	-0.07	-0.06	-0.05	-0.04	-0.04	-0.05	-0.06	-0.06	-0.06	-0.06	-0.05	-0.05	-0.05	-0.05	-0.06	-0.06	-0.07	-0.08	-0.08	-0.08	-0.08	-0.08	-0.09	-0.09	-0.10
-13	-0.05	-0.08	-0.08	-0.08	-0.07	-0.06	-0.05	-0.04	-0.04	-0.04	-0.06	-0.06	-0.06	-0.06	-0.05	-0.04	-0.04	-0.05	-0.05	-0.06	-0.06	-0.07	-0.08	-0.08	-0.08	-0.08	-0.08	-0.09	-0.10	-0.11
-14	-0.06	-0.07	-0.07	-0.07	-0.06	-0.06	-0.04	-0.04	-0.04	-0.05	-0.06	-0.06	-0.06	-0.05	-0.05	-0.04	-0.04	-0.05	-0.05	-0.06	-0.07	-0.07	-0.08	-0.08	-0.08	-0.08	-0.09	-0.09	-0.10	-0.11
-15	-0.04	-0.06	-0.06	-0.06	-0.05	-0.04	-0.04	-0.04	-0.04	-0.05	-0.05	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04	-0.05	-0.05	-0.06	-0.07	-0.07	-0.08	-0.08	-0.08	-0.08	-0.09	-0.09	-0.10	-0.11
-16	-0.04	-0.05	-0.06	-0.06	-0.05	-0.04	-0.04	-0.05	-0.05	-0.05	-0.06	-0.05	-0.05	-0.04	-0.04	-0.04	-0.05	-0.05	-0.06	-0.06	-0.07	-0.08	-0.08	-0.08	-0.08	-0.09	-0.09	-0.10	-0.11	-0.11
-17	-0.04	-0.06	-0.06	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.06	-0.06	-0.05	-0.05	-0.04	-0.05	-0.05	-0.05	-0.06	-0.06	-0.07	-0.07	-0.08	-0.09	-0.09	-0.09	-0.09	-0.10	-0.11	-0.11	-0.12
-18	-0.04	-0.05	-0.05	-0.05	-0.06	-0.06	-0.06	-0.06	-0.05	-0.06	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.06	-0.07	-0.07	-0.08	-0.08	-0.09	-0.09	-0.09	-0.10	-0.10	-0.11	-0.11	-0.12
-19	-0.03	-0.04	-0.05	-0.06	-0.07	-0.07	-0.06	-0.06	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.06	-0.06	-0.07	-0.07	-0.08	-0.09	-0.10	-0.10	-0.10	-0.10	-0.11	-0.11	-0.12	-0.13
-20	-0.02	-0.05	-0.06	-0.07	-0.07	-0.07	-0.06	-0.06	-0.05	-0.05	-0.05	-0.06	-0.06	-0.06	-0.06	-0.06	-0.07	-0.07	-0.08	-0.08	-0.09	-0.10	-0.10	-0.10	-0.11	-0.11	-0.11	-0.12	-0.13	-0.14
-21	-0.04	-0.06	-0.08	-0.08	-0.08	-0.08	-0.07	-0.06	-0.05	-0.06	-0.06	-0.07	-0.07	-0.07	-0.07	-0.07	-0.07	-0.08	-0.08	-0.09	-0.10	-0.11	-0.11	-0.11	-0.11	-0.11	-0.12	-0.13	-0.14	-0.15
-22	-0.05	-0.08	-0.09	-0.08	-0.08	-0.07	-0.06	-0.06	-0.05	-0.06	-0.07	-0.07	-0.07	-0.07	-0.07	-0.07	-0.08	-0.08	-0.09	-0.09	-0.10	-0.11	-0.12	-0.12	-0.12	-0.12	-0.13	-0.14	-0.15	-0.16
-23	-0.05	-0.07	-0.08	-0.08	-0.07	-0.07	-0.05	-0.05	-0.06	-0.06	-0.07	-0.07	-0.07	-0.07	-0.07	-0.08	-0.08	-0.08	-0.09	-0.10	-0.11	-0.12	-0.12	-0.12	-0.12	-0.13	-0.14	-0.15	-0.16	-0.17
-24	-0.05	-0.06	-0.07	-0.07	-0.06	-0.05	-0.05	-0.05	-0.05	-0.06	-0.06	-0.07	-0.07	-0.07	-0.07	-0.07	-0.08	-0.09	-0.09	-0.10	-0.11	-0.12	-0.12	-0.12	-0.13	-0.13	-0.14	-0.16	-0.17	-0.18
-25	-0.04	-0.06	-0.06	-0.06	-0.05	-0.05	-0.05	-0.05	-0.05	-0.06	-0.07	-0.07	-0.07	-0.07	-0.07	-0.08	-0.08	-0.09	-0.10	-0.11	-0.11	-0.12	-0.12	-0.13	-0.13	-0.14	-0.15	-0.17	-0.18	-0.19
-26	-0.04	-0.05	-0.06	-0.05	-0.05	-0.05	-0.05	-0.06	-0.06	-0.06	-0.07	-0.07	-0.07	-0.07	-0.08	-0.08	-0.09	-0.10	-0.10	-0.11	-0.11	-0.12	-0.13	-0.14	-0.14	-0.15	-0.17	-0.17	-0.18	-0.20
-27	-0.03	-0.05	-0.05	-0.05	-0.05	-0.06	-0.05	-0.06	-0.06	-0.06	-0.07	-0.07	-0.07	-0.08	-0.08	-0.09	-0.09	-0.10	-0.11	-0.11	-0.12	-0.13	-0.14	-0.15	-0.16	-0.16	-0.17	-0.18	-0.19	-0.21
-28	-0.03	-0.04	-0.05	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.07	-0.07	-0.08	-0.08	-0.08	-0.09	-0.09	-0.10	-0.11	-0.11	-0.12	-0.13	-0.14	-0.15	-0.16	-0.17	-0.17	-0.18	-0.19	-0.20	-0.21
-29	-0.02	-0.04	-0.06	-0.06	-0.06	-0.07	-0.07	-0.07	-0.07	-0.07	-0.08	-0.09	-0.09	-0.09	-0.10	-0.10	-0.11	-0.11	-0.12	-0.12	-0.14	-0.15	-0.16	-0.17	-0.17	-0.18	-0.19	-0.20	-0.21	-0.22

Figure 12: *Return correlations for industrials within top 60 shares from 1 July 2008 to 31 March 2009*

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
TODAY	0.05	0.01	-0.01	-0.01	-0.02	-0.03	-0.02	-0.03	-0.03	-0.03	-0.02	-0.02	-0.02	-0.01	-0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	-0.01	-0.01	-0.01	0.00	0.00	0.01	0.00	0.00
-1	0.01	-0.03	-0.04	-0.04	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.04	-0.04	-0.03	-0.02	-0.02	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.02	-0.03	-0.02	-0.01	0.00	0.00	-0.01	-0.01
-2	-0.01	-0.04	-0.05	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.05	-0.05	-0.04	-0.03	-0.02	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.02	-0.03	-0.02	-0.02	0.00	0.00	0.00	-0.01	-0.01
-3	-0.01	-0.04	-0.06	-0.05	-0.06	-0.06	-0.06	-0.06	-0.06	-0.05	-0.04	-0.03	-0.02	-0.01	-0.01	0.00	0.00	0.00	0.00	-0.01	-0.01	-0.02	-0.02	-0.02	-0.01	0.00	0.00	0.00	-0.01	-0.01
-4	-0.02	-0.05	-0.05	-0.06	-0.06	-0.06	-0.06	-0.06	-0.05	-0.05	-0.04	-0.03	-0.01	-0.01	0.00	0.00	0.00	0.00	0.00	-0.01	-0.02	-0.02	-0.01	-0.01	0.00	0.00	0.00	0.00	0.00	0.00
-5	-0.03	-0.04	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.05	-0.04	-0.03	-0.02	-0.01	0.00	0.00	0.01	0.01	0.00	0.00	-0.01	-0.01	-0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00
-6	-0.02	-0.04	-0.05	-0.06	-0.06	-0.06	-0.05	-0.05	-0.04	-0.03	-0.02	-0.01	0.00	0.01	0.01	0.02	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.00
-7	-0.03	-0.05	-0.06	-0.06	-0.06	-0.06	-0.05	-0.04	-0.03	-0.02	-0.01	0.00	0.01	0.02	0.02	0.02	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.00
-8	-0.02	-0.05	-0.06	-0.05	-0.05	-0.05	-0.04	-0.03	-0.02	-0.01	0.00	0.01	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.01	0.01	0.02	0.01	0.01	0.00
-9	-0.03	-0.05	-0.05	-0.05	-0.05	-0.04	-0.03	-0.02	-0.01	0.00	0.01	0.02	0.02	0.02	0.02	0.02	0.02	0.01	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.01	0.01	0.00
-10	-0.02	-0.04	-0.05	-0.04	-0.04	-0.03	-0.02	-0.01	0.00	0.01	0.02	0.02	0.03	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.01	0.01	0.02	0.02	0.02	0.02	0.02	0.01	0.01
-11	-0.02	-0.04	-0.04	-0.04	-0.03	-0.02	-0.01	0.00	0.01	0.02	0.02	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.01	0.01
-12	-0.02	-0.03	-0.03	-0.02	-0.02	-0.01	0.00	0.01	0.02	0.02	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.02	0.02	0.01	0.00
-13	-0.01	-0.02	-0.02	-0.01	-0.01	0.00	0.01	0.02	0.02	0.03	0.03	0.03	0.03	0.03	0.04	0.04	0.04	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.02	0.01	0.00	0.00
-14	-0.01	-0.01	-0.01	-0.01	0.00	0.01	0.02	0.02	0.02	0.02	0.02	0.03	0.03	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.03	0.03	0.03	0.03	0.02	0.02	0.01	0.00	0.00
-15	0.00	0.00	-0.01	0.00	0.00	0.01	0.02	0.02	0.02	0.02	0.02	0.03	0.03	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.03	0.03	0.03	0.02	0.02	0.02	0.01	0.00	0.00
-16	0.01	0.00	0.00	0.00	0.01	0.01	0.02	0.01	0.01	0.02	0.02	0.03	0.03	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.03	0.03	0.02	0.02	0.02	0.01	0.01	0.00	0.00
-17	0.00	-0.01	-0.01	0.00	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.03	0.03	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.03	0.03	0.02	0.02	0.01	0.01	0.01	0.01	0.00	0.00
-18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.02	0.03	0.03	0.04	0.04	0.04	0.05	0.04	0.04	0.03	0.03	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.00	0.00
-19	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.02	0.02	0.03	0.03	0.04	0.04	0.05	0.04	0.04	0.03	0.03	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00
-20	0.01	0.00	-0.01	-0.01	-0.01	0.00	0.00	0.01	0.01	0.02	0.02	0.02	0.03	0.04	0.04	0.04	0.04	0.03	0.03	0.02	0.02	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
-21	0.00	-0.01	-0.01	-0.02	-0.01	-0.01	0.00	0.00	0.01	0.01	0.02	0.02	0.03	0.04	0.04	0.03	0.03	0.03	0.02	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.01
-22	0.00	-0.01	-0.02	-0.02	-0.01	0.00	0.00	0.00	0.01	0.01	0.02	0.02	0.03	0.03	0.03	0.03	0.03	0.02	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	-0.01
-23	-0.01	-0.02	-0.02	-0.02	-0.01	0.00	0.00	0.00	0.01	0.01	0.02	0.03	0.03	0.03	0.03	0.03	0.02	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	-0.01
-24	-0.01	-0.02	-0.02	-0.01	0.00	0.00	0.00	0.01	0.01	0.02	0.02	0.03	0.03	0.03	0.03	0.02	0.02	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	-0.01
-25	0.00	-0.01	-0.01	0.00	0.00	0.00	0.01	0.01	0.02	0.02	0.03	0.03	0.03	0.03	0.03	0.02	0.02	0.02	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
-26	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.02	0.02	0.02	0.03	0.03	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
-27	0.01	0.00	0.00	0.00	0.00	0.01	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
-28	0.00	0.00	-0.01	0.00	0.00	0.01	0.02	0.02	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
-29	0.00	0.00	0.00	0.00	0.01	0.01	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Figure 13: *Return correlations for resources within top 60 shares from 1 July 2008 to 31 March 2009*

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
TODAY	0.00	-0.12	-0.14	-0.12	-0.10	-0.15	-0.13	-0.09	-0.05	-0.08	-0.09	-0.09	-0.07	-0.09	-0.10	-0.09	-0.07	-0.07	-0.07	-0.05	-0.05	-0.05	-0.08	-0.10	-0.08	-0.06	-0.08	-0.08	-0.06	-0.06
-1	-0.12	-0.19	-0.19	-0.16	-0.18	-0.20	-0.16	-0.10	-0.09	-0.12	-0.13	-0.12	-0.12	-0.14	-0.13	-0.11	-0.10	-0.10	-0.08	-0.07	-0.07	-0.09	-0.13	-0.13	-0.10	-0.10	-0.11	-0.10	-0.08	-0.08
-2	-0.14	-0.19	-0.17	-0.18	-0.19	-0.19	-0.13	-0.10	-0.10	-0.12	-0.12	-0.13	-0.13	-0.14	-0.13	-0.11	-0.10	-0.08	-0.07	-0.06	-0.08	-0.11	-0.13	-0.12	-0.11	-0.11	-0.11	-0.09	-0.08	-0.10
-3	-0.12	-0.16	-0.18	-0.19	-0.17	-0.14	-0.11	-0.10	-0.10	-0.11	-0.12	-0.13	-0.13	-0.13	-0.12	-0.10	-0.08	-0.07	-0.06	-0.07	-0.10	-0.12	-0.12	-0.12	-0.11	-0.10	-0.10	-0.09	-0.09	-0.10
-4	-0.10	-0.19	-0.20	-0.17	-0.14	-0.13	-0.11	-0.10	-0.09	-0.12	-0.13	-0.13	-0.12	-0.12	-0.11	-0.09	-0.07	-0.06	-0.07	-0.09	-0.11	-0.11	-0.13	-0.13	-0.11	-0.10	-0.10	-0.10	-0.10	-0.11
-5	-0.15	-0.20	-0.19	-0.14	-0.13	-0.13	-0.11	-0.09	-0.10	-0.13	-0.14	-0.13	-0.12	-0.12	-0.10	-0.08	-0.07	-0.07	-0.09	-0.10	-0.11	-0.12	-0.14	-0.13	-0.11	-0.10	-0.11	-0.12	-0.12	-0.13
-6	-0.14	-0.16	-0.13	-0.11	-0.11	-0.11	-0.09	-0.08	-0.10	-0.12	-0.12	-0.11	-0.11	-0.09	-0.08	-0.06	-0.06	-0.08	-0.09	-0.09	-0.10	-0.12	-0.13	-0.12	-0.10	-0.11	-0.11	-0.11	-0.12	-0.14
-7	-0.10	-0.10	-0.10	-0.09	-0.09	-0.09	-0.08	-0.08	-0.09	-0.10	-0.10	-0.10	-0.08	-0.07	-0.06	-0.06	-0.07	-0.08	-0.08	-0.08	-0.10	-0.11	-0.11	-0.11	-0.10	-0.11	-0.11	-0.12	-0.13	-0.14
-8	-0.05	-0.10	-0.10	-0.10	-0.09	-0.10	-0.10	-0.09	-0.09	-0.10	-0.10	-0.09	-0.07	-0.07	-0.07	-0.07	-0.08	-0.08	-0.08	-0.09	-0.10	-0.10	-0.11	-0.11	-0.11	-0.11	-0.12	-0.13	-0.14	-0.15
-9	-0.08	-0.12	-0.13	-0.11	-0.12	-0.13	-0.12	-0.10	-0.10	-0.11	-0.10	-0.09	-0.08	-0.08	-0.09	-0.09	-0.09	-0.09	-0.10	-0.10	-0.10	-0.11	-0.12	-0.13	-0.12	-0.13	-0.14	-0.15	-0.15	-0.15
-10	-0.10	-0.13	-0.12	-0.12	-0.13	-0.13	-0.11	-0.10	-0.10	-0.10	-0.09	-0.08	-0.08	-0.10	-0.10	-0.09	-0.09	-0.10	-0.10	-0.09	-0.10	-0.11	-0.13	-0.13	-0.13	-0.14	-0.15	-0.15	-0.15	-0.16
-11	-0.09	-0.12	-0.12	-0.13	-0.13	-0.13	-0.11	-0.09	-0.08	-0.09	-0.08	-0.08	-0.09	-0.10	-0.10	-0.09	-0.09	-0.09	-0.09	-0.09	-0.10	-0.12	-0.13	-0.14	-0.14	-0.15	-0.15	-0.15	-0.16	-0.17
-12	-0.08	-0.12	-0.13	-0.13	-0.12	-0.12	-0.10	-0.08	-0.07	-0.08	-0.09	-0.10	-0.10	-0.10	-0.10	-0.10	-0.09	-0.09	-0.09	-0.09	-0.11	-0.12	-0.14	-0.15	-0.15	-0.15	-0.15	-0.16	-0.17	-0.18
-13	-0.10	-0.14	-0.14	-0.13	-0.12	-0.12	-0.09	-0.07	-0.07	-0.08	-0.10	-0.11	-0.10	-0.11	-0.11	-0.10	-0.09	-0.09	-0.09	-0.10	-0.11	-0.13	-0.15	-0.16	-0.16	-0.15	-0.16	-0.17	-0.18	-0.19
-14	-0.11	-0.14	-0.13	-0.12	-0.11	-0.10	-0.08	-0.06	-0.07	-0.09	-0.10	-0.10	-0.10	-0.11	-0.10	-0.09	-0.09	-0.09	-0.10	-0.10	-0.12	-0.14	-0.16	-0.16	-0.15	-0.16	-0.17	-0.18	-0.18	-0.20
-15	-0.09	-0.12	-0.11	-0.10	-0.09	-0.08	-0.06	-0.06	-0.07	-0.09	-0.09	-0.10	-0.10	-0.10	-0.09	-0.08	-0.08	-0.09	-0.09	-0.11	-0.13	-0.15	-0.16	-0.15	-0.15	-0.16	-0.17	-0.18	-0.19	-0.20
-16	-0.08	-0.11	-0.10	-0.09	-0.07	-0.07	-0.06	-0.07	-0.08	-0.09	-0.10	-0.10	-0.10	-0.09	-0.08	-0.08	-0.09	-0.09	-0.10	-0.12	-0.13	-0.15	-0.15	-0.16	-0.16	-0.17	-0.18	-0.19	-0.20	-0.20
-17	-0.08	-0.10	-0.09	-0.07	-0.06	-0.07	-0.08	-0.08	-0.08	-0.09	-0.10	-0.10	-0.09	-0.09	-0.09	-0.09	-0.09	-0.10	-0.11	-0.13	-0.14	-0.15	-0.16	-0.17	-0.17	-0.17	-0.19	-0.20	-0.20	-0.20
-18	-0.07	-0.09	-0.08	-0.06	-0.07	-0.09	-0.08	-0.07	-0.08	-0.10	-0.10	-0.09	-0.08	-0.09	-0.09	-0.09	-0.10	-0.11	-0.12	-0.13	-0.14	-0.15	-0.17	-0.17	-0.17	-0.19	-0.20	-0.20	-0.20	-0.21
-19	-0.05	-0.07	-0.07	-0.07	-0.09	-0.09	-0.08	-0.08	-0.09	-0.10	-0.09	-0.09	-0.09	-0.10	-0.10	-0.10	-0.11	-0.12	-0.13	-0.13	-0.15	-0.16	-0.18	-0.18	-0.19	-0.20	-0.20	-0.20	-0.20	-0.22
-20	-0.05	-0.08	-0.09	-0.10	-0.10	-0.10	-0.10	-0.10	-0.10	-0.10	-0.10	-0.10	-0.10	-0.11	-0.11	-0.12	-0.13	-0.13	-0.14	-0.14	-0.16	-0.17	-0.19	-0.20	-0.20	-0.20	-0.20	-0.21	-0.22	-0.23
-21	-0.06	-0.10	-0.12	-0.12	-0.11	-0.12	-0.11	-0.10	-0.10	-0.10	-0.11	-0.11	-0.11	-0.12	-0.13	-0.14	-0.14	-0.14	-0.15	-0.16	-0.17	-0.19	-0.21	-0.21	-0.21	-0.21	-0.21	-0.22	-0.23	-0.25
-22	-0.08	-0.13	-0.13	-0.12	-0.12	-0.13	-0.12	-0.10	-0.10	-0.11	-0.12	-0.12	-0.13	-0.14	-0.15	-0.14	-0.15	-0.15	-0.17	-0.17	-0.19	-0.21	-0.22	-0.22	-0.21	-0.22	-0.23	-0.24	-0.25	-0.28
-23	-0.10	-0.13	-0.12	-0.12	-0.13	-0.12	-0.11	-0.09	-0.10	-0.12	-0.12	-0.13	-0.14	-0.15	-0.15	-0.14	-0.15	-0.16	-0.17	-0.18	-0.20	-0.21	-0.22	-0.22	-0.22	-0.23	-0.24	-0.25	-0.27	-0.31
-24	-0.08	-0.11	-0.12	-0.12	-0.11	-0.10	-0.09	-0.09	-0.10	-0.11	-0.12	-0.13	-0.14	-0.14	-0.14	-0.15	-0.16	-0.16	-0.17	-0.19	-0.20	-0.21	-0.21	-0.22	-0.23	-0.23	-0.25	-0.27	-0.30	-0.32
-25	-0.07	-0.11	-0.12	-0.11	-0.10	-0.09	-0.09	-0.09	-0.09	-0.11	-0.13	-0.14	-0.14	-0.14	-0.15	-0.15	-0.16	-0.17	-0.18	-0.19	-0.20	-0.21	-0.22	-0.23	-0.24	-0.25	-0.27	-0.30	-0.32	-0.34
-26	-0.08	-0.12	-0.11	-0.10	-0.09	-0.10	-0.09	-0.09	-0.10	-0.13	-0.14	-0.14	-0.14	-0.15	-0.16	-0.16	-0.17	-0.18	-0.19	-0.20	-0.20	-0.21	-0.23	-0.24	-0.25	-0.27	-0.30	-0.32	-0.34	-0.36
-27	-0.08	-0.10	-0.09	-0.08	-0.09	-0.10	-0.09	-0.10	-0.11	-0.13	-0.14	-0.14	-0.16	-0.16	-0.17	-0.18	-0.19	-0.19	-0.19	-0.21	-0.22	-0.24	-0.25	-0.27	-0.30	-0.32	-0.34	-0.35	-0.38	
-28	-0.07	-0.08	-0.08	-0.08	-0.09	-0.10	-0.10	-0.11	-0.12	-0.14	-0.14	-0.14	-0.15	-0.16	-0.17	-0.18	-0.19	-0.19	-0.19	-0.20	-0.21	-0.23	-0.25	-0.27	-0.30	-0.32	-0.33	-0.35	-0.37	-0.39
-29	-0.05	-0.08	-0.09	-0.09	-0.10	-0.11	-0.12	-0.12	-0.13	-0.14	-0.15	-0.16	-0.16	-0.17	-0.18	-0.19	-0.19	-0.19	-0.20	-0.21	-0.22	-0.24	-0.27	-0.30	-0.32	-0.33	-0.35	-0.37	-0.39	-0.40

Figure 14: *Return correlations for financials within top 60 shares from 1 July 2008 to 31 March 2009*

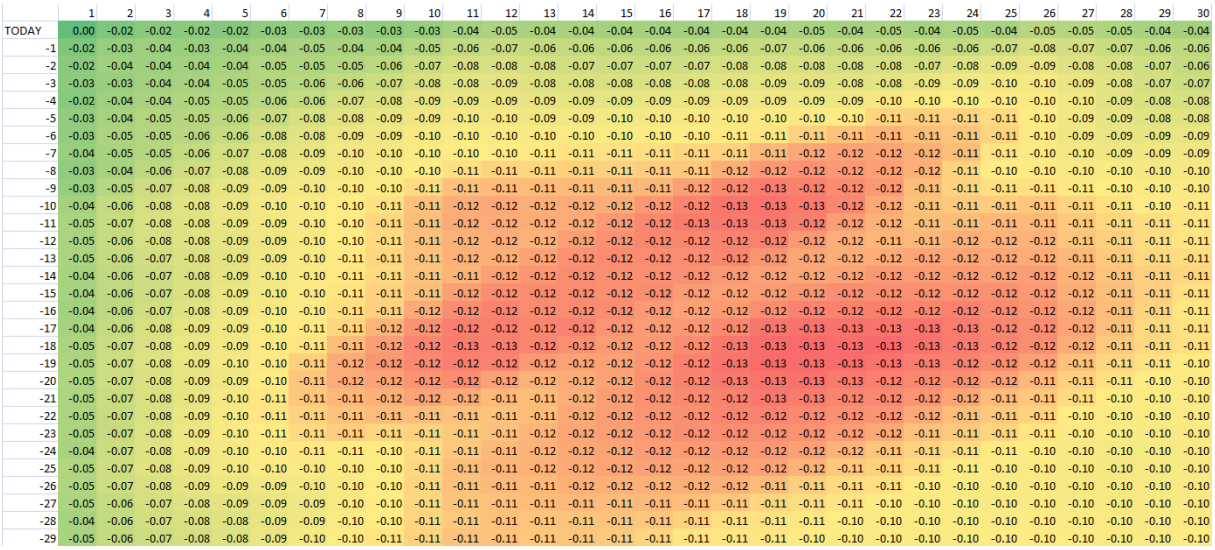
Lastly, heatmaps were generated for the 'post-crash' period of 1 April 2009 to 10 October 2012.

Time	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
0 (Today)	-0.04	-0.07	-0.07	-0.08	-0.07	-0.07	-0.07	-0.07	-0.07	-0.07	-0.07	-0.07	-0.07	-0.07	-0.07	-0.07	-0.07	-0.08	-0.08	-0.08	-0.08	-0.08	-0.08	-0.08	-0.08	-0.08	-0.08	-0.08	-0.08	-0.07
-1	-0.07	-0.09	-0.10	-0.09	-0.08	-0.09	-0.09	-0.09	-0.08	-0.09	-0.09	-0.09	-0.09	-0.09	-0.09	-0.09	-0.09	-0.10	-0.11	-0.11	-0.10	-0.10	-0.10	-0.10	-0.10	-0.11	-0.10	-0.10	-0.10	-0.10
-2	-0.07	-0.10	-0.10	-0.09	-0.09	-0.10	-0.10	-0.09	-0.10	-0.10	-0.10	-0.10	-0.10	-0.10	-0.10	-0.11	-0.11	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.11	-0.11
-3	-0.08	-0.09	-0.09	-0.10	-0.10	-0.10	-0.10	-0.10	-0.10	-0.11	-0.11	-0.11	-0.11	-0.11	-0.11	-0.12	-0.12	-0.13	-0.13	-0.13	-0.13	-0.13	-0.13	-0.13	-0.13	-0.13	-0.13	-0.13	-0.12	-0.12
-4	-0.07	-0.08	-0.09	-0.10	-0.09	-0.10	-0.10	-0.10	-0.11	-0.11	-0.11	-0.11	-0.11	-0.12	-0.12	-0.13	-0.13	-0.14	-0.14	-0.14	-0.13	-0.14	-0.14	-0.14	-0.14	-0.14	-0.14	-0.13	-0.13	-0.12
-5	-0.07	-0.09	-0.10	-0.10	-0.10	-0.10	-0.11	-0.11	-0.11	-0.11	-0.12	-0.12	-0.12	-0.13	-0.13	-0.14	-0.14	-0.14	-0.15	-0.14	-0.14	-0.15	-0.15	-0.15	-0.15	-0.14	-0.14	-0.13	-0.13	-0.13
-6	-0.07	-0.09	-0.10	-0.10	-0.10	-0.11	-0.11	-0.11	-0.12	-0.12	-0.12	-0.12	-0.13	-0.14	-0.14	-0.14	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	-0.14	-0.14	-0.14	-0.14
-7	-0.07	-0.09	-0.09	-0.10	-0.10	-0.11	-0.11	-0.11	-0.12	-0.12	-0.13	-0.13	-0.14	-0.14	-0.15	-0.15	-0.15	-0.15	-0.16	-0.16	-0.16	-0.16	-0.16	-0.15	-0.15	-0.15	-0.14	-0.14	-0.14	-0.14
-8	-0.07	-0.08	-0.10	-0.10	-0.11	-0.11	-0.12	-0.12	-0.12	-0.12	-0.13	-0.14	-0.14	-0.15	-0.15	-0.15	-0.16	-0.16	-0.16	-0.16	-0.16	-0.16	-0.16	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	-0.14
-9	-0.07	-0.09	-0.10	-0.11	-0.11	-0.11	-0.12	-0.12	-0.13	-0.13	-0.14	-0.14	-0.15	-0.15	-0.16	-0.16	-0.16	-0.17	-0.17	-0.17	-0.17	-0.16	-0.16	-0.16	-0.16	-0.16	-0.15	-0.15	-0.15	-0.15
-10	-0.07	-0.09	-0.10	-0.11	-0.11	-0.12	-0.12	-0.13	-0.13	-0.14	-0.15	-0.15	-0.15	-0.16	-0.16	-0.17	-0.17	-0.17	-0.17	-0.17	-0.17	-0.17	-0.16	-0.16	-0.16	-0.16	-0.16	-0.16	-0.16	-0.15
-11	-0.07	-0.09	-0.10	-0.11	-0.11	-0.12	-0.12	-0.13	-0.14	-0.14	-0.15	-0.15	-0.16	-0.16	-0.16	-0.17	-0.17	-0.17	-0.18	-0.17	-0.17	-0.17	-0.17	-0.17	-0.17	-0.16	-0.16	-0.16	-0.16	-0.15
-12	-0.07	-0.09	-0.10	-0.11	-0.11	-0.12	-0.13	-0.14	-0.14	-0.15	-0.15	-0.16	-0.16	-0.16	-0.17	-0.17	-0.17	-0.18	-0.18	-0.17	-0.17	-0.17	-0.17	-0.17	-0.17	-0.17	-0.16	-0.16	-0.16	-0.15
-13	-0.07	-0.09	-0.10	-0.11	-0.11	-0.12	-0.13	-0.14	-0.14	-0.15	-0.16	-0.16	-0.16	-0.17	-0.17	-0.17	-0.18	-0.18	-0.18	-0.17	-0.17	-0.17	-0.17	-0.17	-0.17	-0.17	-0.17	-0.16	-0.16	-0.16
-14	-0.07	-0.09	-0.10	-0.11	-0.12	-0.13	-0.14	-0.14	-0.15	-0.15	-0.16	-0.16	-0.17	-0.17	-0.17	-0.18	-0.18	-0.18	-0.18	-0.18	-0.18	-0.18	-0.18	-0.17	-0.17	-0.17	-0.17	-0.16	-0.16	-0.16
-15	-0.07	-0.09	-0.10	-0.12	-0.13	-0.13	-0.14	-0.15	-0.15	-0.16	-0.16	-0.17	-0.17	-0.17	-0.18	-0.18	-0.18	-0.18	-0.18	-0.18	-0.18	-0.18	-0.18	-0.18	-0.18	-0.17	-0.17	-0.17	-0.16	-0.16
-16	-0.07	-0.09	-0.11	-0.12	-0.13	-0.14	-0.15	-0.15	-0.15	-0.16	-0.17	-0.17	-0.17	-0.18	-0.18	-0.18	-0.18	-0.18	-0.18	-0.18	-0.18	-0.18	-0.18	-0.18	-0.18	-0.17	-0.17	-0.17	-0.16	-0.16
-17	-0.07	-0.10	-0.12	-0.13	-0.14	-0.14	-0.15	-0.15	-0.16	-0.17	-0.17	-0.17	-0.18	-0.18	-0.18	-0.18	-0.18	-0.19	-0.19	-0.19	-0.18	-0.18	-0.18	-0.18	-0.18	-0.17	-0.17	-0.17	-0.16	-0.16
-18	-0.08	-0.10	-0.12	-0.13	-0.14	-0.14	-0.15	-0.16	-0.16	-0.17	-0.17	-0.18	-0.18	-0.18	-0.18	-0.18	-0.18	-0.19	-0.19	-0.19	-0.19	-0.19	-0.18	-0.18	-0.18	-0.17	-0.17	-0.17	-0.16	-0.16
-19	-0.08	-0.11	-0.12	-0.13	-0.14	-0.14	-0.15	-0.16	-0.16	-0.17	-0.17	-0.17	-0.18	-0.18	-0.18	-0.18	-0.19	-0.19	-0.19	-0.19	-0.18	-0.18	-0.18	-0.18	-0.17	-0.17	-0.17	-0.17	-0.16	-0.16
-20	-0.08	-0.10	-0.12	-0.13	-0.13	-0.14	-0.15	-0.16	-0.16	-0.17	-0.17	-0.17	-0.17	-0.18	-0.18	-0.18	-0.18	-0.19	-0.19	-0.19	-0.18	-0.18	-0.18	-0.18	-0.17	-0.17	-0.17	-0.17	-0.16	-0.15
-21	-0.08	-0.10	-0.12	-0.13	-0.14	-0.15	-0.15	-0.16	-0.16	-0.16	-0.17	-0.17	-0.17	-0.18	-0.18	-0.18	-0.18	-0.18	-0.18	-0.18	-0.18	-0.18	-0.17	-0.17	-0.17	-0.17	-0.16	-0.16	-0.15	-0.15
-22	-0.08	-0.10	-0.12	-0.13	-0.14	-0.14	-0.15	-0.16	-0.16	-0.16	-0.17	-0.17	-0.17	-0.18	-0.18	-0.18	-0.18	-0.18	-0.18	-0.18	-0.18	-0.17	-0.17	-0.17	-0.17	-0.16	-0.16	-0.16	-0.15	-0.15
-23	-0.08	-0.10	-0.12	-0.13	-0.14	-0.14	-0.15	-0.15	-0.16	-0.16	-0.16	-0.17	-0.17	-0.18	-0.18	-0.18	-0.18	-0.18	-0.18	-0.18	-0.17	-0.17	-0.17	-0.17	-0.16	-0.16	-0.15	-0.15	-0.15	-0.15
-24	-0.07	-0.10	-0.12	-0.13	-0.14	-0.14	-0.15	-0.15	-0.15	-0.16	-0.16	-0.17	-0.17	-0.17	-0.18	-0.18	-0.18	-0.18	-0.18	-0.17	-0.17	-0.17	-0.16	-0.16	-0.16	-0.15	-0.15	-0.15	-0.15	-0.15
-25	-0.08	-0.10	-0.12	-0.13	-0.14	-0.14	-0.15	-0.15	-0.15	-0.16	-0.17	-0.17	-0.17	-0.17	-0.18	-0.18	-0.17	-0.17	-0.17	-0.17	-0.17	-0.16	-0.16	-0.16	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15
-26	-0.08	-0.10	-0.12	-0.13	-0.13	-0.14	-0.14	-0.15	-0.15	-0.16	-0.16	-0.17	-0.17	-0.17	-0.17	-0.17	-0.17	-0.17	-0.17	-0.17	-0.16	-0.16	-0.16	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15
-27	-0.07	-0.10	-0.12	-0.12	-0.13	-0.14	-0.14	-0.15	-0.15	-0.16	-0.16	-0.17	-0.17	-0.17	-0.17	-0.17	-0.17	-0.17	-0.17	-0.16	-0.16	-0.16	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15
-28	-0.08	-0.10	-0.11	-0.12	-0.13	-0.14	-0.14	-0.15	-0.15	-0.16	-0.16	-0.16	-0.17	-0.17	-0.17	-0.17	-0.17	-0.17	-0.16	-0.16	-0.16	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	-0.16
-29	-0.08	-0.10	-0.11	-0.12	-0.13	-0.14	-0.14	-0.15	-0.15	-0.16	-0.16	-0.16	-0.16	-0.16	-0.16	-0.16	-0.16	-0.16	-0.16	-0.16	-0.15	-0.15	-0.15	-0.15	-0.15	-0.16	-0.16	-0.16	-0.16	-0.16

Figure 15: *Return correlations for all top 60 shares from 1 April 2009 to 10 October 2012*

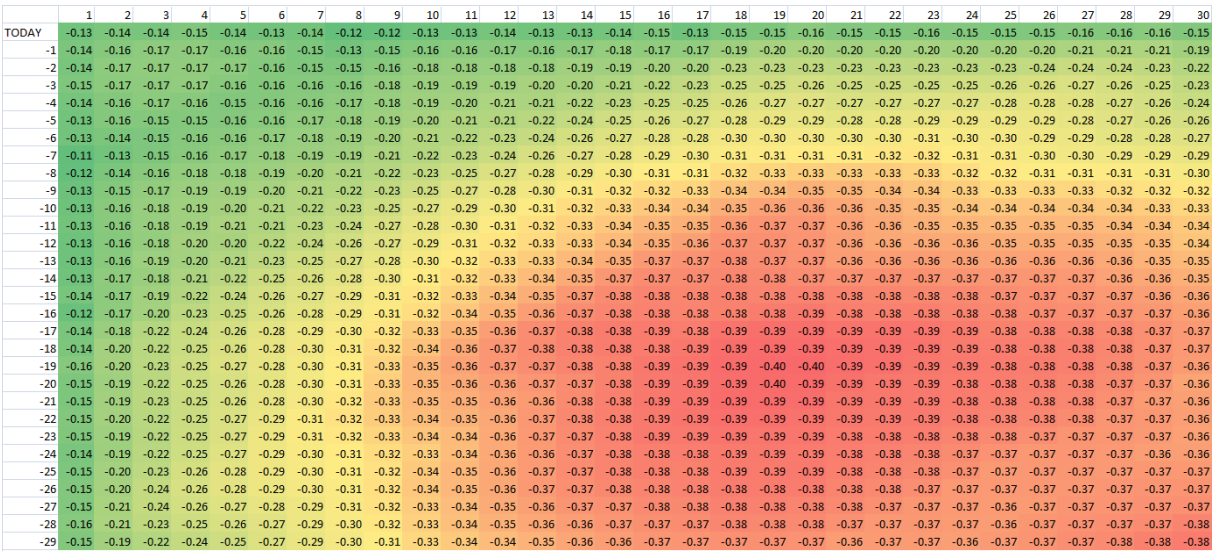
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
TODAY	-0.04	-0.07	-0.08	-0.08	-0.07	-0.07	-0.08	-0.08	-0.07	-0.07	-0.07	-0.07	-0.07	-0.07	-0.06	-0.07	-0.07	-0.07	-0.08	-0.07	-0.07	-0.07	-0.07	-0.07	-0.07	-0.07	-0.07	-0.07	-0.07	-0.07
-1	-0.07	-0.09	-0.11	-0.10	-0.09	-0.09	-0.10	-0.10	-0.09	-0.09	-0.09	-0.09	-0.09	-0.08	-0.08	-0.09	-0.09	-0.10	-0.10	-0.10	-0.09	-0.09	-0.09	-0.09	-0.10	-0.10	-0.09	-0.09	-0.09	-0.09
-2	-0.08	-0.11	-0.10	-0.10	-0.10	-0.10	-0.11	-0.10	-0.10	-0.10	-0.10	-0.10	-0.09	-0.09	-0.09	-0.10	-0.11	-0.11	-0.11	-0.11	-0.11	-0.11	-0.10	-0.11	-0.11	-0.11	-0.10	-0.10	-0.10	-0.10
-3	-0.08	-0.10	-0.10	-0.10	-0.10	-0.11	-0.11	-0.10	-0.10	-0.10	-0.10	-0.10	-0.10	-0.10	-0.10	-0.11	-0.11	-0.12	-0.12	-0.11	-0.11	-0.11	-0.11	-0.12	-0.11	-0.11	-0.11	-0.11	-0.11	-0.10
-4	-0.07	-0.09	-0.10	-0.10	-0.10	-0.10	-0.10	-0.10	-0.10	-0.10	-0.10	-0.10	-0.10	-0.10	-0.11	-0.11	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.11	-0.11	-0.11	-0.11
-5	-0.07	-0.09	-0.10	-0.11	-0.10	-0.10	-0.11	-0.10	-0.10	-0.10	-0.10	-0.10	-0.11	-0.11	-0.12	-0.12	-0.12	-0.13	-0.13	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12
-6	-0.08	-0.10	-0.11	-0.11	-0.10	-0.11	-0.11	-0.11	-0.10	-0.10	-0.10	-0.11	-0.11	-0.12	-0.12	-0.13	-0.13	-0.13	-0.13	-0.13	-0.13	-0.13	-0.13	-0.13	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12
-7	-0.08	-0.10	-0.10	-0.10	-0.10	-0.10	-0.11	-0.10	-0.10	-0.10	-0.11	-0.11	-0.12	-0.12	-0.12	-0.13	-0.13	-0.13	-0.13	-0.13	-0.13	-0.13	-0.13	-0.13	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12
-8	-0.07	-0.09	-0.10	-0.10	-0.10	-0.10	-0.10	-0.10	-0.10	-0.11	-0.11	-0.12	-0.12	-0.12	-0.13	-0.13	-0.13	-0.14	-0.14	-0.13	-0.13	-0.13	-0.13	-0.13	-0.13	-0.12	-0.12	-0.12	-0.12	-0.12
-9	-0.07	-0.09	-0.10	-0.10	-0.10	-0.10	-0.10	-0.10	-0.11	-0.11	-0.12	-0.12	-0.12	-0.13	-0.13	-0.13	-0.14	-0.14	-0.14	-0.13	-0.13	-0.13	-0.13	-0.13	-0.13	-0.13	-0.13	-0.13	-0.12	-0.12
-10	-0.07	-0.09	-0.10	-0.10	-0.10	-0.10	-0.10	-0.11	-0.11	-0.12	-0.12	-0.12	-0.13	-0.13	-0.13	-0.14	-0.14	-0.14	-0.14	-0.14	-0.14	-0.13	-0.13	-0.13	-0.13	-0.13	-0.13	-0.13	-0.13	-0.13
-11	-0.07	-0.09	-0.09	-0.10	-0.10	-0.10	-0.11	-0.11	-0.12	-0.12	-0.12	-0.13	-0.13	-0.13	-0.14	-0.14	-0.14	-0.14	-0.14	-0.14	-0.14	-0.14	-0.14	-0.14	-0.14	-0.14	-0.13	-0.13	-0.13	-0.13
-12	-0.07	-0.09	-0.09	-0.10	-0.10	-0.10	-0.11	-0.12	-0.12	-0.12	-0.13	-0.13	-0.13	-0.14	-0.14	-0.14	-0.14	-0.14	-0.14	-0.14	-0.14	-0.14	-0.14	-0.14	-0.14	-0.14	-0.13	-0.13	-0.13	-0.12
-13	-0.07	-0.08	-0.09	-0.10	-0.10	-0.11	-0.12	-0.12	-0.12	-0.12	-0.13	-0.13	-0.14	-0.14	-0.14	-0.14	-0.14	-0.14	-0.14	-0.14	-0.14	-0.14	-0.14	-0.14	-0.14	-0.14	-0.14	-0.13	-0.13	-0.13
-14	-0.06	-0.08	-0.09	-0.10	-0.11	-0.11	-0.12	-0.12	-0.12	-0.13	-0.13	-0.13	-0.14	-0.14	-0.14	-0.14	-0.14	-0.15	-0.15	-0.15	-0.15	-0.15	-0.14	-0.14	-0.14	-0.14	-0.14	-0.13	-0.13	-0.13
-15	-0.06	-0.08	-0.10	-0.11	-0.11	-0.12	-0.12	-0.13	-0.13	-0.13	-0.14	-0.14	-0.14	-0.14	-0.14	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	-0.14	-0.14	-0.13	-0.13	-0.13	-0.13
-16	-0.06	-0.09	-0.10	-0.11	-0.12	-0.12	-0.13	-0.13	-0.13	-0.13	-0.14	-0.14	-0.14	-0.14	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	-0.14	-0.14	-0.13	-0.13	-0.13	-0.13
-17	-0.07	-0.09	-0.11	-0.11	-0.12	-0.13	-0.13	-0.13	-0.13	-0.14	-0.14	-0.14	-0.14	-0.15	-0.15	-0.15	-0.15	-0.15	-0.16	-0.15	-0.15	-0.15	-0.15	-0.15	-0.14	-0.14	-0.13	-0.13	-0.13	-0.13
-18	-0.07	-0.10	-0.11	-0.12	-0.12	-0.12	-0.13	-0.13	-0.14	-0.14	-0.14	-0.14	-0.14	-0.15	-0.15	-0.15	-0.15	-0.16	-0.15	-0.15	-0.15	-0.15	-0.15	-0.14	-0.14	-0.14	-0.13	-0.13	-0.13	-0.13
-19	-0.07	-0.10	-0.11	-0.11	-0.12	-0.12	-0.13	-0.13	-0.13	-0.13	-0.14	-0.14	-0.14	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	-0.14	-0.14	-0.14	-0.13	-0.13	-0.13	-0.13	-0.12
-20	-0.07	-0.09	-0.11	-0.11	-0.12	-0.12	-0.13	-0.13	-0.13	-0.13	-0.14	-0.14	-0.14	-0.14	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	-0.14	-0.14	-0.14	-0.14	-0.13	-0.13	-0.13	-0.12	-0.12
-21	-0.07	-0.09	-0.10	-0.11	-0.12	-0.12	-0.13	-0.13	-0.13	-0.13	-0.14	-0.14	-0.14	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	-0.14	-0.14	-0.14	-0.13	-0.13	-0.13	-0.13	-0.12	-0.12	-0.12	-0.11
-22	-0.07	-0.09	-0.10	-0.11	-0.12	-0.12	-0.13	-0.13	-0.13	-0.13	-0.14	-0.14	-0.14	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	-0.14	-0.14	-0.13	-0.13	-0.13	-0.13	-0.12	-0.12	-0.12	-0.11	-0.11
-23	-0.07	-0.09	-0.10	-0.11	-0.11	-0.12	-0.13	-0.13	-0.13	-0.13	-0.13	-0.14	-0.14	-0.14	-0.14	-0.15	-0.15	-0.14	-0.14	-0.14	-0.13	-0.13	-0.13	-0.13	-0.12	-0.12	-0.11	-0.11	-0.11	-0.11
-24	-0.07	-0.09	-0.10	-0.11	-0.11	-0.12	-0.12	-0.13	-0.13	-0.13	-0.14	-0.14	-0.14	-0.14	-0.14	-0.14	-0.14	-0.14	-0.14	-0.13	-0.13	-0.13	-0.13	-0.12	-0.12	-0.11	-0.11	-0.11	-0.11	-0.11
-25	-0.07	-0.09	-0.10	-0.11	-0.11	-0.12	-0.12	-0.13	-0.13	-0.13	-0.14	-0.14	-0.14	-0.14	-0.14	-0.14	-0.14	-0.14	-0.13	-0.13	-0.13	-0.12	-0.12	-0.12	-0.11	-0.11	-0.11	-0.11	-0.11	-0.11
-26	-0.07	-0.09	-0.10	-0.11	-0.11	-0.12	-0.12	-0.12	-0.13	-0.13	-0.13	-0.14	-0.14	-0.14	-0.14	-0.14	-0.13	-0.13	-0.13	-0.13	-0.12	-0.12	-0.12	-0.11	-0.11	-0.11	-0.11	-0.11	-0.11	-0.11
-27	-0.06	-0.09	-0.10	-0.11	-0.11	-0.12	-0.12	-0.13	-0.13	-0.13	-0.13	-0.14	-0.14	-0.14	-0.13	-0.13	-0.13	-0.13	-0.13	-0.12	-0.12	-0.12	-0.11	-0.11	-0.11	-0.11	-0.11	-0.11	-0.11	-0.11
-28	-0.07	-0.09	-0.10	-0.11	-0.11	-0.12	-0.12	-0.13	-0.13	-0.13	-0.13	-0.13	-0.13	-0.13	-0.13	-0.13	-0.13	-0.13	-0.13	-0.12	-0.12	-0.11	-0.11	-0.11	-0.11	-0.11	-0.11	-0.11	-0.11	-0.12
-29	-0.07	-0.09	-0.10	-0.11	-0.11	-0.12	-0.12	-0.13	-0.13	-0.13	-0.13	-0.13	-0.13	-0.13	-0.13	-0.13	-0.13	-0.13	-0.12	-0.12	-0.11	-0.11	-0.11	-0.11	-0.11	-0.11	-0.11	-0.11	-0.12	-0.12

Figure 16: *Return correlations for industrials within top 60 shares from 1 April 2009 to 10 October 2012*



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
TODAY	0.00	-0.02	-0.02	-0.02	-0.02	-0.03	-0.03	-0.03	-0.03	-0.03	-0.04	-0.05	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.05	-0.04	-0.05	-0.04	-0.05	-0.04	-0.05	-0.05	-0.05	-0.04	-0.04
-1	-0.02	-0.03	-0.04	-0.03	-0.04	-0.04	-0.05	-0.04	-0.04	-0.05	-0.06	-0.07	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.07	-0.06	-0.06	-0.06	-0.06	-0.06	-0.07	-0.08	-0.07	-0.07	-0.06	-0.06
-2	-0.02	-0.04	-0.04	-0.04	-0.04	-0.05	-0.05	-0.05	-0.06	-0.07	-0.08	-0.08	-0.08	-0.07	-0.07	-0.07	-0.07	-0.08	-0.08	-0.08	-0.08	-0.08	-0.07	-0.08	-0.09	-0.09	-0.08	-0.08	-0.07	-0.06
-3	-0.03	-0.03	-0.04	-0.04	-0.05	-0.05	-0.06	-0.06	-0.07	-0.08	-0.08	-0.09	-0.08	-0.08	-0.08	-0.08	-0.08	-0.08	-0.09	-0.09	-0.08	-0.08	-0.09	-0.09	-0.10	-0.10	-0.09	-0.08	-0.07	-0.07
-4	-0.02	-0.04	-0.04	-0.05	-0.05	-0.06	-0.06	-0.07	-0.08	-0.09	-0.09	-0.09	-0.09	-0.09	-0.09	-0.09	-0.09	-0.09	-0.09	-0.09	-0.09	-0.10	-0.10	-0.10	-0.10	-0.10	-0.10	-0.09	-0.08	-0.08
-5	-0.03	-0.04	-0.05	-0.05	-0.06	-0.07	-0.08	-0.08	-0.09	-0.09	-0.10	-0.10	-0.09	-0.09	-0.10	-0.10	-0.10	-0.10	-0.10	-0.10	-0.10	-0.11	-0.11	-0.11	-0.11	-0.10	-0.09	-0.09	-0.08	-0.08
-6	-0.03	-0.05	-0.05	-0.06	-0.06	-0.08	-0.08	-0.09	-0.09	-0.10	-0.10	-0.10	-0.10	-0.10	-0.10	-0.10	-0.10	-0.11	-0.11	-0.11	-0.11	-0.11	-0.11	-0.11	-0.11	-0.10	-0.09	-0.09	-0.09	-0.09
-7	-0.04	-0.05	-0.05	-0.06	-0.07	-0.08	-0.09	-0.10	-0.10	-0.10	-0.10	-0.10	-0.11	-0.11	-0.11	-0.11	-0.11	-0.11	-0.11	-0.12	-0.12	-0.12	-0.12	-0.11	-0.11	-0.10	-0.10	-0.09	-0.09	-0.09
-8	-0.03	-0.04	-0.06	-0.07	-0.08	-0.09	-0.09	-0.10	-0.10	-0.10	-0.11	-0.11	-0.11	-0.11	-0.11	-0.11	-0.11	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.11	-0.10	-0.10	-0.10	-0.10	-0.10	-0.10
-9	-0.03	-0.05	-0.07	-0.08	-0.09	-0.09	-0.10	-0.10	-0.10	-0.11	-0.11	-0.11	-0.11	-0.11	-0.11	-0.11	-0.12	-0.12	-0.13	-0.12	-0.12	-0.12	-0.11	-0.11	-0.11	-0.11	-0.11	-0.10	-0.10	-0.10
-10	-0.04	-0.06	-0.08	-0.08	-0.09	-0.10	-0.10	-0.10	-0.11	-0.11	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.13	-0.13	-0.13	-0.12	-0.12	-0.11	-0.11	-0.11	-0.11	-0.11	-0.11	-0.10	-0.11
-11	-0.05	-0.07	-0.08	-0.08	-0.09	-0.09	-0.10	-0.10	-0.11	-0.11	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.13	-0.13	-0.13	-0.12	-0.12	-0.12	-0.11	-0.11	-0.11	-0.11	-0.11	-0.11	-0.11	-0.11
-12	-0.05	-0.06	-0.08	-0.08	-0.09	-0.09	-0.10	-0.10	-0.11	-0.11	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.11	-0.11	-0.12	-0.12	-0.12	-0.11	-0.11	-0.11	-0.11
-13	-0.05	-0.06	-0.07	-0.08	-0.09	-0.09	-0.10	-0.11	-0.11	-0.11	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.11	-0.11	-0.11	-0.11
-14	-0.04	-0.06	-0.07	-0.08	-0.09	-0.10	-0.10	-0.11	-0.11	-0.11	-0.11	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.11	-0.11	-0.11
-15	-0.04	-0.06	-0.07	-0.08	-0.09	-0.10	-0.10	-0.11	-0.11	-0.11	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.11	-0.11	-0.11
-16	-0.04	-0.06	-0.07	-0.08	-0.09	-0.10	-0.10	-0.11	-0.11	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.11	-0.11	-0.11
-17	-0.04	-0.06	-0.08	-0.09	-0.09	-0.10	-0.11	-0.11	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.13	-0.13	-0.13	-0.13	-0.13	-0.13	-0.12	-0.12	-0.12	-0.11	-0.11	-0.11
-18	-0.05	-0.07	-0.08	-0.09	-0.09	-0.10	-0.11	-0.11	-0.12	-0.12	-0.13	-0.13	-0.12	-0.12	-0.12	-0.12	-0.12	-0.13	-0.13	-0.13	-0.13	-0.13	-0.13	-0.13	-0.12	-0.12	-0.12	-0.11	-0.11	-0.11
-19	-0.05	-0.07	-0.08	-0.09	-0.10	-0.10	-0.11	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.13	-0.13	-0.13	-0.13	-0.13	-0.13	-0.12	-0.12	-0.12	-0.11	-0.11	-0.11	-0.10
-20	-0.05	-0.07	-0.08	-0.09	-0.09	-0.10	-0.11	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.13	-0.13	-0.13	-0.13	-0.12	-0.12	-0.12	-0.12	-0.11	-0.11	-0.11	-0.10	-0.10
-21	-0.05	-0.07	-0.08	-0.09	-0.10	-0.11	-0.11	-0.11	-0.12	-0.12	-0.12	-0.11	-0.11	-0.12	-0.12	-0.12	-0.12	-0.12	-0.13	-0.13	-0.12	-0.12	-0.12	-0.12	-0.11	-0.11	-0.11	-0.10	-0.10	-0.10
-22	-0.05	-0.07	-0.08	-0.09	-0.10	-0.11	-0.11	-0.11	-0.11	-0.11	-0.11	-0.11	-0.11	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.11	-0.11	-0.11	-0.10	-0.10	-0.10	-0.10
-23	-0.05	-0.07	-0.08	-0.09	-0.10	-0.11	-0.11	-0.11	-0.11	-0.11	-0.11	-0.11	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.11	-0.11	-0.11	-0.11	-0.10	-0.10	-0.10	-0.10
-24	-0.04	-0.07	-0.08	-0.09	-0.10	-0.10	-0.11	-0.11	-0.10	-0.11	-0.11	-0.11	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.11	-0.11	-0.11	-0.11	-0.10	-0.10	-0.10	-0.10	-0.10
-25	-0.05	-0.07	-0.08	-0.09	-0.10	-0.10	-0.10	-0.10	-0.10	-0.11	-0.11	-0.11	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.11	-0.11	-0.11	-0.11	-0.10	-0.10	-0.10	-0.10	-0.10	-0.10
-26	-0.05	-0.07	-0.08	-0.09	-0.09	-0.09	-0.10	-0.10	-0.10	-0.11	-0.11	-0.11	-0.11	-0.12	-0.12	-0.12	-0.12	-0.12	-0.11	-0.11	-0.11	-0.11	-0.10	-0.10	-0.10	-0.10	-0.10	-0.10	-0.10	-0.10
-27	-0.05	-0.06	-0.07	-0.08	-0.09	-0.09	-0.09	-0.10	-0.10	-0.11	-0.11	-0.11	-0.11	-0.11	-0.11	-0.11	-0.11	-0.11	-0.11	-0.11	-0.11	-0.10	-0.10	-0.10	-0.10	-0.10	-0.10	-0.10	-0.10	-0.10
-28	-0.04	-0.06	-0.07	-0.08	-0.08	-0.09	-0.09	-0.10	-0.10	-0.11	-0.11	-0.11	-0.11	-0.11	-0.11	-0.11	-0.11	-0.11	-0.11	-0.11	-0.10	-0.10	-0.10	-0.10	-0.10	-0.10	-0.10	-0.10	-0.10	-0.10
-29	-0.05	-0.06	-0.07	-0.08	-0.08	-0.09	-0.10	-0.10	-0.11	-0.11	-0.11	-0.11	-0.11	-0.11	-0.11	-0.11	-0.11	-0.11	-0.11	-0.10	-0.10	-0.10	-0.10	-0.10	-0.10	-0.10	-0.10	-0.10	-0.10	-0.10

Figure 17: *Return correlations for resources within top 60 shares from 1 April 2009 to 10 October 2012*



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
TODAY	-0.13	-0.14	-0.14	-0.15	-0.14	-0.13	-0.14	-0.12	-0.12	-0.13	-0.13	-0.14	-0.13	-0.13	-0.14	-0.15	-0.13	-0.15	-0.15	-0.16	-0.15	-0.15	-0.16	-0.15	-0.15	-0.15	-0.16	-0.16	-0.16	-0.15
-1	-0.14	-0.16	-0.17	-0.17	-0.16	-0.16	-0.15	-0.13	-0.15	-0.16	-0.16	-0.17	-0.16	-0.17	-0.18	-0.17	-0.17	-0.19	-0.20	-0.20	-0.20	-0.20	-0.20	-0.20	-0.20	-0.20	-0.21	-0.21	-0.21	-0.19
-2	-0.14	-0.17	-0.17	-0.17	-0.17	-0.16	-0.15	-0.15	-0.16	-0.18	-0.18	-0.18	-0.18	-0.19	-0.19	-0.20	-0.20	-0.23	-0.23	-0.23	-0.23	-0.23	-0.23	-0.23	-0.23	-0.24	-0.24	-0.24	-0.23	-0.22
-3	-0.15	-0.17	-0.17	-0.17	-0.16	-0.16	-0.16	-0.16	-0.18	-0.19	-0.19	-0.19	-0.20	-0.20	-0.21	-0.22	-0.23	-0.25	-0.25	-0.26	-0.25	-0.25	-0.25	-0.25	-0.26	-0.26	-0.27	-0.26	-0.25	-0.23
-4	-0.14	-0.16	-0.17	-0.16	-0.15	-0.16	-0.16	-0.17	-0.18	-0.19	-0.20	-0.21	-0.21	-0.22	-0.23	-0.25	-0.25	-0.26	-0.27	-0.27	-0.27	-0.27	-0.27	-0.27	-0.28	-0.28	-0.28	-0.27	-0.26	-0.24
-5	-0.13	-0.16	-0.15	-0.15	-0.16	-0.16	-0.17	-0.18	-0.19	-0.20	-0.21	-0.21	-0.22	-0.24	-0.25	-0.26	-0.27	-0.28	-0.29	-0.29	-0.28	-0.28	-0.29	-0.29	-0.29	-0.29	-0.28	-0.27	-0.26	-0.26
-6	-0.13	-0.14	-0.15	-0.16	-0.16	-0.17	-0.18	-0.19	-0.20	-0.21	-0.22	-0.23	-0.24	-0.26	-0.27	-0.28	-0.28	-0.30	-0.30	-0.30	-0.30	-0.30	-0.31	-0.30	-0.30	-0.29	-0.29	-0.28	-0.28	-0.27
-7	-0.11	-0.13	-0.15	-0.16	-0.17	-0.18	-0.19	-0.19	-0.21	-0.22	-0.23	-0.24	-0.26	-0.27	-0.28	-0.29	-0.30	-0.31	-0.31	-0.31	-0.31	-0.32	-0.32	-0.31	-0.31	-0.30	-0.30	-0.29	-0.29	-0.29
-8	-0.12	-0.14	-0.16	-0.18	-0.18	-0.19	-0.20	-0.21	-0.22	-0.23	-0.25	-0.27	-0.28	-0.29	-0.30	-0.31	-0.31	-0.32	-0.33	-0.33	-0.33	-0.33	-0.33	-0.32	-0.32	-0.31	-0.31	-0.31	-0.31	-0.30
-9	-0.13	-0.15	-0.17	-0.19	-0.19	-0.20	-0.21	-0.22	-0.23	-0.25	-0.27	-0.28	-0.30	-0.31	-0.32	-0.32	-0.33	-0.34	-0.34	-0.35	-0.35	-0.34	-0.34	-0.33	-0.33	-0.33	-0.33	-0.32	-0.32	-0.32
-10	-0.13	-0.16	-0.18	-0.19	-0.20	-0.21	-0.22	-0.23	-0.25	-0.27	-0.29	-0.30	-0.31	-0.32	-0.33	-0.34	-0.34	-0.35	-0.36	-0.36	-0.36	-0.35	-0.35	-0.34	-0.34	-0.34	-0.34	-0.34	-0.33	-0.33
-11	-0.13	-0.16	-0.18	-0.19	-0.21	-0.21	-0.23	-0.24	-0.27	-0.28	-0.30	-0.31	-0.32	-0.33	-0.34	-0.35	-0.35	-0.36	-0.37	-0.37	-0.36	-0.36	-0.35	-0.35	-0.35	-0.35	-0.35	-0.34	-0.34	-0.34
-12	-0.13	-0.16	-0.18	-0.20	-0.20	-0.22	-0.24	-0.26	-0.27	-0.29	-0.31	-0.32	-0.33	-0.33	-0.34	-0.35	-0.36	-0.37	-0.37	-0.37	-0.36	-0.36	-0.36	-0.36	-0.35	-0.35	-0.35	-0.35	-0.35	-0.34
-13	-0.13	-0.16	-0.19	-0.20	-0.21	-0.23	-0.25	-0.27	-0.28	-0.30	-0.32	-0.33	-0.33	-0.34	-0.35	-0.37	-0.37	-0.38	-0.37	-0.37	-0.36	-0.36	-0.36	-0.36	-0.36	-0.36	-0.36	-0.36	-0.35	-0.35
-14	-0.13	-0.17	-0.18	-0.21	-0.22	-0.25	-0.26	-0.28	-0.30	-0.31	-0.32	-0.33	-0.34	-0.35	-0.37	-0.37	-0.37	-0.38	-0.38	-0.37	-0.37	-0.37	-0.37	-0.37	-0.37	-0.37	-0.37	-0.36	-0.36	-0.35
-15	-0.14	-0.17	-0.19	-0.22	-0.24	-0.26	-0.27	-0.29	-0.31	-0.32	-0.33	-0.34	-0.35	-0.37	-0.38	-0.38	-0.38	-0.38	-0.38	-0.38	-0.38	-0.38	-0.38	-0.38	-0.37	-0.37	-0.37	-0.37	-0.36	-0.36
-16	-0.12	-0.17	-0.20	-0.23	-0.25	-0.26	-0.28	-0.29	-0.31	-0.32	-0.34	-0.35	-0.36	-0.37	-0.38	-0.38	-0.38	-0.38	-0.38	-0.39	-0.38	-0.38	-0.38	-0.38	-0.38	-0.37	-0.37	-0.37	-0.37	-0.36
-17	-0.14	-0.18	-0.22	-0.24	-0.26	-0.28	-0.29	-0.30	-0.32	-0.33	-0.35	-0.36	-0.37	-0.38	-0.38	-0.39	-0.38	-0.39	-0.39	-0.39	-0.39	-0.39	-0.39	-0.39	-0.38	-0.38	-0.38	-0.38	-0.37	-0.37
-18	-0.14	-0.20	-0.22	-0.25	-0.26	-0.28	-0.30	-0.31	-0.32	-0.34	-0.36	-0.37	-0.38	-0.38	-0.38	-0.38	-0.39	-0.39	-0.39	-0.39	-0.39	-0.39	-0.39	-0.38	-0.38	-0.38	-0.38	-0.38	-0.37	-0.37
-19	-0.16	-0.20	-0.23	-0.25	-0.27	-0.28	-0.30	-0.31	-0.33	-0.35	-0.36	-0.37	-0.37	-0.38	-0.38	-0.39	-0.39	-0.39	-0.40	-0.40	-0.39	-0.39	-0.39	-0.39	-0.38	-0.38	-0.38	-0.38	-0.37	-0.36
-20	-0.15	-0.19	-0.22	-0.25	-0.26	-0.28	-0.30	-0.31	-0.33	-0.35	-0.36	-0.36	-0.37	-0.37	-0.38	-0.39	-0.39	-0.39	-0.40	-0.39	-0.39	-0.39	-0.39	-0.38	-0.38	-0.38	-0.38	-0.37	-0.37	-0.36
-21	-0.15	-0.19	-0.23	-0.25	-0.26	-0.28	-0.30	-0.32	-0.33	-0.35	-0.35	-0.36	-0.36	-0.38	-0.38	-0.39	-0.39	-0.39	-0.39	-0.39	-0.39	-0.39	-0.39	-0.38	-0.38	-0.38	-0.38	-0.37	-0.37	-0.36
-22	-0.15	-0.20	-0.22	-0.25	-0.27	-0.29	-0.31	-0.32	-0.33	-0.34	-0.35	-0.36	-0.37	-0.38	-0.38	-0.39	-0.39	-0.39	-0.39	-0.39	-0.39	-0.39	-0.39	-0.38	-0.38	-0.38	-0.38	-0.37	-0.37	-0.36
-23	-0.15	-0.19	-0.22	-0.25	-0.27	-0.29	-0.31	-0.32	-0.33	-0.34	-0.34	-0.36	-0.37	-0.37	-0.38	-0.39	-0.39	-0.39	-0.39	-0.39	-0.38	-0.38	-0.38	-0.38	-0.38	-0.37	-0.37	-0.37	-0.37	-0.36
-24	-0.14	-0.19	-0.22	-0.25	-0.27	-0.29	-0.30	-0.31	-0.32	-0.33	-0.34	-0.36	-0.36	-0.37	-0.38	-0.38	-0.38	-0.39	-0.39	-0.39	-0.38	-0.38	-0.38	-0.37	-0.37	-0.37	-0.37	-0.37	-0.36	-0.36
-25	-0.15	-0.20	-0.23	-0.26	-0.28	-0.29	-0.30	-0.31	-0.32	-0.34	-0.35	-0.36	-0.37	-0.37	-0.38	-0.38	-0.38	-0.39	-0.39	-0.39	-0.38	-0.38	-0.38	-0.37	-0.37	-0.37	-0.37	-0.37	-0.37	-0.37
-26	-0.15	-0.20	-0.24	-0.26	-0.28	-0.29	-0.30	-0.31	-0.32	-0.34	-0.35	-0.36	-0.37	-0.37	-0.38	-0.38	-0.38	-0.38	-0.38	-0.38	-0.38	-0.38	-0.37	-0.37	-0.37	-0.37	-0.37	-0.37	-0.37	-0.37
-27	-0.15	-0.21	-0.24	-0.26	-0.27	-0.28	-0.29	-0.31	-0.32	-0.33	-0.34	-0.35	-0.36	-0.37	-0.37	-0.38	-0.38	-0.38	-0.38	-0.38	-0.38	-0.37	-0.37	-0.37	-0.36	-0.37	-0.37	-0.37	-0.37	-0.37
-28	-0.16	-0.21	-0.23	-0.25	-0.26	-0.27	-0.29	-0.30	-0.32	-0.33	-0.34	-0.35	-0.36	-0.36	-0.37	-0.37	-0.37	-0.38	-0.38	-0.38	-0.37	-0.37	-0.37	-0.37	-0.36	-0.37	-0.37	-0.37	-0.37	-0.38
-29	-0.15	-0.19	-0.22	-0.24	-0.25	-0.27	-0.29	-0.30	-0.31	-0.33	-0.34	-0.34	-0.35	-0.36	-0.36	-0.37	-0.37	-0.37	-0.37	-0.37	-0.36	-0.37	-0.37	-0.36	-0.37	-0.37	-0.37	-0.38	-0.38	-0.38

Figure 18: *Return correlations for financials within top 60 shares from 1 April 2009 to 10 October 2012*

B Extract of eViews code written

The following program runs the standard return reversal strategy and takes the formation period, the holding period and a percentile as parameters and generates a daily return series of profits to long positions and profits to short positions. It also creates series which keeps track of the number of positions taken by each strategy.

```
subroutine percentileMethod(scalar fp, scalar hp, scalar p)
  'Working Simulation: Percentile contrarian ranking method
  smpl @all
  'PARAMETERS and INITIALISATION

  !fperiod = fp' the formation period
  '!fperiod2 = 10 'the second formation period!

  !hperiod = hp' the holding period
  !percentile = p
  !length = @obsrange

  !test_start = !fperiod
  !test_end = !length-!hperiod-!fperiod

  vector(60) period_ret = 0
  vector(60) daily_ret = 0
  series _shorts = 0
  series _longs = 0
  series _num_shorts = 0
  series _num_longs = 0
  scalar temp

 %top60= "SAB BIL AGL MTN CFR SOL NPN SBK KIO FSR VOD AMS ANG OML ASA SHP NED IMP GFI SLM REM BVT APN
       EXX RMH TBS TRU WHL GRT SHF IPL MSM CSO HAR ARI TFG DSY MPC MMI REI INP MDC ABL LBH MNP NTC RDF
       TSH SNT PIK SPP ACL AVI LON BAW NPK CPL HYP PPC RLO"

  group stocks
  group dailyreturns 'use daily returns, NOT period returns, for comparing strategies!

  for %share {%top60}
    genr {%share}_ret_{!fperiod} = 0
    {%share}_ret_{!fperiod} = ({%share}_p - {%share}_p(-!fperiod)) / ( {%share}_p(-!fperiod) )
    stocks.add {%share}_ret_{!fperiod}
    dailyreturns.add {%share}_return
  next

  for !i = !test_start to !test_end step !hperiod
    'Get decision-making data from one day before (next day implementation)
    smpl @first +!i - 1 @first +!i - 1
    for !x = 1 to 60
      %series = stocks.@seriesname(!x)
      period_ret(!x) = @max({%series})
      if (period_ret(!x) = "NA") then
        period_ret(!x) = 0
      endif
    next

    'SHORT POSITIONS
    for !y = !i to (!i + !hperiod) step 1
      'Note that @first has a value of 1 !!!
      smpl @first + !y @first +!y
      'Use the dailyreturns group to build a vector of daily returns
      for !z = 1 to 60
        %series = dailyreturns.@seriesname(!z)
        daily_ret(!z) = @min({%series})
      next
      'temp counts the number of longs and shorts
      temp = 0
      for !z = 1 to 60
        'exclude all shares that do NOT meet criteria
        if (daily_ret(!z) = "NA") or (period_ret(!z) < @quantile(period_ret, 1-!percentile)) then
          daily_ret(!z) = 0
        endif
        if (daily_ret(!z) <> 0) then
          _shorts(!y+1)= _shorts(!y+1) - daily_ret(!z)
        endif
        'count the number of shares which do meet criteria
        if (period_ret(!z) > @quantile(period_ret, 1-!percentile)) then
          temp = temp + 1
        endif
      next
      'record the number of postions entered into
      _num_shorts(!y+1) = temp
      if temp = 0 then temp = 1
      endif
      'caluculate correct returns assuming equal weighting
      _shorts(!y+1)= _shorts(!y+1)/temp
```

```
    next
    'LONG POSITIONS
    for !y = !i to (!i + !hperiod) step 1
      smpl @first + !y @first +!y
      for !z = 1 to 60'build the daily_ret vector using the dailyreturns group
        %series = dailyreturns.@seriesname(!z)
        daily_ret(!z) = @min({%series})
      next
      temp = 0
      for !z = 1 to 60
        if (daily_ret(!z) = "NA") or (period_ret(!z) > @quantile(period_ret, !percentile)) then
          daily_ret(!z) = 0
        endif
        if (daily_ret(!z) <> 0) then
          _longs(!y+1)= _longs(!y+1) + daily_ret(!z)
        endif
        if (period_ret(!z) < @quantile(period_ret, !percentile)) then
          temp = temp + 1
        endif
      next'build the vector of daily returns accross shares at a single point in time
      _num_longs(!y+1) = temp
      if temp = 0 then temp = 1
      endif
      _longs(!y+1) = _longs(!y+1)/temp

    next
  next
  'Clean up unneccessary series...
  for %share {%top60}
    delete {%share}_ret_{!fperiod}
  next
  delete stocks'clear the stocks group
  delete dailyreturns
  'create series with useful names!!!
  temp = !percentile*100
  smpl @all
  %namedlongs = "_l" + @STR(!fperiod) +  "d" + @STR(temp) + "q" + @STR(!hperiod) + "d"
  %namedshorts = "_s" + @STR(!fperiod) +  "d" + @STR(temp) + "q" + @STR(!hperiod) + "d"
  %numlongs = "_nol" + @STR(!fperiod) +  "d" + @STR(temp) + "q" + @STR(!hperiod) + "d"
  %numshorts = "_nos" + @STR(!fperiod) +  "d" + @STR(temp) + "q" + @STR(!hperiod)+ "d"
  genr {%namedlongs } = _longs
  genr {%namedshorts } = _shorts
  genr {%numlongs } = _num_longs
  genr {%numshorts } = _num_shorts
endsub

'parameters are formation period, holding period and percentiles

'call percentileMethod(6,5,0.10)
'call percentileMethod(6,5,0.20)
'call percentileMethod(6,5,0.30)
'call percentileMethod(6,5,0.40)

'call percentileMethod(5,5,0.05)
'call percentileMethod(5,5,0.10)
'call percentileMethod(5,5,0.15)
'call percentileMethod(5,5,0.20)
'call percentileMethod(5,5,0.25)
'call percentileMethod(5,5,0.30)
'call percentileMethod(5,5,0.40)
'
'call percentileMethod(5,7,0.05)
'call percentileMethod(5,7,0.10)
'call percentileMethod(5,7,0.15)
'call percentileMethod(5,7,0.20)
'call percentileMethod(5,7,0.25)
'call percentileMethod(5,7,0.30)
'call percentileMethod(5,7,0.40)
'
'call percentileMethod(5,10,0.05)
'call percentileMethod(5,10,0.10)
'call percentileMethod(5,10,0.15)
'call percentileMethod(5,10,0.20)
'call percentileMethod(5,10,0.25)
'call percentileMethod(5,10,0.30)
'call percentileMethod(5,10,0.40)
'
'call percentileMethod(7,7,0.05)
'call percentileMethod(7,7,0.10)
'call percentileMethod(7,7,0.15)
'call percentileMethod(7,7,0.20)
'
'call percentileMethod(10,10,0.05)
'call percentileMethod(10,10,0.10)
'call percentileMethod(10,10,0.15)
'call percentileMethod(10,10,0.20)

'RESET SAMPLE PERIOD to the beginning of 1998 onwards...
smpl @first + 1408 @last - 14
```

Testing other strategies led to multiple variations of programs similar to the one above. The next program is a more complicated case of the same problem. This program runs the standard return reversal strategy combined with moving average rules and the kicker rule. It takes appropriate parameters such as the formation period, the percentile, the holding period and the moving average.

```
subroutine percentmovavkick(scalar fp, scalar hp, scalar p, scalar ma1)
  'Working Simulation: Movav, kicker and percentile rules
  smpl @all
  'PARAMETERS and INITIALISATION
  !fperiod = fp' the formation period
  !hperiod = hp' the holding period
  !percentile = p
  !ma = ma1
  !length = @obsrange

  !test_start = !fperiod 'Allows for testing in periods
  !test_end = !length-!hperiod-!fperiod

  vector(60) period_ret = 0'with group set up, should be able to rewrite the vector at each time
       period and rank using the vector only
  vector(60) daily_ret = 0
  vector(60) kicker = 0
  vector(60) period_mas = 0
  vector(60) price_on_day = 0

  series _shorts = 0
  series _longs = 0
  series _num_shorts = 0
  series _num_longs = 0
  scalar temp

 %top60= "SAB BIL AGL MTN CFR SOL NPN SBK KIO FSR VOD AMS ANG OML ASA SHP NED IMP GFI SLM REM BVT APN
       EXX RMH TBS TRU WHL GRT SHF IPL MSM CSO HAR ARI TFG DSY MPC MMI REI INP MDC ABL LBH MNP NTC RDF
       TSH SNT PIK SPP ACL AVI LON BAW NPK CPL HYP PPC RLO"

  group stocks
  group dailyreturns 'use daily returns, NOT period returns, for comparing strategies!
  group moving
  group price

  for %share {%top60}
    genr {%share}_ret_{!fperiod} = 0
    genr {%share}_ma_{!ma} = 0
    {%share}_ret_{!fperiod} = ({%share}_p - {%share}_p(-!fperiod)) / ( {%share}_p(-!fperiod) )
    {%share}_ma_{!ma} = @movav({%share}_p,{!ma})
    stocks.add {%share}_ret_{!fperiod}
    moving.add {%share}_ma_{!ma}
    price.add {%share}_p
    dailyreturns.add {%share}_return
  next

  for !i = !test_start to !test_end step !hperiod
    'Get decision-making data from one day before (next day implementation)
    smpl @first +!i - 1 @first +!i - 1
    for !x = 1 to 60
      %series = stocks.@seriesname(!x)
      period_ret(!x) = @max({%series})
      if (period_ret(!x) = "NA") then
        period_ret(!x) = 0
      endif
      %series = moving.@seriesname(!x)
      period_mas(!x) = @max({%series})
      %series = price.@seriesname(!x)
      price_on_day(!x) = @max({%series})
    next
    'Build Kicker vector
    for !z = 1 to 60
      %series = dailyreturns.@seriesname(!z)
      kicker(!z) = @min({%series})
    next
    'SHORT POSITIONS
    for !y = !i to (!i + !hperiod) step 1
      'Note that @first has a value of 1 !!!
      smpl @first + !y @first +!y
      'Use the dailyreturns group to build a vector of daily returns
      for !z = 1 to 60
        %series = dailyreturns.@seriesname(!z)
        daily_ret(!z) = @min({%series})
      next
      'temp counts the number of longs and shorts
      temp = 0
      for !z = 1 to 60
        'exclude all shares that do NOT meet criteria
        if (daily_ret(!z) = "NA") or (period_ret(!z) < @quantile(period_ret, 1-!percentile)) or (
             kicker(!z) >= 0) then
```

```
          daily_ret(!z) = 0
        endif
        if (price_on_day(!z) >= period_mas(!z))  then
          daily_ret(!z) = 0
        endif
        if (daily_ret(!z) <> 0) then
          _shorts(!y+1)= _shorts(!y+1) - daily_ret(!z)
        endif
        'count the number of shares which do meet criteria
        if (period_ret(!z) > @quantile(period_ret, 1-!percentile)) and (kicker(!z) < 0) and (
            price_on_day(!z) < period_mas(!z)) then
          temp = temp + 1
        endif
      next
      'record the number of postions entered into
      _num_shorts(!y+1) = temp
      if temp = 0 then temp = 1
      endif
      'caluculate correct returns assuming equal weighting
      _shorts(!y+1)= _shorts(!y+1)/temp
    next
    'LONG POSITIONS
    for !y = !i to (!i + !hperiod) step 1
      smpl @first + !y @first +!y
      for !z = 1 to 60'build the daily_ret vector using the dailyreturns group
        %series = dailyreturns.@seriesname(!z)
        daily_ret(!z) = @min({%series})
      next
      temp = 0
      for !z = 1 to 60
        if (daily_ret(!z) = "NA") or (period_ret(!z) > @quantile(period_ret, !percentile)) or (kicker
            (!z) <= 0)   then
          daily_ret(!z) = 0
        endif
        if (price_on_day(!z) <= period_mas(!z)) then
          daily_ret(!z) = 0
        endif
        if (daily_ret(!z) <> 0) then
          _longs(!y+1)= _longs(!y+1) + daily_ret(!z)
        endif
        if (period_ret(!z) < @quantile(period_ret, !percentile)) and (kicker(!z) > 0) and (
            price_on_day(!z) > period_mas(!z)) then
          temp = temp + 1
        endif
      next'build the vector of daily returns accross shares at a single point in time
      _num_longs(!y+1) = temp
      if temp = 0 then temp = 1
      endif
      _longs(!y+1) = _longs(!y+1)/temp

    next
  next
  'Clean up unneccessary series...
  for %share {%top60}
    delete {%share}_ret_{!fperiod}
    delete {%share}_ma_{!ma}
  next
  delete stocks'clear the stocks group
  delete dailyreturns
  delete price
  delete moving

  'create series with useful names!!!
  temp = !percentile*100
  smpl @all
  %namedlongs = "_l" + @STR(!fperiod) +  "d" + @STR(temp) + "q" + @STR(!hperiod) + "d_1k_" + @STR(!ma)
      +"ma"
  %namedshorts = "_s" + @STR(!fperiod) +  "d" + @STR(temp) + "q" + @STR(!hperiod) + "d_1k_" + @STR(!ma
      ) +"ma"
  %numlongs = "_nol" + @STR(!fperiod) +  "d" + @STR(temp) + "q" + @STR(!hperiod)+ "d_1k_" + @STR(!ma)
      +"ma"
  %numshorts = "_nos" + @STR(!fperiod) +  "d" + @STR(temp) + "q" + @STR(!hperiod)+ "d_1k_" + @STR(!ma)
      +"ma"
  genr {%namedlongs } = _longs
  genr {%namedshorts } = _shorts
  genr {%numlongs } = _num_longs
  genr {%numshorts } = _num_shorts
endsub

 'parameters are formation period, holding period, percentile, moving average
'call percentmovavkick(6, 5, 0.20, 50)
'call percentmovavkick(6, 5, 0.20, 100)
'call percentmovavkick(6, 5, 0.20, 150)
'call percentmovavkick(6, 5, 0.20, 200)
'
'call percentmovavkick(6, 5, 0.30, 50)
'call percentmovavkick(6, 5, 0.30, 100)
'call percentmovavkick(6, 5, 0.30, 150)
'call percentmovavkick(6, 5, 0.30, 200)
'
'call percentmovavkick(6, 5, 0.40, 50)
'call percentmovavkick(6, 5, 0.40, 100)
'call percentmovavkick(6, 5, 0.40, 150)
'call percentmovavkick(6, 5, 0.40, 200)
'
```

```
'call percentmovavkick(6, 5, 0.50, 50)
'call percentmovavkick(6, 5, 0.50, 100)
'call percentmovavkick(6, 5, 0.50, 150)
'call percentmovavkick(6, 5, 0.50, 200)

'RESET SAMPLE PERIOD to the beginning of 1998 onwards...
smpl @first + 1408 @last - 14
```

The next program calculates heat maps (grids of return correlations) over the entire sample for each individual share.

```
'full set of shares:
%top60= "SAB BIL AGL MTN CFR SOL NPN SBK KIO FSR VOD AMS ANG OML ASA SHP NED IMP GFI SLM REM BVT APN
     EXX RMH TBS TRU WHL GRT SHF IPL MSM CSO HAR ARI TFG DSY MPC MMI REI INP MDC ABL LBH MNP NTC RDF
     TSH SNT PIK SPP ACL AVI LON BAW NPK CPL HYP PPC RLO"
%temp_series = ""
subroutine returnsToNDays(scalar size)
  'iterate for each n-day return series
  for !i=size to 2 step -1
    'then iterate for each share,
    for %share {%top60}
      genr {%share}_return_{!i} = 0
      genr {%share}_return_1 = {%share}_return
      'factor in each of the i days!
      for !j = 1 to !i step 1
        {%share}_return_{!i} = {%share}_return_{!i} +  {%share}_return(1-!j)
      next
    next'end each of the share loops
  next
endsub
subroutine initialiseTables(scalar size)
  for %share {%top60}
    'NB: table addressing is ROW, COLUMN and NOT "x (col),y (row)"
    TABLE(size, size) heatmap_{%share}
  next
endsub
subroutine populateTables(scalar size)
  'do for each shares
  for %share {%top60}
    'then for each row
    for !row = 1 to size step 1
      for !col = 1 to size step 1
        'lag increases with row so that return series don't overlap!
        'CHECK THIS:
        SETCELL(heatmap_{%share}, !row, !col, @cor({%share}_return_!row (-!col), {%share}_return_!col)
            )
      next'end for loop for rows
    next'end for loop for columns
  next'end for loop for shares
endsub
subroutine flushData(scalar size)
  for %innerset {%top60}
    for !i = 2 to (size) step 1
      delete {%innerset}_return_{!i}
    next
  next
  %temp_series = "" ' clear temp_series
endsub

subroutine buildHeatMap(scalar size)
  'generate n day returns
  call returnsToNDays(size)
  'create tables (for each share) of the correct size
  call initialiseTables(size)
  'calculate correlations, using all the shares!
  call populateTables(size)
  'clear n day returns
  call flushData(size)
endsub

call  buildHeatMap(30)
```

C Guide to the naming code used in eViews

A naming convention has been adopted to allow easier testing of variations of multiple strategies and to satisfy the 26 character limit for series imposed by eViews 7.

Every series begins with one the following prefixes, which generally describes its contents:

Prefix	Meaning
_l	long returns
_s	short returns
_nol	number of longs
_nos	number of shorts
_cl	cumulative long returns
_cs	cumulative short returns
_cb	cumulative returns on both longs and shorts
_ccl	cumulative long returns starting on crash (1 July 2008)
_ccs	cumulative short returns starting on crash (1 July 2008)
_ccb	cumulative long and short returns starting on crash (1 July 2008)
_cpl	cumulative long returns starting postcrash (1 April 2009)
_cps	cumulative short returns starting postcrash (1 April 2009)
_cpb	cumulative long and short returns starting postcrash (1 April 2009)
_dl	difference between longs and equally weighted index
_ds	difference between shorts and equally weighted index

Table 22: Prefixes on series

This is followed by an underscore and a code which identifies the specific strategy that series pertains to. For example,

_5d10q7d	Percentile ranking method (5 day prior returns, 7 day holding period, 10% percentiles)
_7d10q5d_next	Percentile ranking method (7 day prior returns, 5 day holding period, 10% percentiles using next day implementation)
_5d_50ma	The 50 day moving average rule, held for 5 days
_5d_50x100ma	The moving average crossover rule, using a 50 day and a 100 day moving average held for 5 days
_5d10q_10d20q7d	Percentile ranking method applied twice (10% percentiles on 5 day prior returns and 20% percentiles on 10 day prior returns, 7 day holding period)
_6d10q5d_1k	Percentile ranking method (6 day prior returns, 5 day holding period, 10% percentiles) and the kicker rule
_6d10q_11d20q5d_1k	Percentile ranking method applied twice (10% percentiles on 6 day prior returns and 20% percentiles on 11 day prior returns, 5 day holding period) and the kicker rule
_5d10q5d_1k_50ma	Percentile ranking method (10% percentiles on 5 day prior returns, 5 day holding period), the 50 day moving average rule and the kicker rule

Table 23: Examples of codes for strategies