Momentum in the UK Stock Market

by

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Abstract

This paper investigates the presence of abnormal returns through the use of trading strategies that exploit the predictability of short run stock price movements. Based on historical returns of the largest set of individual securities in the UK stock market examined to date, this paper identifies profitable momentum trading strategies as investment tools over the period 1955-96. Our results show that returns on trading strategies cannot be accounted for by a simple adjustment for beta-risk. Although we find evidence of size effect in the UK stock market, this phenomenon cannot explain the momentum profits. However the paper finds that these profitable investment strategies are only apparent in the sub-sample 1977-96, and are not present in the earlier 1955-76 period. The implication is that momentum is not a general feature of the UK stock market, but is only apparent over certain time periods.

JEL Classification
Keywords: Momentum strategies, Contrarian Strategies

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1. Introduction

Recently there has been much work on the profitability of trading strategies in stock markets. This work stands in stark contrast to the previously well-accepted doctrine of the efficient markets hypothesis. Under the null hypothesis of weak-form market efficiency, the performance of portfolios of stocks should be independent of past returns. However empirical research has shown that asset returns tend to exhibit some form of positive autocorrelation in the short to medium term; but mean-revert over longer horizons. There are two prevalent types of trading methodologies used to take advantage of serial correlation in stock price returns: momentum trading and contrarian strategies. At one end of the spectrum, momentum strategies rely on short-run positive autocorrelation in returns and generates abnormal profits by buying past winners and selling past losers. Liu, Strong and Xu (1999) report on the profitability of momentum strategies in the UK over the period 1977-96. In contrast contrarian strategies are based on negative serial correlation in stock prices such that selling winners and buying losers generates abnormal profits.

The current paper assesses the profitability of momentum strategies on the UK stock market using the most comprehensive set of data available to date. This is important since any rejection of the efficient markets hypothesis, may be a consequence of short span of data, and raises the question as to whether the documented rejection of the efficient markets hypothesis is a property of the sample or whether it is a more detailed empirical regularity. In fact Liu, Strong and Xu (1999) argue that their momentum results are robust across two sub-samples in their dataset . However we find that extending the data on UK returns back to 1955, the momentum effects apparent from 1977 onwards do not exist in the earlier period 1955-76. The next section presents an overview of both the theoretical and empirical literature on serial correlation in stock prices. Section III describes the data set in detail, Section IV covers the methodology and safeguards applied to this study, Section V presents the empirical results, Section VI explores the empirical findings after controlling for risk. Section VII further examines the effect of size on the empirical results, and

Section VIII holds the conclusion to the overall findings of this paper.

2. Literature Review

In recent years, there has been a surge of articles on the predictability of asset returns based on historical returns. DeBondt and Thaler (1985, 1987) identified long run return reversals; which suggest that contrarian strategies of selling past winners and buying past losers generates abnormal returns.[1] Other papers [Fama and French (1988), Lo and MacKinlay (1988), Porterba and Summers (1988) and Jagadeesh (1990)] also documented evidence of negative serial correlation in long horizon stock returns, but positive correlation at shorter intervals[2]. Positive autocorrelation at short-time intervals suggests that momentum strategies might yield profitable trading opportunities. Jegadeesh and Titman (1993, 1995) document significant positive returns when stocks are bought and sold based on short-run historical returns. Firms with higher returns over the past 3- to 12- months subsequently outperform firms with lower returns over the same period. Using data from the NYSE and stocks listed on the American Stock Exchange (AMEX) from 1965 to 1989, they ranked stocks in an ascending order based on their past 3- to 12- month returns. Based on this ranking, ten equally-weighted deciles of stock portfolios are formed. The top decile is classified as the 'loser' decile and the bottom decile is known as the 'winner' decile. In each overlapping period, the strategy was to buy the winner decile and sell the loser decile with holding periods of 3- to 12- months. Abnormal returns were documented with this trading strategy; however, the profits generated in the first year after portfolio formation dissipates in the following two years. In addition Grinblatt and Titman's (1989) paper indicated the success of mutual funds which use momentum strategies as an investment tool for selecting stocks. Grundy and Martin (1998), use the Fama-French three factor risk-adjusted returns model to document profitability of

[1] For the UK Power, Lonie and Lonie (1991), MacDonald and Power (1991), and Dissanaike (1997) find that contrarian strategies based on monthly returns of UK companies yield abnormal profits. Though Clare and Thomas (1995) using randomly selected UK annual returns data from the period of 1955 to 1990 conclude that the documented overreaction was a manifestation of small firm effect.

[2] These findings are contentious, and a number of arguments have been suggested that would reduce the profitability from exploiting these contrarian patterns: risk [Chan (1988), Ball and Kothari (1989), Fama and French (1996)], size effects [Zarowin (1990)], microstructure effects [Kaul and Nimalendran (1990), Lo and Mackinlay (1990)].

more than 1.3 percent per month using momentum strategies on NYSE and AMEX stocks over the period 1966 to 1995. Moskowitz and Grinblatt (1999) document strong momentum effect across industries. When stocks from past winning industries are bought and stocks from past losing industries sold, the strategy appears to be highly profitable, even after controlling for cross-sectional dispersion in mean returns and likely microstructure differences. Conrad and Kaul (1998) in a study on NYSE and AMEX securities between the period of 1926 to 1989 document the success of contrarian strategies at long horizons and momentum trading strategies at medium horizons. Chan, Jegadeesh and Lakonishok (1996) find that momentum effects are distinct from post-earnings announcement drift.

The momentum anomaly is not confined to the US. Rouwenhourst (1998) tested the profitability of momentum strategies in international equity markets. Monthly total returns from 12 European countries during the period 1980 to 1995 are used to form relative strength portfolios. After correcting for risk, it was found that winner portfolios outperform loser portfolios by more than 1 percent per month and the overall returns all momentum portfolios are significantly correlated to findings for the US market by Jegadeesh and Titman (1993). Using monthly returns from stock indices of 16 countries for the period of 1970 to 1995, Richards (1997) find that the momentum effect is strongest at the 6-month horizon with an annual excess return of 3.4 percent. For horizons longer than one year, ranking period losers begin to outperform winners with an average annualised excess returns of more than 5.8 percent. A recent paper by Liu, Strong and Xu (1999) show the presence of momentum profits using weekly UK stock prices over the period of January 1977 to December 1996. Controlling for systematic risk, size, price, book-to-market ratio, or cash earnings-to-price ratio did not eliminate momentum profits. They further conclude that the momentum effect is derived from market underreaction to firm-specific information.

It is apparent from the above studies that over short to medium-term (i.e., 3- to 12- month) horizons, momentum strategies are most profitable; while contrarian strategies prove to be more profitable over the very short-term (i.e., 1- to 4- week) and long-term (i.e., 36- to 60- month) horizon.

While most of the empirical works point to some level of predictability in stock returns, there is widespread disagreement about the underlying explanation for this type of predictability. A number of theoretical models of investor behaviour have been proposed to explain these serial correlation properties in stock prices. Daniel, Hirshleifer and Subrahmanyam (1998) base their theory on investor *overconfidence*, and changes in confidence arising from *biased self-attribution*. DeLong et al. (1990) and Jegadeesh and Titman (1993) point out that positive feedback traders tend to force prices of equities to overreact and move away from their long-run values temporarily as these "trend-chasers" reinforce stock price movements even in the absence of fundamental information. Baberis, Shleifer and Vishny (1998) present a model consisting of a representative investor who believes that earnings tend to move between two different "states" or "regimes" (i.e., earnings either mean-revert or trend); even as earnings follow a random walk in the model. Berk, Green, and Naik (1999) suggest that when firms exploit advantageous investment opportunities, they tend to change their non-systematic risks in a predictable manner, which will generate predictable patterns in returns. Hong and Stein (1999) propose a model which focuses on externalities that result from interactions between heterogeneous agents rather than the psychology of the representative agent. In a follow up paper Hong, Lim and Stein (2000), test this model and conclude that firm size and residual analyst coverage play an important role in determining profitability in momentum strategies.

3. Methodology and Data

The aim of this paper is to test the null hypothesis of weak form stock market efficiency that states that time series returns are independent over any time horizon. That is, when returns are defined over short intervals, they are serially independent under the Efficient Market Hypothesis (EMH). To the extent that the null hypothesis is rejected, returns observed over different time intervals will display some form of serial correlation or predictability based on the prescribed set of trading strategies. Portfolios are formed on the basis of past returns. The top batch of the ranked and sorted stocks is labelled as the 'loser' portfolio and the bottom 'winner' portfolio. Momentum strategies form portfolios on the basis of past short-run returns, by buying winner portfolios and selling loser portfolios.

We test the empirical implications of forming winner-loser portfolios in the UK market which involve the simultaneous sale of loser stocks and the purchase of winner stocks; hence resulting in zero net investment. The efficiency market hypothesis predicts that these winner-loser portfolios will yield zero profits. However if asset prices exhibit mean-reversion or overreaction, the winner-loser portfolios will generate profits over some horizons in the sample period.

The test for the profitability of momentum trading strategies in the paper will be based on the methodology used by DeBondt and Thaler (1985, 1987) and Jegadeesh and Titman (1993)[3]. These papers assess the profitability of *JxK* trading strategies, where securities are assigned to portfolios according to a ranking in period *t* based on the previous *J* months' returns. In month *t*, we form a winner-loser portfolio, where an investor goes short on the loser portfolio and takes on a long position on the winner portfolio for the following *K* month horizon. Thus, based on *J* months of historical data, portfolios are held on for horizon of *K* months after being executed in month *t*. Jegadeesh and Titman (1993) classify the top decile of performing stocks as winners and the bottom decile as losers. Of course different definitions of winners and losers may actually produce significantly different results. We follow the Jegadeesh and Titman (1993) and Liu, Strong and Xu (1999) methodology of decile portfolios.

This paper examines a large sample of historical returns from January 1955 to December 1996 of all companies on the London Business School London Share Price Database (LSPD) tape. This tape consists of all companies quoted on the London Stock Exchange since 1975. For the period before 1975 the file is made up of a number of different samples. As well as a random sample of 33% of the companies quoted on the Exchange between 1955 and 1974, there are 33% of new issues in each year 1955-74. The tape also includes the 500 largest companies by market value in January 1955, and the 200 largest in December 1972, plus all 100 companies in the brewing industry. There are a total of 1,571 securities in the sample starting in January

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[3] This study will be based on log returns instead of raw returns. Conrad and Kaul (1993) and Ball et al. (1995) point out that results documented by DeBondt and Thaler (1985, 1987), Chan (1988), Ball and Kothari (1989), and Chopra et al. (1992), suffer from measurement errors as raw returns were used in

1955, and as securities enter and leave the Exchange over the next 40 years, there are over 6,600 securities in total over the entire sample period. Portfolios will be formed based on historical share price performance and the monthly stock returns data are also taken from the LSPD tapes.[4]

For every stock *i* on the LSPD tape without any missing values between test intervals, an equally weighted portfolio of losers and winners are formed based on cumulative monthly returns. The procedure is repeated up to 64 times (i.e., once for each *J x K* trading strategy) using non-overlapping observations starting January 1955 to December 1996.

Securities are selected based on their returns over the past 3 to 24 months. Holding periods examined will also vary from 3 to 24 months. The trading strategy consists of three basic steps. First, individual stocks are ranked according to Cumulative Continuous Returns (CCR) for each stock *i* on past *J* months of continuously compounded monthly returns in the initial portfolio formation period.

$$CCR_i = \sum_{t=-1}^{-J} R_{it}$$

where

$$R_{it} = \log_e [(P_{it} + D_{it}) / P_{t-1}]$$

where R_{it} is the log-return in month t for company i, P_t is the last traded price in month t, D_t is the dividend declared ex-dividend during month t, and P_{t-1} is the last traded price in month $t-1$. The continuously compounded monthly LSPD returns are assumed to be temporally independently and identically distributed (IID): returns are assumed to be normally distributed, identically distributed over time, and independent over

estimating portfolio performance.

[4] Ariel (1987) documents higher returns on days immediately before and after the first half of calendar months from 1963 through 1981 in the US market; however, this should not affect the findings of this paper as profits are calculated based on strategies where the closing price on the last day of month are consistently used as a reference point throughout the test period.

time, although conceivably cross-sectionally correlated.

Second, in each month *t*, the entire series of securities at that date is divided into ten equal deciles in ascending order based on CCR_is. Securities are assigned in equal numbers to each of the ten portfolios. The top decile (decile 1) is designated the 'loser' portfolio and the bottom decile (decile 10) 'winner' portfolio. In month *t*, we form a winner-loser portfolio whereby an investor goes short on the loser portfolio and takes on a long position on the winner portfolio.

The profits of the above strategies are calculated for the returns on buy-and-hold returns for both the winner and loser portfolios. The trading strategies are replicated for each stated period and the mean returns for each horizon is simply the average of all the replications.

The final step of the trading rule is to determine the profits of a winner minus loser portfolio ($\overline{R}_{winner-loser}$) where the mean monthly returns from past loser portfolios ($\overline{R}_{loser}$) are subtracted from mean monthly returns of past winner portfolios ($\overline{R}_{winner}$):

$$\overline{R}_{winner-loser} = \overline{R}_{winner} - \overline{R}_{loser}$$

Under the null hypothesis of weak form market efficiency, the EMH would predict that the average returns on the winner-loser portfolio is zero.[5] If the returns on these arbitrage portfolios ($\overline{R}_{winner-loser}$) are significantly different from zero, we can reject the weak form of the EMH; assuming that transaction costs do not influence $\overline{R}_{winner-loser}$. A significant and positive value for $\overline{R}_{winner-loser}$ would support the findings of previous empirical work carried out in the US and UK. In other words, the

[5] The winner-loser portfolio test statistic is:

$$\frac{\mu_{winner} - \mu_{loser}}{\sqrt{\dfrac{\sigma^2_{winner}}{N_{winner}} + \dfrac{\sigma^2_{loser}}{N_{loser}}}}$$

where μ_{winner} is the mean monthly return on winner portfolio, σ^2_{winner} the variance of winner portfolio, N_{winner} the number of observations in the winner portfolio, μ_{loser} the mean monthly return on loser portfolio, σ^2_{loser} the variance of winner portfolio, N_{loser} the number of observations in the winner portfolio.

null hypothesis of market efficiency is tested against the alternate hypothesis of the predictability of stock prices based on past returns. That is, if the momentum strategy is profitable, past winners should outperform past losers:

$$\overline{R}_{winner} - \overline{R}_{loser} > 0$$

The profits on these arbitrage portfolios are returns generated from going long and short one dollar in winners and losers, respectively (i.e., the difference in returns on winner and loser portfolios). If there are evidence of momentum in the stock market, the winner-loser portfolios will generate significant abnormal profits. The payoff generated by buying the winner stocks and selling the loser stocks is equivalent to the excess return of a zero cost portfolio with an initial net investment of zero.

4. Potential Problems and Safeguards

The investment horizons considered span between 3 months to 24 months. As such, only the direct difference of winner-loser portfolio returns will be reported instead of abnormal returns for each portfolio. This is because of the sensitivity of abnormal returns to the performance benchmark used over long horizons, as highlighted by Dimson and Marsh (1986). Kothari and Warner (1997) also point out that tests for long-horizon abnormal returns around firm-specific events are severely misspecified. In addition the methodology of carrying out a portfolio-to-portfolio comparison is conceptually akin to the control firm-to-firm approach suggested by Barber and Lyon (1997) to help correct misspecified abnormal returns based test statistics.

Since we use LSPD returns for this study, the monthly returns are computed from the last traded price in any month, and we acknowledge that the use of transactions prices potentially induces bid-ask bounce effects in our data. Serial correlation can be induced by bid-ask spread effects when the last price of the ranking period is also the first price of the post-ranking period. To overcome the potential bid-ask bounce effects and seasonality effects, Liu, Strong and Xu (1999) used monthly returns computed from weekly Datastream price quotes for their empirical investigation. The

Liu, Strong and Xu (1999) study uses data from 4,182 UK companies available from Datastream for the period January 1976 to December 1996 with 3-month to 12-month test intervals. Our test is more robust as we use a total of 6,600 securities from the LSPD tapes for period January 1955 to 1996 with test intervals of 3-month to 24-month trading strategies. In fact he bid-ask bounce effect is likely to overstate contrarian profits, but understate momentum returns. Since the bid-ask bounce effect is likely to be more pronounced for illiquid smaller companies, in our sample value-weighted decile portfolios could be constructed to help minimise the possible bid-ask bounce effects. We will checkout the role of firm size in the computation of momentum profits.

Another issue is the importance of transactions costs. Some of the trading strategies implied by our winner-loser portfolios can be transaction intensive, especially with overlapping test periods where up to an average of 300 transactions take place in a week. Naturally, it is possible to modify the strategy to reduce the frequency of trading (i.e., by random selection of *N* percent of stocks from each decile or, do so by further dividing the top and bottom deciles into sub-deciles for investment purposes). Also, institutional traders can often secure substantial trade discounts relative to individual retail investors. Second, stocks with smaller market capitalisation are more likely to be traded at a wider bid-ask spread compared to firms with larger market capitalisation. Third, it is possible to reduce overall transaction costs substantially with the use of options to achieve the same level of exposure. However, the aim of this paper is not to search for low transaction cost versions of trading strategies but rather, to identify stock price reversals and momentum in the UK market within a reasonable framework. As such, portfolio profits in this study are made under non-specific transaction cost assumptions.

The tests are performed on portfolio returns computed over non-overlapping time periods. The drawback of conducting such non-overlapping tests for long horizons is that first, there is an inevitable loss of information, and second, there is a chance that economic cycle may be a major component in determining the outcome of contrarian and momentum strategies due to the limited data range. However, Smith and Yadav (1996) conclude that for explanatory variables with serial correlation, General Method of Moments (GMM) estimators perform worst than non-overlapping regressions in producing standard errors (i.e., generating empirical size probabilities above that of their respective theoretical values). To test the robustness of the results, the data is truncated into two sub-periods.

5. Empirical Findings

This section evaluates the profitability of momentum investment strategies described in the previous section. The strategies were applied to all securities with non-missing returns listed on the London Stock Exchange between January 1955 and December 1996.

5.1. Non-Overlapping Observations (January 1955 to December 1996)

Table I gives a detailed breakdown of returns based on non-overlapping observations from January 1955 to December 1996 with a *J* lag-holding period where the *J* lags range from 3-month to 24-months in three month intervals. The table then reports profitability of each of the *J* strategies over the following *K* horizons where the *K* horizons also range from 3-month to 24-month. In fact there are 8 reported lags and 8 horizons in total (i.e., 3, 6, 9, 12, 15, 18, 21, 24-month intervals for every *J* x *K* strategy). For each of these 64 strategies a total of eight summary statistics are shown: the loser portfolio mean monthly return, loser portfolio monthly standard deviation, number of observations for the loser portfolio, winner portfolio mean monthly return, winner portfolio monthly standard deviation, number of observations for the winner portfolio, winner-loser portfolio mean monthly return, and test statistic for the winner-loser portfolio (see footnote 5).

<Table I>

Most of the average returns for winner minus loser portfolios for the 64 strategies in Table I are positive and statistically significant. The results show a total of 24 trading strategies that are positive and statistically significant at the level of at least 90 percent. The most profitable strategy is the 12 x 6 momentum strategy with a winner-loser portfolio that earns an annualised return of 16.2 percent. This outcome is consistent with results of overlapping test periods of Jegadeesh and Titman (1993) and non-overlapping test intervals by Liu, Strong and Xu (1999). For multiple tests of the efficient markets hypothesis, the Bonferroni method is used to guard against the eventuality of non-independent *k* tests. Even with an adjusted critical value at 3.29, the 12 x 6 strategy stays significant at a level of 99.95 percent. In fact a total of 10 strategies remain significant at the new higher critical value. Note that the 3x3 strategy actually yield significant negative returns implying that in the very short run a contrarian strategy would be profitable. Also at the other end of the trading strategy range, for the 24-month ranking period none of the subsequent returns on the winner-loser portfolio are significantly different from zero, and in fact a number of returns are negative. This suggests that over longer periods returns are negatively correlated.

The returns are mostly leptokurtic (more so over the short horizons) and negatively skewed for the entire series with the kurtosis tapering off as the time horizon increases. This is expected as over long horizons, the Central Limit Theorem applies and the returns tend to be closer to the normal distribution. Figure 1 graphs the returns for winner-loser portfolios across investment horizons for all 8 ranking periods.

<Figure 1>

As can be seen from the figure, each of the strategies based on past returns exhibit a peak at around the 6 to 9-month holding period with subsequent returns tailing off to be insignificant, and even negative. We observe a pronounced upward drift in the returns as we progress from a 3-month up to a 12-month ranking period, such that the 12-month ranking period more-or-less dominates all other ranking periods in terms of subsequent investment returns. The drift downwards of longer length ranking periods continues into the negative domain as the lagged past returns periods are lengthened. Of the 24 statistically significant trading strategies, most of them are can be found between the 6- to 12-month investment horizons based on 6-month to 15-month ranking periods. All investment horizons for the winner-loser portfolio beyond 15-months yielded insignificant profits. Notice the returns seem to slip into the negative domain quicker as the ranking period increases. This suggest that momentum strategy is profitable in the short- to medium-time horizon but contrarian trading strategies are more profitable at very short intervals and over the long run as we observe a reversal in stock returns.

5.2. Non-Overlapping Observations (January 1955 to December 1976)

In Table II we report the returns of winner and loser portfolios from non-overlapping observations for the first series of truncated data from January 1955 to December 1996 with a 3-month to 24-month lag-holding period. The table reports profitability of investment strategies over 8 horizons in total (i.e., increment of 3-month intervals for every *J* x *K* strategy).

<Table II>

Results from this truncated series are significantly different from the comprehensive data set. The returns on winner and loser portfolios in this sub-period are mostly positive but insignificant except for the 18x3 trading strategy where the winner-loser portfolio yield an average annualised return of 13.8 percent. Apart from this momentum strategy the only other statistically significant winner-loser portfolios was the 3x3 and 3x6 contrarian trading strategies which yielded an annualised profit of 14.04 percent.

<Figure 2>

Figure 2 plots the holding period returns for each of the 8 strategies for the first sub-period. In contrast to figure 1 it can be seen that the pattern of returns is much flatter, though again their is a tendency for negative returns for longer ranking periods, and a longer holding periods. Only the 18x3 strategy breaks through the 0.005 per cent barrier, in contrast to figure 1 where 10 strategies did so.

5.3. Non-Overlapping Observations (January 1977 to December 1996)

Table III reports the returns for strategies based on non-overlapping observations from for the second series of truncated data from January 1977 to December 1996 with a 3-month to 24-month lag-holding period. The table again reports profitability of the strategies over 8 horizons in total.

<Table III>

The results presented in Table III and plotted in figure 3 are notably different from those in Table II. All profits from winner-loser strategies formed from a 3-month ranking period are positive and significant. The 6 to 18-month strategies yield positive returns over all return horizons and up to a 12-month horizon are typically significant. There is a downward drift to returns on the winner-loser portfolio as the investment horizon increases, but it is only for the 21 month and 24 month ranking period strategies that there is any negative returns, and only at long investment horizons. The evidence on profitable very short-term contrarian strategies has also disappeared. Almost half of the strategies yield significant positive returns, and break though the 0.005 barrier. The 18x3 strategy is the most profitable yielding an average return of 23.6 percent, though this seems slightly anomalous. A more general pattern seems to be that returns increase at short investment horizons as we move from the 3-month up to the 9-month raking periods, and thereafter start to fall off, though still yielding positive and significant returns. The evidence in this table are most closely comparable with the Liu, Strong and Xu (1999) dataset.

<Figure 3>

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6. Empirical Findings After Controlling for Risk

We know that riskier investments generally yield higher returns than investments that are free of risk, so that the fact that the results from the previous section have shown that returns on winner portfolios dominate returns on loser portfolios may be because the securities in the winner portfolio are riskier. With the use of Capital Asset Pricing Model (CAPM), we are able to quantify of the trade-off between risk and expected return.

With the market portfolio as exogenous and conditional on the realised return of individual assets, the CAPM model offers a testable prediction of betas. Thus, to investigate whether time varying risk beta risk explains the phenomenon observed, the Ordinary Least Squares (OLS) estimator of the slope coefficient in the market model is used to estimate the respective portfolio betas[6] :

$$R_{it} = \alpha_i + \beta_{im} R_{mt} + e_{it}$$

where R_{it} is the realised of portfolio i at time t, R_{mt} is the realised return of the market portfolio[7] at time t and e_{it} is the zero mean disturbance term. We use this regression method to obtain the beta of each of the respective decile portfolios. Rather than report the results for all 64 trading strategies, we concentrate on the symmetric strategies 3x3, 6x6 etc. The t-statistics is the table are based on the null hypothesis of a unity beta for the market portfolio instead rather than zero.

<Table IV>

<Figure 4>

Table IV shows that portfolio betas of extreme portfolios (both winner and loser) peak across the board for all trading strategies: the t-statistic however, show that the mid-range betas are statistically more significantly different from unity than compared to that of extreme winner and loser deciles. There is a tendency for the betas of the loser portfolios to be slightly higher than the betas for the winner portfolios. In the final row of the table we report the results of a t-test on the difference in the betas of the winner and loser portfolios: the evidence is inconclusive that the betas of winner deciles are larger (or riskier) than that of loser deciles.

<Table V>

<Figure 5>

We repeat the test on the values of the decile portfolio betas for each of the two sub-periods. Results from Table V relate to the first sub-period, January 1955 to December 1976, are similar to figures presented in Table IV. Table V shows that

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[6] This is based on the Sharpe-Lintner capital asset pricing model (CAPM) excess-return market model: $(R_{it} - R_f) = \alpha_{im} + \beta_{im}(R_{mt} - R_f) + e_{it}$. The intercept term α_i is transposed as $[\alpha_{im} - R_f(\beta_{im} - 1)]$ instead of the prevalent Jensen performance index.

[7] We use the mean equally-weighted returns of all securities listed on the London Stock Exchange as a broad-based benchmark for the market portfolio.

again the betas of the extreme portfolio peak across the board for all trading strategies, with a tendency for the winner portfolios to have slightly higher betas. However the t-statistic on the difference between the betas of the winner and loser portfolios reported in the last row of Table V indicate an insignificant difference.

<Table VI>

<Figure 6>

Table VI and Figure 6 reports the results of the beta regressions for the second sub-period January 1977 to December 1996, and in this case the betas of the winner portfolios are less than the betas of the loser decile. Again though the differences are insignificant.

The above result confirms that returns on trading strategies cannot be accounted for by a simple adjustment for beta-risk, because the Winner and Loser portfolios generated cognate beta estimations. These beta values suggest that the returns from trading strategies exploiting both positive and negative serial correlation cannot be easily explained by simple beta risk. We document momentum in the UK stock market, even after attempting to control for risk.

7. Empirical Findings After Controlling for Size

Market capitalisation (size) is defined as the current share price multiplied by the number of common shares outstanding. Banz (1981) was one of the first to note that firms with lower market capitalisation (small firms) tend have higher sample mean returns. DeBondt and Thaler (1987) aruge that the winner-loser phenomena is primary not size effect; however, their finding show that on average, winners are twice as large as losers.[8] Zarowin (1990) also find that losers are usually smaller than winners based on 3-year sample periods. Fama and French (1992) further demonstrate the small firm effect with findings of smaller firms generating higher returns than larger firms do. Berk (1997) attributes the higher returns of smaller firms to higher discount rates - because smaller firms are generally riskier than larger firms, their

[8] No statistical test was performed to verify the equality of size between these two groups by DeBondt and Thaler in their paper.

higher discount rates yield higher average returns over long time periods.

We examine the effect of size on returns in this paper by comparing the difference in market capitalisation between winners and losers. We concentrate on the second sub-period of the full sample, since it was over this period that the momentum profits were most significant. As before, we rank all British registered companies quoted on the London Stock Exchange since January 1977 based on their 3-month to 24-month historical returns. The stocks are then sorted into ten equally-weighted deciles in ascending order; that is, the top decile (decile 1) consolidates as the loser portfolio and the bottom decile (decile 10) is the winner portfolio. The unique company identification number of each company is then matched with the LSPD market capitalisation file to obtain the respective market values,[9] and the market capitalisation of each decile is computed by averaging the cumulative total of the decile portfolio. To be included in this investigation, a firm must have non-missing values in both the LSPD returns and market capitalisation files.

<Table VII>

<Figure 7>

Table VIII shows results obtained by using unadjusted rates of market capitalisation for the period of January 1977 to December 1996. It can be seen that the average size of a security in each decile rises as we move from the loser decile up to decile number seven, however in the last three deciles, the small size effect is present in and average market capitalisation falls as we move to the winner decile.. The market capitalisation of loser portfolios is smaller than that of winner portfolios across the board. The result of statistical test performed to test the equality between these two groups is shown in parenthesis in the last row of Table VII. Our finding in this section is identical to evidence presented by Liu, Strong and Xu (2000) where market capitalisation peaks around the mid-range deciles with loser portfolios smaller

[9] Zarowin (1990) and Fama and French (1992) also perform tests on the effect of size on past period performance on returns. Their method ranks stocks based on size first before sorting them into loser and winner deciles within the individual size decile. Our investigation on the other hand, involves the ranking of stocks by returns followed by the analysis of size for the individual winner and loser decile. However, we follow DeBondt and Thaler (1985) and Zarowin (1990) procedure of dropping a firm

than winner portfolios. However, it is crucial to note that we can attribute the size phenomenon to abnormal profits only if losers (winners) are *consistently* larger or smaller than winners (losers) in periods when they outperform each other. While it is true that losers have a tendency to be smaller than winners, only 2 out of 8 test periods are statistically significant when tested for equality between these groups. Moreover, statistically significant momentum profits are only present in holding periods of 3 to 6 months. Consequently, the difference in size between loser and winner portfolios cannot explain momentum profits.

<Table VIII>

<Figure 8>

Table VIII demonstrates that the size test holds results to the inflation-adjusted market capitalisation with 1977 as the base year. The result acquired with adjusted rate of market capitalisation is identical to that of the unadjusted rate. Loser portfolios are smaller than winner portfolios across the entire test period. Again we observe that losers have a tendency to be smaller than winners. However, only 3 out of 8 test periods are statistically significant when tested for equality between these groups. Once more, we find some evidence of size effect in the UK stock market; nonetheless, this phenomenon can neither contribute to nor explain momentum and contrarian profits.

9. Conclusions

This paper has tested the profitability of momentum trading strategies in the UK stock market. It did so by examining profits generated by extreme decile portfolios formed on historical returns. Overall, returns from winner minus loser portfolios are positive and significant over practically all investment horizons up to 24 months after the portfolio formation. There is strong evidence of momentum effect over the short- to medium-term horizons, where an investor takes on a long position on winner portfolio and sells the loser portfolio.

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from the test sample once a missing return is detected.

The defining feature of the random walk in stock prices is that successive changes are uncorrelated, and deviations from this characteristic essentially imply that the market is not necessarily efficient. However when we split our sample into two sub-periods from 1955-76 and 1977-96, we found that although the momentum strategy was profitable over the latter period, there was little evidence of momentum profits over the earlier period. Hence the profitability of momentum strategies over the entire sample is due to the high profitability of strategies over the latter half of the sample. This is an important result, because it indicates that positive serial correlation in UK stock prices is not a general feature of the whole sample, but is only confined to sub-samples. One possible reason for this result could be due to the less volatile pre-1976 market as reported by earlier studies on random walk models for stock prices.

We have also investigated the notion that winner portfolios were probably riskier than loser portfolios, thus accounting for their superior returns. Our results show that returns on trading strategies cannot be accounted for by a simple adjustment for beta-risk. We find evidence of size effect in the UK stock market; however, this phenomenon can neither contribute to nor explain momentum and contrarian profits.

In conclusion our results confirm the presence of momentum in the UK market over the period entire 1955-96, but we note the strong caveat that most of these profits were generated over the second half of the sample, with the implication that momentum was not a general feature of the UK stock market over this whole period.

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TABLE I
MONTHLY RETURNS ON NON-OVERLAPPING PORTFOLIO STRATEGIES BY TIME HORIZON
(JANUARY 1955 TO DECEMBER 1996)

Stocks are sorted and ranked in ascending order based on their respective *J*-month lagged returns. Stocks are further divided into ten equally weighted deciles. The top decile is the 'loser' portfolio and the bottom decile 'winner' portfolio. In month *t*, the strategy goes short on the loser portfolio and long on the winner portfolio. Thus, based on *J*-months of historical data, portfolios are held on for period of *K*-months and executed in month *t*. Buy-and-hold returns are computed for both the winner and loser portfolios.

J-MONTH PAST RETURNS		***K-MONTH HOLDING PERIOD***							
		3	**6**	**9**	**12**	**15**	**18**	**21**	**24**
3	**Loser Portfolio**	**0.010855**	**0.007095**	**0.005808**	**0.005659**	**0.006458**	**0.007177**	**0.007771**	**0.007809**
	Standard Deviation	0.16212	0.15551	0.15244	0.15321	0.15365	0.15178	0.14989	0.14919
	Number of Observations	29578	28578	27604	26652	25812	24933	24179	22630
	Winner Portfolio	**0.006575**	**0.008734**	**0.009717**	**0.010512**	**0.010008**	**0.009659**	**0.009536**	**0.0098**
	Standard Deviation	0.13662	0.13434	0.13415	0.13473	0.13455	0.13585	0.13441	0.13394
	Number of Observations	28530	27535	26732	26013	25321	24685	24055	22744
	Winner-Loser Portfolio[a]	**-0.00428**	**0.001639**	**0.003908**	**0.004853**	**0.00355**	**0.002482**	**0.001765**	**0.001991**
	Test Statistic[b]	**-3.44†**	**1.315**	**3.098†**	**3.792†**	**2.751†**	**1.897>**	**1.346**	**1.482**
6	**Loser Portfolio**	**0.007999**	**0.004404**	**0.004231**	**0.004631**	**0.005644**	**0.006398**	**0.007139**	**0.007357**
	Standard Deviation	0.16862	0.16067	0.15652	0.15807	0.15625	0.1556	0.1534	0.15299
	Number of Observations	14524	13906	13511	12952	12591	12064	11759	11269
	Winner Portfolio	**0.011329**	**0.011344**	**0.012305**	**0.011654**	**0.011088**	**0.010368**	**0.010556**	**0.010257**
	Standard Deviation	0.13375	0.13139	0.13458	0.13225	0.1336	0.1346	0.13307	0.13343
	Number of Observations	14085	13523	13255	12805	12580	12183	11959	11539
	Winner-Loser Portfolio	**0.003329**	**0.00694**	**0.008074**	**0.007023**	**0.005444**	**0.003969**	**0.003417**	**0.0029**
	Test Statistic	**1.881>**	**3.917†**	**4.47†**	**3.854†**	**2.953†**	**2.12***	**1.8>**	**1.531**
9	**Loser Portfolio**	**0.004286**	**0.002706**	**0.003782**	**0.004303**	**0.004952**	**0.00654**	**0.006875**	**0.007325**
	Standard Deviation	0.17132	0.16205	0.15984	0.16169	0.16017	0.15657	0.1576	0.15312
	Number of Observations	9316	9036	8755	8288	8089	7868	7501	7305
	Winner Portfolio	**0.010683**	**0.012223**	**0.012188**	**0.011753**	**0.010263**	**0.010224**	**0.01007**	**0.009415**
	Standard Deviation	0.13202	0.12615	0.13029	0.13616	0.13446	0.13394	0.1367	0.13665
	Number of Observations	9126	8925	8782	8421	8288	8150	7827	7683
	Winner-Loser Portfolio	**0.006397**	**0.009518**	**0.008405**	**0.007449**	**0.00531**	**0.003683**	**0.003195**	**0.00209**
	Test Statistic	**2.904†**	**4.4†**	**3.801†**	**3.238†**	**2.308†**	**1.598**	**1.358**	**0.886**
12	**Loser Portfolio**	**0.015929**	**0.001601**	**-4.8E-05**	**0.004617**	**0.007754**	**0.006158**	**0.005862**	**0.007992**
	Standard Deviation	0.16857	0.16431	0.15954	0.15626	0.15291	0.15493	0.15424	0.15241
	Number of Observations	6889	6680	6459	6092	5915	5736	5595	5299
	Winner Portfolio	**0.024624**	**0.01418**	**0.009957**	**0.011893**	**0.013213**	**0.010556**	**0.009071**	**0.009881**
	Standard Deviation	0.12651	0.12545	0.13155	0.12923	0.12903	0.13167	0.13244	0.12979
	Number of Observations	6797	6632	6515	6222	6115	6000	5906	5629
	Winner-Loser Portfolio	**0.008695**	**0.012579**	**0.010005**	**0.007276**	**0.005459**	**0.004399**	**0.00321**	**0.001889**
	Test Statistic	**3.447†**	**5.005†**	**3.864†**	**2.767†**	**2.068†**	**1.649>**	**1.201**	**0.701**
15	**Loser Portfolio**	**-0.00211**	**-0.00158**	**0.001334**	**0.002872**	**0.006297**	**0.005721**	**0.006396**	**0.007108**
	Standard Deviation	0.18065	0.16586	0.16201	0.16429	0.16225	0.15777	0.15347	0.15145
	Number of Observations	5520	5155	4995	4842	4694	4562	4297	4166

J-MONTH PAST RETURNS		*K-MONTH HOLDING PERIOD*							
		3	**6**	**9**	**12**	**15**	**18**	**21**	**24**
	Winner Portfolio	**0.004555**	**0.004876**	**0.007215**	**0.008756**	**0.009888**	**0.00847**	**0.00738**	**0.007387**
	Standard Deviation	0.13399	0.13492	0.13263	0.13654	0.13452	0.13307	0.13156	0.13084
	Number of Observations	5471	5186	5115	5031	4937	4843	4575	4500
	Winner-Loser Portfolio	**0.006665**	**0.006452**	**0.00588**	**0.005884**	**0.00359**	**0.002749**	**0.000983**	**0.000279**
	Test Statistic	**2.314***	**2.194***	**1.995***	**1.953>**	**1.196**	**0.92**	**0.325**	**0.092**
18	**Loser Portfolio**	**0.00947**	**0.008257**	**0.009997**	**0.008203**	**0.007521**	**0.00831**	**0.009295**	**0.009741**
	Standard Deviation	0.16901	0.1584	0.1547	0.16074	0.158	0.15863	0.15597	0.14972
	Number of Observations	4389	4256	4108	3830	3736	3640	3532	3414
	Winner Portfolio	**0.016939**	**0.01423**	**0.014068**	**0.012544**	**0.010091**	**0.009073**	**0.009121**	**0.008926**
	Standard Deviation	0.12484	0.11835	0.12715	0.13039	0.13392	0.13391	0.13641	0.13507
	Number of Observations	4359	4272	4219	3956	3910	3838	3778	3712
	Winner-Loser Portfolio	**0.00747**	**0.005973**	**0.004071**	**0.004341**	**0.00257**	**0.000763**	**-0.00017**	**-0.00081**
	Test Statistic	**2.383***	**1.94>**	**1.278**	**1.312**	**0.769**	**0.228**	**-0.05**	**-0.24**
21	**Loser Portfolio**	**0.003773**	**0.00125**	**0.00132**	**0.006628**	**0.007861**	**0.007594**	**0.009102**	**0.009404**
	Standard Deviation	0.1703	0.16487	0.16376	0.16748	0.1526	0.15212	0.14737	0.14426
	Number of Observations	3679	3575	3452	3189	3093	3000	2907	2828
	Winner Portfolio	**0.011318**	**0.008125**	**0.006803**	**0.011126**	**0.009774**	**0.008452**	**0.009213**	**0.008749**
	Standard Deviation	0.11076	0.12163	0.12493	0.12598	0.12261	0.13063	0.13036	0.13037
	Number of Observations	3677	3605	3539	3307	3251	3193	3135	3089
	Winner-Loser Portfolio	**0.007545**	**0.006875**	**0.005483**	**0.004498**	**0.001913**	**0.000858**	**0.000111**	**-0.00065**
	Test Statistic	**2.293***	**2.031***	**1.591**	**1.263**	**0.541**	**0.236**	**0.031**	**-0.18**
24	**Loser Portfolio**	**0.036526**	**0.015561**	**0.013223**	**0.015504**	**0.013819**	**0.010867**	**0.008803**	**0.01051**
	Standard Deviation	0.17083	0.16335	0.15552	0.16025	0.15912	0.15671	0.15904	0.15449
	Number of Observations	3219	3109	3014	2771	2689	2608	2539	2456
	Winner Portfolio	**0.035315**	**0.020914**	**0.016328**	**0.015762**	**0.013609**	**0.010241**	**0.007961**	**0.008804**
	Standard Deviation	0.11703	0.12311	0.12224	0.12176	0.12884	0.13101	0.135	0.13429
	Number of Observations	3222	3168	3109	2879	2831	2777	2745	2706
	Winner-Loser Portfolio	**-0.00121**	**0.005353**	**0.003105**	**0.000258**	**-0.00021**	**-0.00063**	**-0.00084**	**-0.00171**
	Test Statistic	**-0.34**	**1.474**	**0.851**	**0.068**	**-0.05**	**-0.16**	**-0.21**	**-0.43**

[a] The trading strategies are replicated for each stated period and the mean returns shown for each horizon is the log normal average of all non-overlapping replications.
† Significant at the 99% level * Significant at the 95% level > Significant at the 90% level.

TABLE II
MONTHLY RETURNS ON NON-OVERLAPPING PORTFOLIO STRATEGIES BY TIME HORIZON OVER FIRST SUB-PERIOD (JANUARY 1955 TO DECEMBER 1976)

Stocks are sorted and ranked in ascending order based on their respective *J*-month lagged returns. Stocks are further divided into ten equally weighted deciles. The top decile is the 'loser' portfolio and the bottom decile 'winner' portfolio. In month *t*, the strategy goes short on the loser portfolio and long on the winner portfolio. Thus, based on *J*-months of historical data, portfolios are held on for period of *K*-months and executed in month *t*. Buy-and-hold returns are computed for both the winner and loser portfolios.

J-MONTH PAST RETURNS		***K-MONTH HOLDING PERIOD***							
		3	**6**	**9**	**12**	**15**	**18**	**21**	**24**
3	**Loser Portfolio**	**0.014643**	**0.010182**	**0.008505**	**0.007209**	**0.007106**	**0.007218**	**0.007472**	**0.007368**
	Standard Deviation	0.1385	0.13228	0.1282	0.12969	0.13028	0.12827	0.12765	0.12582
	Number of Observations	12842	12412	11971	11517	11091	10657	10271	9962
	Winner Portfolio	**0.002937**	**0.005646**	**0.006986**	**0.008188**	**0.007819**	**0.00764**	**0.007546**	**0.007577**
	Standard Deviation	0.1291	0.12567	0.12418	0.12604	0.12538	0.1243	0.12542	0.12376
	Number of Observations	12357	11841	11407	11012	10621	10234	9851	9523
	Winner-Loser Portfolio[a]	**-0.01171**	**-0.00454**	**-0.00152**	**0.000979**	**0.000713**	**0.000422**	**7.46E-05**	**0.000208**
	Test Statistic[b]	**-6.94†**	**-2.74†**	**-0.92**	**0.575**	**0.411**	**0.242**	**0.042**	**0.116**
6	**Loser Portfolio**	**0.011165**	**0.00891**	**0.006768**	**0.005532**	**0.006003**	**0.005837**	**0.006576**	**0.006194**
	Standard Deviation	0.14438	0.13424	0.13469	0.13362	0.13485	0.13204	0.13276	0.12922
	Number of Observations	6333	6000	5886	5552	5446	5132	5048	4812
	Winner Portfolio	**0.008189**	**0.007967**	**0.009195**	**0.009263**	**0.009213**	**0.008077**	**0.008137**	**0.007436**
	Standard Deviation	0.13063	0.12084	0.12827	0.12585	0.12606	0.12671	0.1266	0.12677
	Number of Observations	6082	5725	5633	5312	5242	4918	4842	4620
	Winner-Loser Portfolio	**-0.00298**	**-0.00094**	**0.002427**	**0.003732**	**0.00321**	**0.00224**	**0.001561**	**0.001242**
	Test Statistic	**-1.2**	**-0.4**	**0.99**	**1.499**	**1.272**	**0.868**	**0.599**	**0.471**
9	**Loser Portfolio**	**-0.00142**	**0.004138**	**0.00511**	**0.002353**	**0.00463**	**0.006079**	**0.005329**	**0.006327**
	Standard Deviation	0.14765	0.13269	0.13349	0.13781	0.13345	0.12873	0.1329	0.12747
	Number of Observations	3973	3897	3815	3514	3459	3404	3224	3166
	Winner Portfolio	**0.000559**	**0.007175**	**0.007864**	**0.007691**	**0.007602**	**0.00773**	**0.006414**	**0.006555**
	Standard Deviation	0.1268	0.12402	0.1273	0.13483	0.12962	0.12537	0.1368	0.13573
	Number of Observations	3842	3774	3726	3431	3376	3325	3118	3059
	Winner-Loser Portfolio	**0.001976**	**0.003037**	**0.002754**	**0.005339**	**0.002972**	**0.001651**	**0.001085**	**0.000228**
	Test Statistic	**0.635**	**1.036**	**0.917**	**1.632**	**0.934**	**0.533**	**0.32**	**0.068**
12	**Loser Portfolio**	**0.013993**	**0.003012**	**0.001836**	**0.004769**	**0.007176**	**0.005729**	**0.005723**	**0.006792**
	Standard Deviation	0.14815	0.13698	0.14035	0.13554	0.13454	0.13247	0.13524	0.12927
	Number of Observations	2947	2884	2817	2561	2506	2457	2414	2238
	Winner Portfolio	**0.018436**	**0.007285**	**0.005512**	**0.009642**	**0.010564**	**0.006951**	**0.005884**	**0.006784**
	Standard Deviation	0.12421	0.11654	0.12648	0.12741	0.12606	0.12607	0.12992	0.12768
	Number of Observations	2870	2805	2769	2484	2440	2404	2373	2191
	Winner-Loser Portfolio	**0.004443**	**0.004273**	**0.003676**	**0.004873**	**0.003388**	**0.001222**	**0.000162**	**-7.7E-06**
	Test Statistic	**1.241**	**1.268**	**1.029**	**1.316**	**0.914**	**0.329**	**0.042**	**-0**
15	**Loser Portfolio**	**0.004338**	**-0.00467**	**0.000738**	**0.003399**	**0.006676**	**0.005864**	**0.00416**	**0.004803**
	Standard Deviation	0.15841	0.14396	0.14426	0.14983	0.14145	0.13275	0.13053	0.12566
	Number of Observations	2416	2354	2091	2049	2015	1985	1947	1780

J-MONTH PAST RETURNS		*K-MONTH HOLDING PERIOD*							
		3	**6**	**9**	**12**	**15**	**18**	**21**	**24**
	Winner Portfolio	**0.000512**	**-0.00349**	**0.004428**	**0.006658**	**0.007838**	**0.006075**	**0.003379**	**0.003764**
	Standard Deviation	0.13103	0.12944	0.13194	0.14442	0.13431	0.12808	0.13063	0.13162
	Number of Observations	2364	2321	2057	2025	1987	1946	1912	1752
	Winner-Loser Portfolio	**-0.00383**	**0.001183**	**0.00369**	**0.003259**	**0.001163**	**0.000211**	**-0.00078**	**-0.00104**
	Test Statistic	**-0.91**	**0.296**	**0.86**	**0.707**	**0.267**	**0.051**	**-0.19**	**-0.24**
18	**Loser Portfolio**	**0.003952**	**0.011908**	**0.0129**	**0.006823**	**0.007173**	**0.008132**	**0.008749**	**0.010207**
	Standard Deviation	0.14765	0.12899	0.12692	0.12756	0.12729	0.12673	0.13422	0.12836
	Number of Observations	1873	1831	1791	1632	1606	1584	1554	1520
	Winner Portfolio	**0.01483**	**0.013526**	**0.012751**	**0.01**	**0.008624**	**0.007514**	**0.007371**	**0.008138**
	Standard Deviation	0.121	0.11614	0.12556	0.12708	0.12835	0.12922	0.13917	0.13509
	Number of Observations	1834	1797	1777	1599	1581	1558	1529	1497
	Winner-Loser Portfolio	**0.010878**	**0.001619**	**-0.00015**	**0.003177**	**0.001451**	**-0.00062**	**-0.00138**	**-0.00207**
	Test Statistic	**2.456***	**0.397**	**-0.04**	**0.709**	**0.32**	**-0.14**	**-0.28**	**-0.43**
21	**Loser Portfolio**	**0.004556**	**0.000736**	**0.002287**	**0.007783**	**0.007954**	**0.008995**	**0.009889**	**0.009999**
	Standard Deviation	0.14225	0.14526	0.13243	0.12062	0.12868	0.13178	0.12964	0.12202
	Number of Observations	1561	1526	1492	1336	1309	1281	1252	1229
	Winner Portfolio	**0.007799**	**0.003722**	**0.005063**	**0.011461**	**0.00925**	**0.007912**	**0.007544**	**0.007211**
	Standard Deviation	0.11185	0.12758	0.1285	0.11986	0.12735	0.13499	0.13321	0.13339
	Number of Observations	1538	1503	1479	1305	1284	1262	1238	1219
	Winner-Loser Portfolio	**0.003244**	**0.002986**	**0.002776**	**0.003677**	**0.001296**	**-0.00108**	**-0.00235**	**-0.00279**
	Test Statistic	**0.706**	**0.601**	**0.58**	**0.786**	**0.258**	**-0.2**	**-0.45**	**-0.54**
24	**Loser Portfolio**	**0.027714**	**0.01057**	**0.014079**	**0.013923**	**0.013087**	**0.011503**	**0.008787**	**0.008498**
	Standard Deviation	0.15381	0.12816	0.13456	0.1407	0.1449	0.13786	0.13689	0.1226
	Number of Observations	1267	1235	1212	1185	1155	1129	1107	953
	Winner Portfolio	**0.027649**	**0.011678**	**0.014706**	**0.014239**	**0.012342**	**0.008295**	**0.005425**	**0.006207**
	Standard Deviation	0.11817	0.11825	0.12115	0.12686	0.13537	0.13698	0.13869	0.13841
	Number of Observations	1248	1229	1213	1186	1164	1146	1133	986
	Winner-Loser Portfolio	**-6.4E-05**	**0.001107**	**0.000627**	**0.000316**	**-0.00074**	**-0.00321**	**-0.00336**	**-0.00229**
	Test Statistic	**-0.01**	**0.223**	**0.121**	**0.057**	**-0.13**	**-0.56**	**-0.58**	**-0.39**

[a] The trading strategies are replicated for each stated period and the mean returns shown for each horizon is the log normal average of all non-overlapping replications.

† Significant at the 99% level * Significant at the 95% level

TABLE III

MONTHLY RETURNS ON NON-OVERLAPPING PORTFOLIO STRATEGIES BY TIME HORIZON

SECOND SUB-PERIOD (JANUARY 1977 TO DECEMBER 1996)

Stocks are sorted and ranked in ascending order based on their respective *J*-month lagged returns. Stocks are further divided into ten equally weighted deciles. The top decile is the 'loser' portfolio and the bottom decile 'winner' portfolio. In month *t*, the strategy goes short on the loser portfolio and long on the winner portfolio. Thus, based on *J*-months of historical data, portfolios are held on for period of *K*-months and executed in month *t*. Buy-and-hold returns are computed for both the winner and loser portfolios.

J-MONTH PAST RETURNS		***K-MONTH HOLDING PERIOD***							
		3	**6**	**9**	**12**	**15**	**18**	**21**	**24**
3	**Loser Portfolio**	**0.004213**	**0.002611**	**0.002888**	**0.002881**	**0.004192**	**0.004822**	**0.005588**	**0.005576**
	Standard Deviation	0.17542	0.172	0.16878	0.16851	0.16847	0.1675	0.1651	0.16415
	Number of Observations	15641	14897	14198	13536	12881	12302	11767	11267
	Winner Portfolio	**0.011028**	**0.011142**	**0.011429**	**0.011711**	**0.010814**	**0.009993**	**0.009442**	**0.009566**
	Standard Deviation	0.13951	0.14043	0.13976	0.14091	0.1417	0.14231	0.14147	0.14135
	Number of Observations	15151	14482	13918	13395	12917	12506	12082	11685
	Winner-Loser Portfolio[a]	**0.006815**	**0.008531**	**0.008542**	**0.00883**	**0.006623**	**0.00517**	**0.003855**	**0.00399**
	Test Statistic[b]	**3.779†**	**4.662†**	**4.626†**	**4.667†**	**3.416†**	**2.618†**	**1.934>**	**1.97***
6	**Loser Portfolio**	**0.006795**	**0.001014**	**0.002766**	**0.002506**	**0.00477**	**0.004621**	**0.005859**	**0.005567**
	Standard Deviation	0.18196	0.17325	0.1722	0.16848	0.17096	0.16839	0.16906	0.16534
	Number of Observations	7541	7266	6819	6578	6181	5972	5635	5441
	Winner Portfolio	**0.01905**	**0.013494**	**0.015628**	**0.013648**	**0.012974**	**0.010765**	**0.011536**	**0.010519**
	Standard Deviation	0.13196	0.13474	0.13834	0.13415	0.13773	0.13856	0.13929	0.13738
	Number of Observations	7375	7174	6811	6670	6369	6268	5992	5861
	Winner-Loser Portfolio	**0.012255**	**0.01248**	**0.012862**	**0.011142**	**0.008204**	**0.006144**	**0.005677**	**0.004952**
	Test Statistic	**4.716†**	**4.835†**	**4.807†**	**4.207†**	**2.955†**	**2.198***	**1.969***	**1.725>**
9	**Loser Portfolio**	**-0.0031**	**-0.00115**	**0.001787**	**0.001251**	**0.003879**	**0.004761**	**0.004621**	**0.005563**
	Standard Deviation	0.19193	0.176	0.1777	0.17995	0.17125	0.17056	0.17181	0.16722
	Number of Observations	4933	4750	4396	4224	4066	3756	3632	3516
	Winner Portfolio	**0.01263**	**0.014547**	**0.014575**	**0.01275**	**0.011304**	**0.010812**	**0.010032**	**0.00984**
	Standard Deviation	0.12437	0.13451	0.13577	0.13705	0.13373	0.13474	0.13629	0.13475
	Number of Observations	4877	4760	4450	4363	4293	4040	3972	3898
	Winner-Loser Portfolio	**0.01573**	**0.015698**	**0.012788**	**0.011499**	**0.007425**	**0.006051**	**0.005411**	**0.004277**
	Test Statistic	**4.823†**	**4.886†**	**3.8†**	**3.323†**	**2.201***	**1.73>**	**1.512**	**1.204**
12	**Loser Portfolio**	**0.019528**	**0.00979**	**0.004217**	**0.002136**	**0.006906**	**0.007535**	**0.00663**	**0.005395**
	Standard Deviation	0.1846	0.17573	0.17786	0.16864	0.17043	0.17028	0.17147	0.1653
	Number of Observations	3534	3406	3271	3139	2864	2753	2657	2572
	Winner Portfolio	**0.032672**	**0.024734**	**0.017004**	**0.011318**	**0.014232**	**0.013038**	**0.010784**	**0.008995**
	Standard Deviation	0.1297	0.13058	0.13676	0.13055	0.13249	0.13286	0.13556	0.13262
	Number of Observations	3510	3415	3335	3288	3056	3002	2960	2905
	Winner-Loser Portfolio	**0.013144**	**0.014943**	**0.012787**	**0.009182**	**0.007326**	**0.005503**	**0.004154**	**0.0036**
	Test Statistic	**3.46†**	**3.985†**	**3.271†**	**2.433***	**1.838>**	**1.358**	**1.0**	**0.881**
15	**Loser Portfolio**	**0.004848**	**0.006835**	**0.001968**	**0.002821**	**0.003567**	**0.005463**	**0.00673**	**0.006248**
	Standard Deviation	0.18412	0.17481	0.18286	0.16742	0.16613	0.17155	0.16637	0.17011
	Number of Observations	2733	2627	2527	2420	2325	2090	2028	1968

J-MONTH PAST RETURNS		*K-MONTH HOLDING PERIOD*							
		3	**6**	**9**	**12**	**15**	**18**	**21**	**24**
	Winner Portfolio	**0.021999**	**0.020319**	**0.016075**	**0.012573**	**0.010402**	**0.010185**	**0.010245**	**0.009522**
	Standard Deviation	0.11186	0.1278	0.13335	0.12673	0.13166	0.13604	0.13518	0.14272
	Number of Observations	2753	2696	2650	2607	2568	2367	2335	2299
	Winner-Loser Portfolio	**0.017151**	**0.013484**	**0.014107**	**0.009752**	**0.006836**	**0.004721**	**0.003515**	**0.003274**
	Test Statistic	**4.166†**	**3.206†**	**3.159†**	**2.315***	**1.584**	**1.009**	**0.759**	**0.674**
18	**Loser Portfolio**	**-0.00419**	**-0.00387**	**-2.6E-05**	**-0.00044**	**0.004197**	**0.004953**	**0.00454**	**0.004003**
	Standard Deviation	0.19164	0.17884	0.1694	0.16687	0.17005	0.17084	0.17605	0.16597
	Number of Observations	2327	2227	1968	1881	1807	1740	1694	1645
	Winner Portfolio	**0.013656**	**0.007928**	**0.011223**	**0.009312**	**0.010819**	**0.009197**	**0.008835**	**0.007672**
	Standard Deviation	0.12998	0.13804	0.13274	0.12883	0.13033	0.13326	0.13809	0.13442
	Number of Observations	2345	2311	2077	2045	2015	1988	1960	1916
	Winner-Loser Portfolio	**0.017849**	**0.011796**	**0.011249**	**0.009755**	**0.006623**	**0.004244**	**0.004295**	**0.003669**
	Test Statistic	**3.723†**	**2.481***	**2.342***	**2.038***	**1.34**	**0.837**	**0.811**	**0.717**
21	**Loser Portfolio**	**0.022138**	**0.00375**	**0.004923**	**0.006689**	**0.006629**	**0.007344**	**0.007883**	**0.010989**
	Standard Deviation	0.17979	0.17822	0.17724	0.17948	0.18106	0.18693	0.19307	0.1827
	Number of Observations	1929	1867	1793	1569	1502	1450	1398	1359
	Winner Portfolio	**0.020061**	**0.011026**	**0.011533**	**0.010863**	**0.007566**	**0.006762**	**0.007648**	**0.008908**
	Standard Deviation	0.11133	0.13779	0.13549	0.1306	0.1314	0.1363	0.1371	0.13198
	Number of Observations	1945	1909	1869	1672	1644	1623	1604	1581
	Winner-Loser Portfolio	**-0.00208**	**0.007277**	**0.006609**	**0.004174**	**0.000937**	**-0.00058**	**-0.00023**	**-0.00208**
	Test Statistic	**-0.43**	**1.401**	**1.264**	**0.753**	**0.165**	**-0.1**	**-0.04**	**-0.35**
24	**Loser Portfolio**	**0.041998**	**0.025748**	**0.021317**	**0.011708**	**0.011556**	**0.010508**	**0.00694**	**0.007534**
	Standard Deviation	0.18399	0.18498	0.17029	0.16859	0.17537	0.16702	0.17301	0.16672
	Number of Observations	1556	1501	1443	1390	1351	1295	1244	1203
	Winner Portfolio	**0.045846**	**0.031251**	**0.022324**	**0.012167**	**0.012207**	**0.010478**	**0.007094**	**0.007173**
	Standard Deviation	0.11721	0.11992	0.12898	0.11942	0.12764	0.12416	0.13198	0.13113
	Number of Observations	1569	1546	1522	1494	1474	1448	1426	1409
	Winner-Loser Portfolio	**0.003848**	**0.005503**	**0.001007**	**0.000459**	**0.000651**	**-3E-05**	**0.000154**	**-0.00036**
	Test Statistic	**0.697**	**0.971**	**0.181**	**0.084**	**0.112**	**-0.01**	**0.026**	**-0.06**

[a] The trading strategies are replicated for each stated period and the mean returns shown for each horizon is the log normal average of all non-overlapping replications.

† Significant at the 99% level   * Significant at the 95% level   > Significant at the 90% level

TABLE IV
OLS PORTFOLIO REGRESSIONS OF TEST PERIOD RETURNS ON RANK PERIOD BETAS
(JANUARY 1955 TO DECEMBER 1996)

Ordinary Least Squares (OLS) estimator of the slope coefficient in the market model is used to estimate the respective betas for non-overlapping test periods using data from January 1955 to December 1996:

$$R_{it} = \alpha_{im} + \beta_{im} R_{mt} + e_{it}$$

where R_{it} is the realised log return on portfolio[a] i at time t, R_{mt} is the realised log return on market porfolio[b] at time t and e_{it} is the zero mean disturbance term. We obtain the beta of the respective portfolios by regressing the return on market porfolio on the mean return of portfolio i at time t.

***PORTFOLIO* β**	***INVESTMENT HORIZON***							
	3 x 3	***6 x 6***	***9 x 9***	***12 x 12***	***15 x 15***	***18 x 18***	***21 x 21***	***24 x 24***
Decile 1	**1.176091**[c]	**1.208653**	**1.254213**	**1.193675**	**1.223593**	**1.277913**	**1.175794**	**1.240793**
	(2.195)[d]	(1.863)	(1.962)	(1.210)	(1.587)	(1.170)	(0.763)	(1.328)
Decile 2	**0.999965**	**1.001493**	**1.043352**	**1.016221**	**1.021921**	**1.078817**	**1.001172**	**1.063785**
	-(0.001)	(0.034)	(0.925)	(0.244)	(0.437)	(0.757)	(0.016)	(0.877)
Decile 3	**0.940137**	**0.938175**	**0.973212**	**0.957217**	**0.950305**	**0.98991**	**0.947399**	**0.985305**
	-(2.117)	-(2.302)	-(0.997)	-(1.413)	-(1.595)	-(0.227)	-(1.828)	-(0.529)
Decile 4	**0.917579**	**0.913568**	**0.936796**	**0.933152**	**0.918518**	**0.942095**	**0.931281**	**0.942562**
	-(4.366)	-(4.216)	-(2.862)	-(3.538)	-(2.679)	-(2.861)	-(2.633)	-(3.458)
Decile 5	**0.916266**	**0.909406**	**0.918353**	**0.92491**	**0.917793**	**0.916302**	**0.935497**	**0.922999**
	-(5.693)	-(4.576)	-(3.358)	-(2.995)	-(2.706)	-(2.116)	-(1.726)	-(2.629)
Decile 6	**0.922992**	**0.9164**	**0.91243**	**0.927201**	**0.919953**	**0.909967**	**0.94464**	**0.91115**
	-(4.856)	-(3.919)	-(3.083)	-(2.049)	-(2.574)	-(1.571)	-(1.057)	-(2.208)
Decile 7	**0.942888**	**0.934627**	**0.920046**	**0.932553**	**0.933659**	**0.920593**	**0.955298**	**0.918017**
	-(2.751)	-(2.533)	-(2.541)	-(1.551)	-(1.983)	-(1.136)	-(0.733)	-(1.576)
Decile 8	**0.971089**	**0.9665**	**0.945709**	**0.958718**	**0.954159**	**0.933903**	**0.982389**	**0.942985**
	-(1.053)	-(1.035)	-(1.489)	-(0.788)	-(1.260)	-(0.851)	-(0.278)	-(1.001)
Decile 9	**1.027154**	**1.017155**	**0.984969**	**1.017976**	**1.012939**	**0.966293**	**1.018469**	**0.994204**
	(0.721)	(0.421)	-(0.341)	(0.306)	(0.265)	-(0.415)	(0.297)	-(0.100)
Decile 10	**1.185659**	**1.193482**	**1.110957**	**1.137798**	**1.145241**	**1.067488**	**1.108219**	**1.076219**
	(3.138)	(2.875)	(1.649)	(2.583)	(1.890)	(0.909)	(1.605)	(1.662)
D1 - D10	**0.009568**	**-0.015171**	**-0.143256**	**-0.055877**	**-0.078352**	**-0.210425**	**-0.067575**	**-0.164574**
	(0.033)[e]	-(0.041)	-(0.422)	-(0.127)	-(0.185)	-(0.752)	-(0.186)	-(0.354)

[a] To be included in each test period, a security must have non-missing returns both the past and holding period. On each portfolio formation date, companies are sorted and ranked based on the holding period returns and allocated to one of the ten deciles; with the extreme top decile as the 'loser' portfolio and the extreme bottom decile as the 'winner' portfolio.

[b] We use the mean equally-weighted returns of all companies listed on the London Stock Exchange with non-missing returns as a broad-based benchmark for the market porfolio.

[c] Securities are ranked based on past returns and assigned in equal numbers to ten portfolios. For each decile, a pooled regression over the returns was performed to estimate the beta for the respective portfolios.

[d] Test statistic for null hypothesis of portfolio having a unity beta (i.e., market portfolio) using the Newey-West standard error.

[e] Test statistic for null hypothesis of equality between betas of winner portfolio (decile 10) and loser portfolio (decile 1) using Newey-West standard errors.

† Significant at the 95% level * Significant at the 95% level > Significant at the 90% level.

TABLE V

OLS PORTFOLIO REGRESSIONS OF TEST PERIOD RETURNS ON RANK PERIOD BETAS (JANUARY 1955 TO DECEMBER 1976)

Ordinary Least Squares (OLS) estimator of the slope coefficient in the market model is used to estimate the respective betas for non-overlapping test periods using data from January 1955 to December 1976:

$$R_{it} = \alpha_{im} + \beta_{im} R_{mt} + e_{it}$$

where R_{it} is the realised log return on portfolio[a] i at time t, R_{mt} is the realised log return on market porfolio[b] at time t and e_{it} is the zero mean disturbance term. We obtain the beta of the respective portfolios by regressing the return on market porfolio on the mean return of portfolio i at time t.

PORTFOLIO β	***INVESTMENT HORIZON***							
	3 x 3	*6 x 6*	*9 x 9*	*12 x 12*	*15 x 15*	*18 x 18*	*21 x 21*	*24 x 24*
Decile 1	**1.091153**[c]	**1.040029**	**1.076387**	**1.007098**	**1.076734**	**0.981906**	**0.960319**	**1.135188**
	(0.852)[d]	(0.378)	(0.749)	(0.069)	(0.789)	-(0.216)	-(0.595)	(3.194)
Decile 2	**1.029104**	**0.973579**	**1.008041**	**0.954797**	**0.988176**	**0.961938**	**0.93391**	**1.005601**
	(0.439)	-(0.410)	(0.128)	-(0.801)	-(0.207)	-(0.901)	-(3.028)	(0.159)
Decile 3	**0.978171**	**0.962629**	**0.983038**	**0.94984**	**0.96213**	**0.963284**	**0.940535**	**0.965162**
	-(0.482)	-(0.868)	-(0.379)	-(1.322)	-(0.804)	-(1.388)	-(2.358)	-(1.307)
Decile 4	**0.954599**	**0.956475**	**0.969904**	**0.953888**	**0.955516**	**0.972372**	**0.955319**	**0.952359**
	-(1.951)	-(1.806)	-(1.041)	-(1.842)	-(1.385)	-(1.032)	-(1.613)	-(3.028)
Decile 5	**0.951605**	**0.960892**	**0.961818**	**0.963837**	**0.961553**	**0.980437**	**0.982306**	**0.949359**
	-(3.873)	-(2.523)	-(2.031)	-(2.138)	-(2.095)	-(0.766)	-(0.876)	-(4.259)
Decile 6	**0.948734**	**0.964022**	**0.963288**	**0.979196**	**0.963946**	**0.996704**	**1.006321**	**0.949639**
	-(2.574)	-(1.883)	-(2.883)	-(1.041)	-(2.482)	-(0.136)	(0.331)	-(4.163)
Decile 7	**0.958935**	**0.97951**	**0.970821**	**0.988245**	**0.975177**	**1.015042**	**1.018649**	**0.967526**
	-(1.245)	-(0.722)	-(1.410)	-(0.377)	-(1.062)	(0.673)	(1.025)	-(2.003)
Decile 8	**0.973518**	**1.004157**	**0.988507**	**1.011285**	**0.983188**	**1.026099**	**1.039222**	**0.985098**
	-(0.560)	(0.093)	-(0.312)	(0.262)	-(0.385)	(1.156)	(2.169)	-(0.554)
Decile 9	**1.0093**	**1.035899**	**1.008888**	**1.059398**	**1.025943**	**1.038009**	**1.057851**	**1.01989**
	(0.144)	(0.564)	(0.130)	(0.962)	(0.385)	(1.199)	(2.344)	(0.624)
Decile 10	**1.1052**	**1.12314**	**1.070569**	**1.132714**	**1.106314**	**1.067724**	**1.107412**	**1.068219**
	(1.213)	(1.391)	(0.579)	(2.003)	(1.138)	(0.945)	(2.031)	(1.659)
D1 - D10	**0.014015**	**0.083111**	**-0.00582**	**0.125616**	**0.02958**	**0.085818**	**0.147094**	**-0.06697**
	(0.088)[e]	(0.378)	-(0.033)	(0.287)	(0.088)	(0.331)	(0.241)	-(0.059)

[a] To be included in each test period, a security must have non-missing returns both the past and holding period. On each portfolio formation date, companies are sorted and ranked based on the holding period returns and allocated to one of the ten deciles; with the extreme top decile as the 'loser' portfolio and the extreme bottom decile as the 'winner' portfolio.

[b] We use the mean equally-weighted returns of all companies listed on the London Stock Exchange with non-missing returns as a broad-based benchmark for the market porfolio.

[c] Securities are ranked based on past returns and assigned in equal numbers to ten portfolios. For each decile, a pooled regression over the returns was performed to estimate the beta for the respective portfolios.

[d] Test statistic for null hypothesis of portfolio having a unity beta (i.e., market portfolio) using the Newey-West standard error.

[e] Test statistic for null hypothesis of equality between betas of winner portfolio (decile 10) and loser portfolio (decile 1) using Newey-West standard errors.

† Significant at the 95% level   * Significant at the 95% level   > Significant at the 90% level.

TABLE VI
OLS PORTFOLIO REGRESSIONS OF TEST PERIOD RETURNS ON RANK PERIOD BETAS
(JANUARY 1977 TO DECEMBER 1996)

Ordinary Least Squares (OLS) estimator of the slope coefficient in the market model is used to estimate the respective betas for non-overlapping test periods using data from January 1977 to December 1996:

$$R_{it} = \alpha_{im} + \beta_{im} R_{mt} + e_{it}$$

where R_{it} is the realised log return on portfolio[a] i at time t, R_{mt} is the realised log return on market porfolio[b] at time t and e_{it} is the zero mean disturbance term. We obtain the beta of the respective portfolios by regressing the return on market porfolio on the mean return of portfolio i at time t.

PORTFOLIO β	*INVESTMENT HORIZON*							
	3 x 3	*6 x 6*	*9 x 9*	*12 x 12*	*15 x 15*	*18 x 18*	*21 x 21*	*24 x 24*
Decile 1	**1.321572**[c]	**1.39155**	**1.372877**	**1.554991**	**1.700659**	**1.445434**	**1.491589**	**1.676913**
	(2.682)[d]	(2.528)	(2.166)	(3.067)	(7.187)	(1.963)	(2.870)	(9.239)
Decile 2	**1.002698**	**1.036286**	**1.035213**	**1.138987**	**1.240915**	**1.081319**	**1.166323**	**1.250804**
	(0.065)	(0.609)	(0.680)	(1.500)	(5.668)	(0.918)	(1.870)	(12.563)
Decile 3	**0.915866**	**0.91859**	**0.921221**	**0.97942**	**1.017229**	**0.934894**	**0.998745**	**1.0399**
	-(2.755)	-(2.832)	-(3.587)	-(0.465)	(0.647)	-(1.789)	-(0.026)	(1.619)
Decile 4	**0.8817**	**0.873827**	**0.871505**	**0.901958**	**0.891573**	**0.873387**	**0.898578**	**0.912547**
	-(4.649)	-(5.987)	-(6.524)	-(7.005)	-(6.064)	-(15.859)	-(5.432)	-(4.699)
Decile 5	**0.872751**	**0.860215**	**0.852401**	**0.858584**	**0.829457**	**0.850947**	**0.843656**	**0.844886**
	-(5.516)	-(5.919)	-(4.986)	-(6.642)	-(10.880)	-(8.658)	-(12.701)	-(8.685)
Decile 6	**0.882661**	**0.869467**	**0.862118**	**0.835293**	**0.807717**	**0.842861**	**0.831324**	**0.802184**
	-(5.161)	-(4.464)	-(3.680)	-(4.058)	-(10.521)	-(4.218)	-(5.879)	-(17.024)
Decile 7	**0.908194**	**0.889109**	**0.892399**	**0.831934**	**0.80716**	**0.873287**	**0.840827**	**0.781738**
	-(3.642)	-(3.009)	-(2.691)	-(2.936)	-(7.480)	-(2.452)	-(3.310)	-(11.062)
Decile 8	**0.947168**	**0.926336**	**0.930988**	**0.859151**	**0.817139**	**0.917041**	**0.874501**	**0.803714**
	-(1.728)	-(1.629)	-(1.692)	-(1.867)	-(5.519)	-(1.261)	-(1.917)	-(7.699)
Decile 9	**1.022292**	**0.991492**	**1.007558**	**0.930122**	**0.858597**	**1.010485**	**0.941285**	**0.872292**
	(0.546)	-(0.165)	(0.173)	-(0.855)	-(4.116)	(0.130)	-(0.710)	-(4.403)
Decile 10	**1.24447**	**1.242**	**1.254449**	**1.107636**	**1.027981**	**1.169855**	**1.113063**	**1.013016**
	(3.152)	(2.96625)	(3.495)	(1.861)	(0.783)	(1.500)	(1.114)	(0.314)
D1 - D10	**-0.077**	**-0.40**	**-0.234**	**-0.447**	**-0.673**	**-0.276**	**-0.379**	**-0.664**
	-(0.166)[e]	-(0.987)	-(0.848)	-(0.544)	-(0.360)	-(0.402)	-(0.408)	-(0.215)

[a] To be included in each test period, a security must have non-missing returns both the past and holding period. On each portfolio formation date, companies are sorted and ranked based on the holding period returns and allocated to one of the ten deciles; with the extreme top decile as the 'loser' portfolio and the extreme bottom decile as the 'winner' portfolio.
[b] We use the mean equally-weighted returns of all companies listed on the London Stock Exchange with non-missing returns as a broad-based benchmark for the market porfolio.
[c] Securities are ranked based on past returns and assigned in equal numbers to ten portfolios. For each decile, a pooled regression over the returns was performed to estimate the beta for the respective portfolios.
[d] Test statistic for null hypothesis of portfolio having a unity beta (i.e., market portfolio) using the Newey-West standard error.
[e] Test statistic for null hypothesis of equality between betas of winner portfolio (decile 10) and loser portfolio (decile 1) using Newey-West standard errors.

† Significant at the 95% level   * Significant at the 95% level   > Significant at the 90% level.

TABLE VII
TEST PERIOD UNADJUSTED MARKET CAPITALISATION* BASED ON HISTORICAL RETURNS
(JANUARY 1977 TO DECEMBER 1996)

Using yearly market capitalisation data from the LSPD tapes, we first rank all British registered companies quoted on the London Stock Exchange based on their historical returns on each portfolio formation date. The stocks are further sorted into ten equally-weighted deciles in ascending order; that is, the top decile (decile 1) consolidates as the loser portfolio and the bottom decile (decile 10) is the winner portfolio. The unique company identification number of each company is then matched with the LSPD market capitalisation file to obtain the subsequent average market capitalisation for the following year for each decile portfolio[a].

PORTFOLIO	***HISTORICAL HORIZON***							
	3 MONTHS	*6 MONTHS*	*9 MONTHS*	*12 MONTHS*	*15 MONTHS*	*18 MONTHS*	*21 MONTHS*	*24 MONTHS*
DECILE 1	**25.28529**	**26.78357**	**19.71065**	**22.58617**	**30.21178**	**21.73454**	**36.17106**	**30.57591**
DECILE 2	**39.39969**	**35.13514**	**40.22184**	**35.82762**	**46.81164**	**51.84539**	**55.56755**	**70.70428**
DECILE 3	**47.19705**	**45.46198**	**47.91207**	**45.52254**	**56.74286**	**64.7092**	**82.21728**	**86.09013**
DECILE 4	**51.89732**	**53.09011**	**56.32554**	**62.42694**	**71.20015**	**65.33721**	**86.42639**	**76.61201**
DECILE 5	**58.70914**	**64.80128**	**54.00528**	**54.01964**	**82.56018**	**70.54661**	**64.67656**	**76.61376**
DECILE 6	**62.09066**	**55.27176**	**59.55845**	**64.32991**	**84.74254**	**83.4422**	**91.13129**	**86.83911**
DECILE 7	**60.12649**	**61.0156**	**63.7086**	**56.07212**	**74.08633**	**87.75444**	**92.68729**	**81.01731**
DECILE 8	**57.02047**	**62.36741**	**61.43302**	**61.42132**	**72.19598**	**78.73848**	**89.69774**	**104.3805**
DECILE 9	**49.31313**	**49.40938**	**49.62785**	**50.6396**	**63.29282**	**70.7767**	**93.87261**	**87.04655**
DECILE 10	**33.18102**	**31.065**	**29.69709**	**34.94349**	**46.6177**	**39.61123**	**62.06236**	**65.42405**
(T-STATISTIC) [b]	**(1.549125751)**	**(0.722252975)**	**(1.772474587) †**	**(1.377762132)**	**(1.039104269)**	**(1.862743771) †**	**(0.913972681)**	**(1.131324585)**

[a] To be included in each test period, a security must have non-missing market capitalisation data post-historical returns ranking period.
[b] Statistical test performed to test the equality of size between winner and loser portofolio:
† Significant at the 90% level
* Million £

TABLE VIII
TEST PERIOD ADJUSTED^ MARKET CAPITALISATION* BASED ON HISTORICAL RETURNS
(JANUARY 1977 TO DECEMBER 1996)

Using yearly market capitalisation data from the LSPD tapes, we first rank all British registered companies quoted on the London Stock Exchange based on their historical returns on each portfolio formation date. The stocks are further sorted into ten equally-weighted deciles in ascending order; that is, the top decile (decile 1) consolidates as the loser portfolio and the bottom decile (decile 10) is the winner portfolio. The unique company identification number of each company is then matched with the LSPD market capitalisation file to obtain the subsequent average market capitalisation for the following year for each decile portfolio[a].

PORTFOLIO	***HISTORICAL HORIZON***							
	3 MONTHS	*6 MONTHS*	*9 MONTHS*	*12 MONTHS*	*15 MONTHS*	*18 MONTHS*	*21 MONTHS*	*24 MONTHS*
DECILE 1	**23.4123**	**24.87831**	**18.19055**	**21.06481**	**27.62423**	**20.14545**	**30.01112**	**25.41228**
DECILE 2	**36.46783**	**32.45337**	**37.11601**	**33.18265**	**43.09243**	**48.26271**	**45.5545**	**57.8808**
DECILE 3	**43.63281**	**42.06987**	**44.315**	**42.06309**	**52.54118**	**60.44807**	**66.82402**	**70.14192**
DECILE 4	**47.96091**	**49.08309**	**52.03454**	**57.70418**	**65.95312**	**60.9877**	**70.39863**	**62.42256**
DECILE 5	**54.2462**	**59.82295**	**49.90724**	**49.9073**	**76.64269**	**65.95816**	**52.42564**	**62.26746**
DECILE 6	**57.36148**	**51.07165**	**55.02303**	**59.43116**	**78.75453**	**78.03669**	**73.91827**	**70.383**
DECILE 7	**55.54834**	**56.3996**	**58.86735**	**51.81883**	**73.72482**	**82.0841**	**75.09611**	**65.60038**
DECILE 8	**52.6569**	**57.59863**	**56.76366**	**56.68794**	**70.93657**	**73.67321**	**72.64594**	**84.48552**
DECILE 9	**45.55809**	**45.62096**	**45.83683**	**46.75425**	**67.18287**	**66.20691**	**75.7839**	**70.20469**
DECILE 10	**30.64615**	**28.68481**	**27.42734**	**32.26521**	**45.60565**	**37.05462**	**50.25639**	**52.94293**
(T-STATISTIC)[b]	**(1.713225988) †**	**(0.86101012)**	**(1.927977124) †**	**(1.45574841)**	**(1.565200626)**	**(2.086609846) †**	**(0.933931851)**	**(1.128949326)**

[a] To be included in each test period, a security must have non-missing market capitalisation data post-historical returns ranking period.
[b] Statistical test performed to test the equality of size between winner and loser portofolio:
† Significant at the 90% level
^ With 1977 as base year.
* £Million

Figure 1
MONTHLY RETURNS ON NON-OVERLAPPING PORTFOLIO STRATEGIES BY TIME HORIZON (JANUARY 1955 TO DECEMBER 1996)

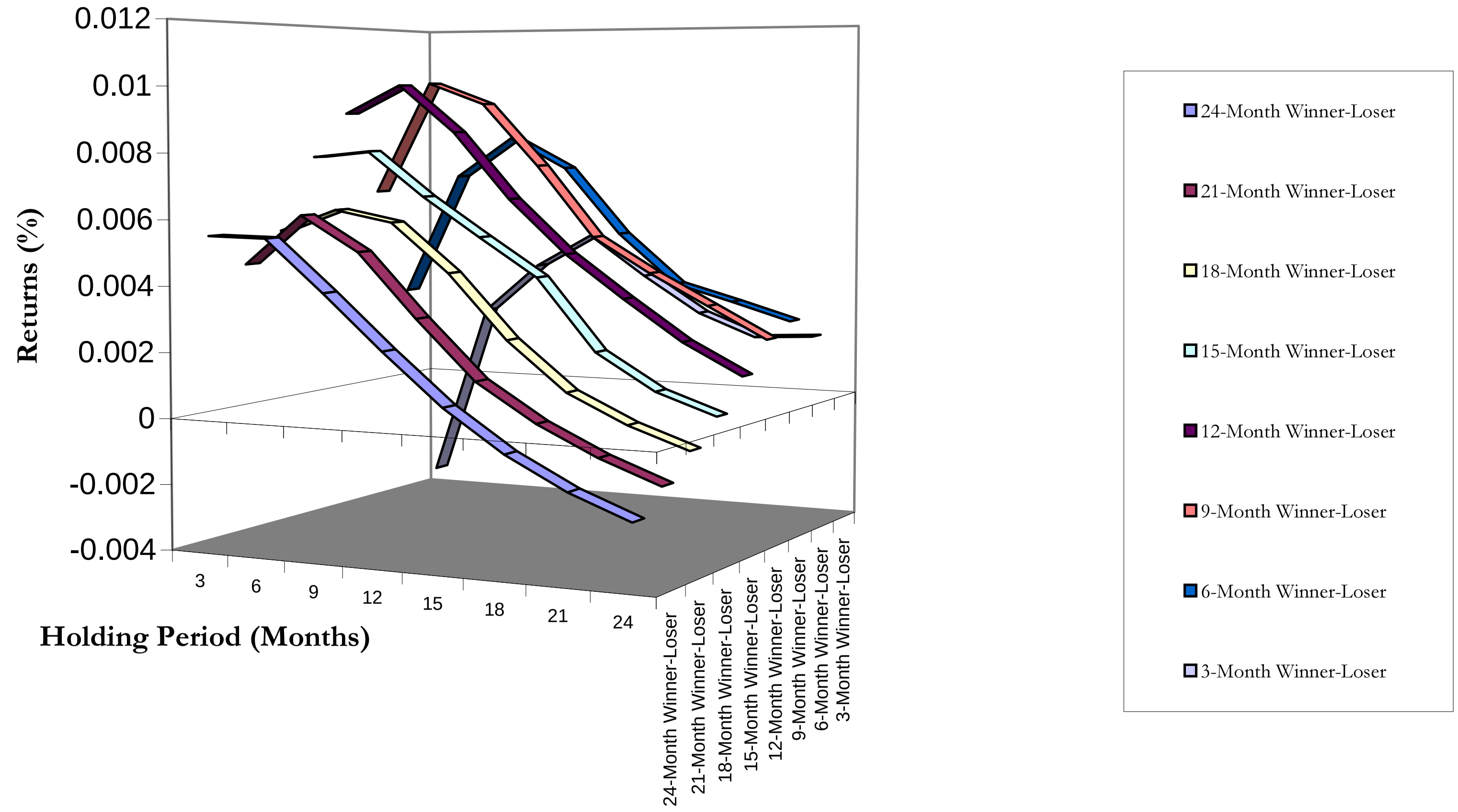

Figure 2

MONTHLY RETURNS ON NON-OVERLAPPING PORTFOLIO STRATEGIES BY TIME HORIZON OVER FIRST SUB-PERIOD (JANUARY 1955 TO DECEMBER 1976)

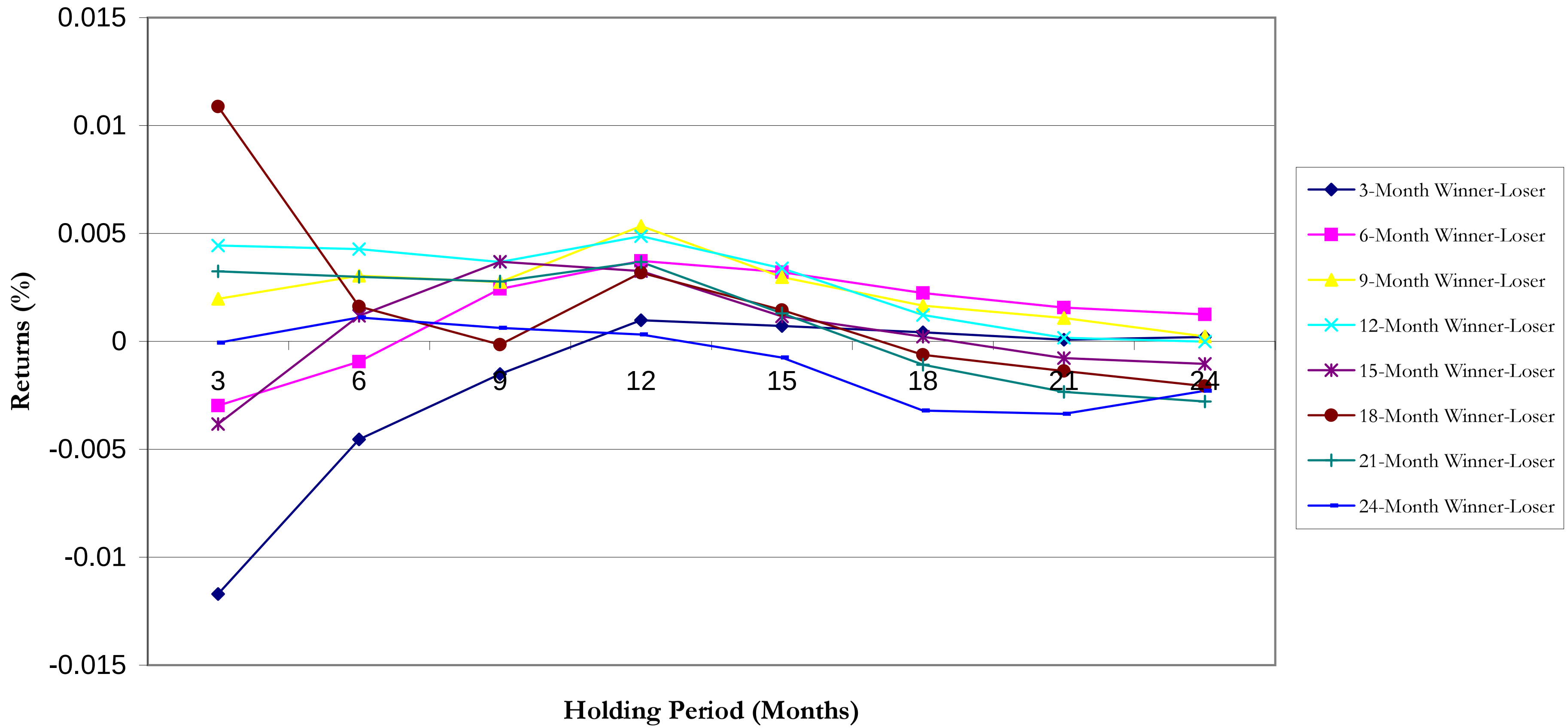

Figure 3
MONTHLY RETURNS ON NON-OVERLAPPING PORTFOLIO STRATEGIES BY TIME HORIZON SECOND SUB-PERIOD (JANUARY 1977 TO DECEMBER 1996)

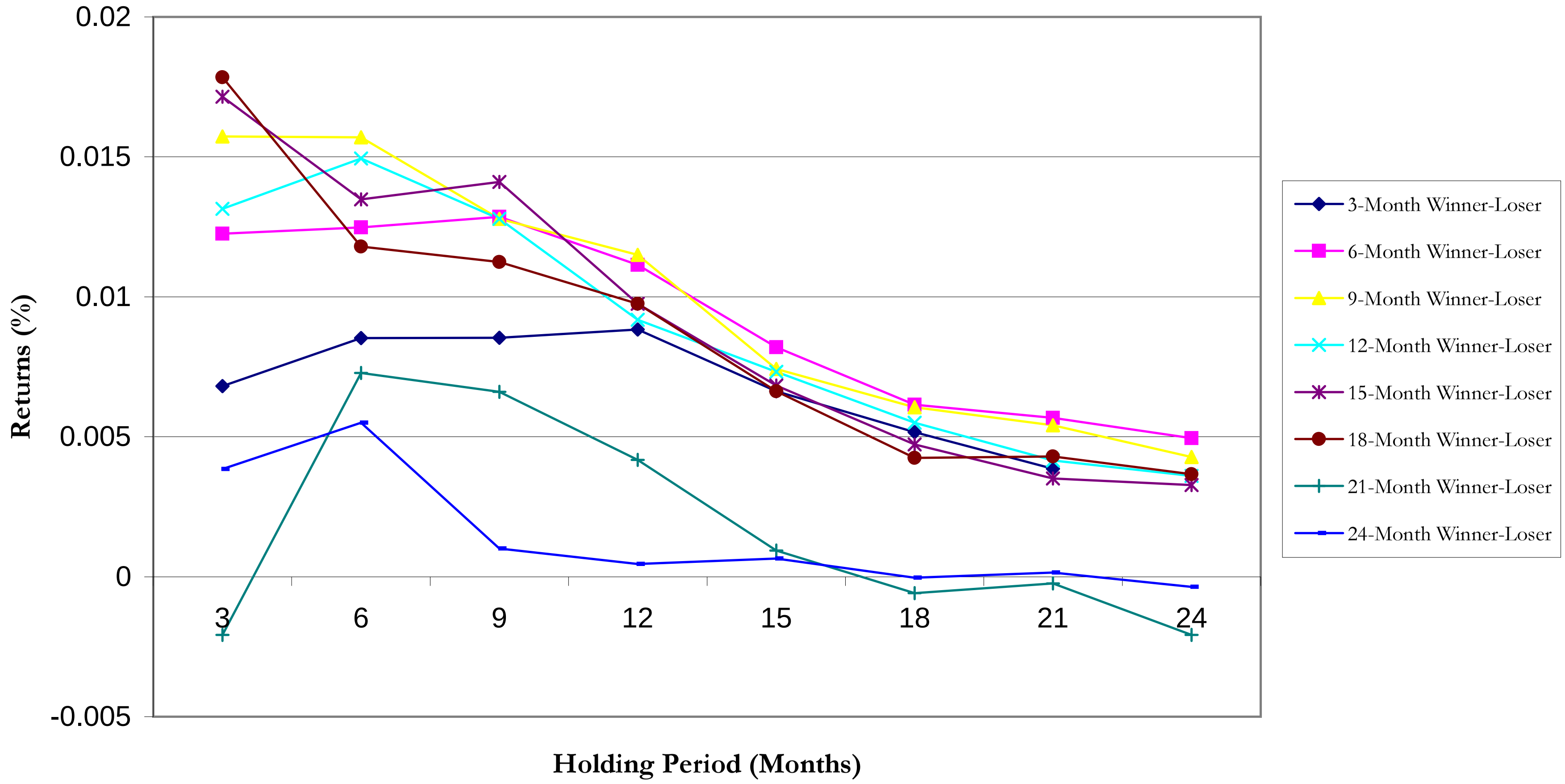

Figure 4
OLS PORTFOLIO REGRESSIONS OF TEST PERIOD RETURNS ON RANK PERIOD BETAS
(JANUARY 1955 TO DECEMBER 1996)

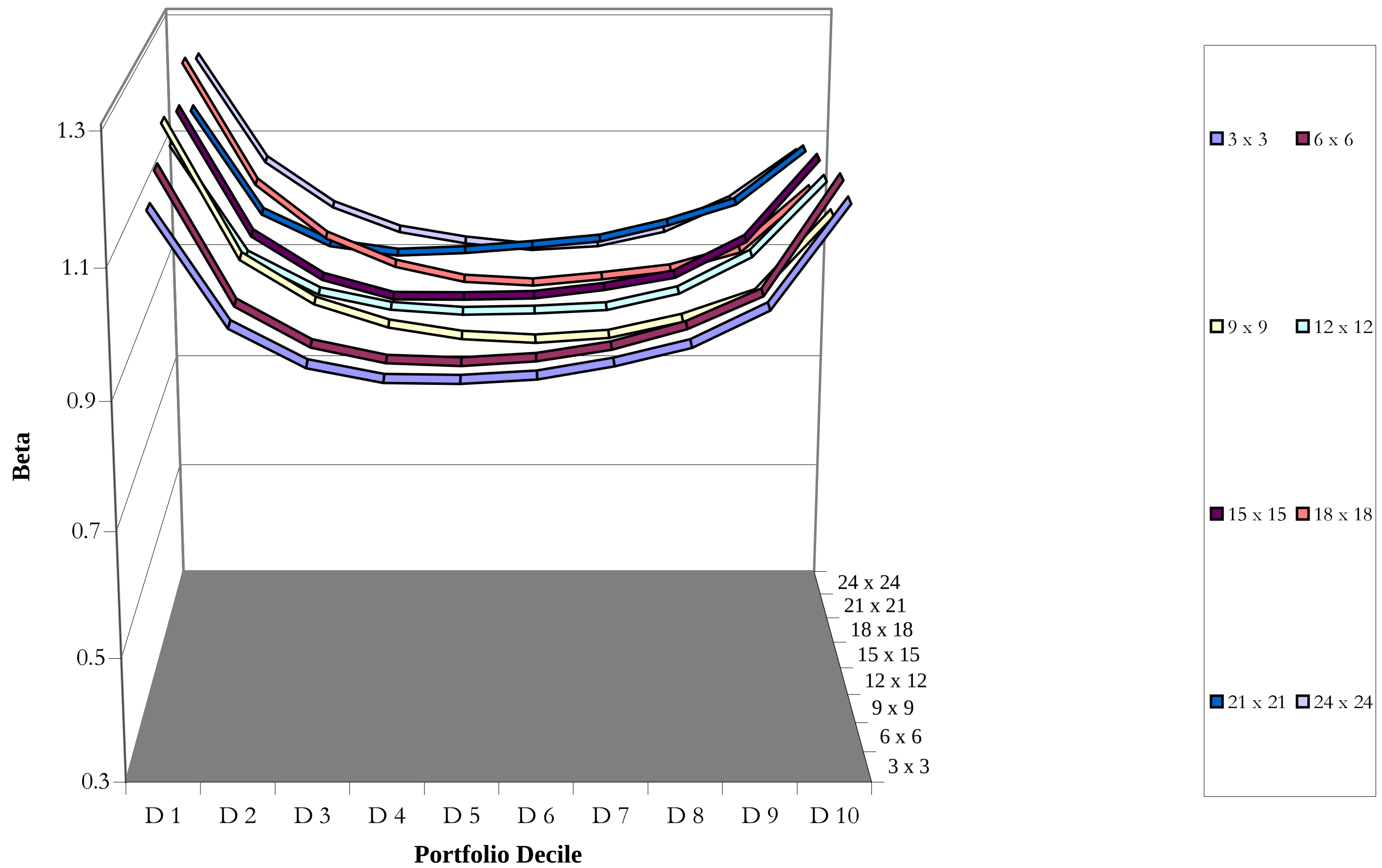

Figure 5

OLS PORTFOLIO REGRESSIONS OF TEST PERIOD RETURNS ON RANK PERIOD BETAS

(JANUARY 1955 TO DECEMBER 1976)

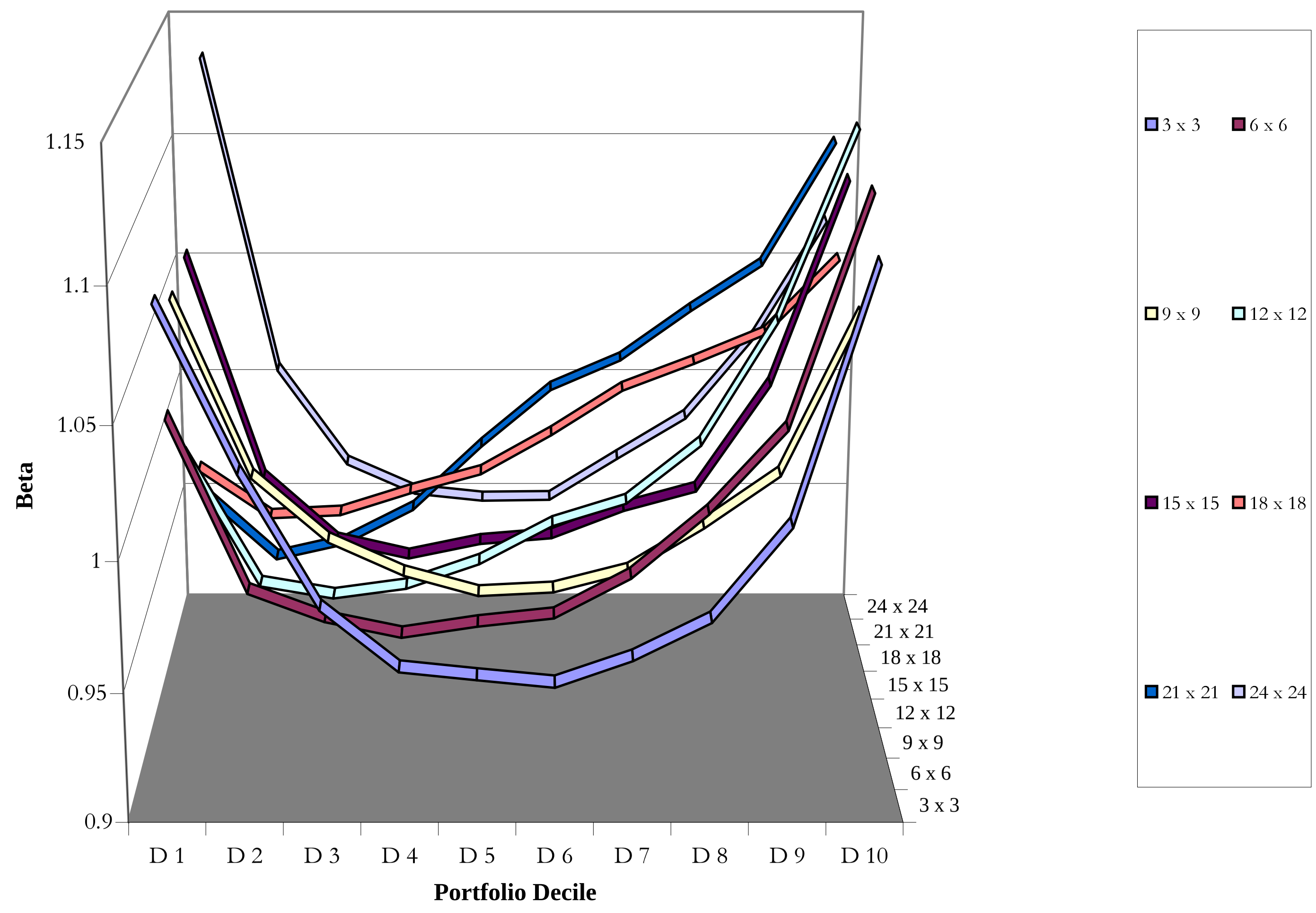

Figure 6
OLS PORTFOLIO REGRESSIONS OF TEST PERIOD RETURNS ON RANK PERIOD BETAS
(JANUARY 1977 TO DECEMBER 1996)

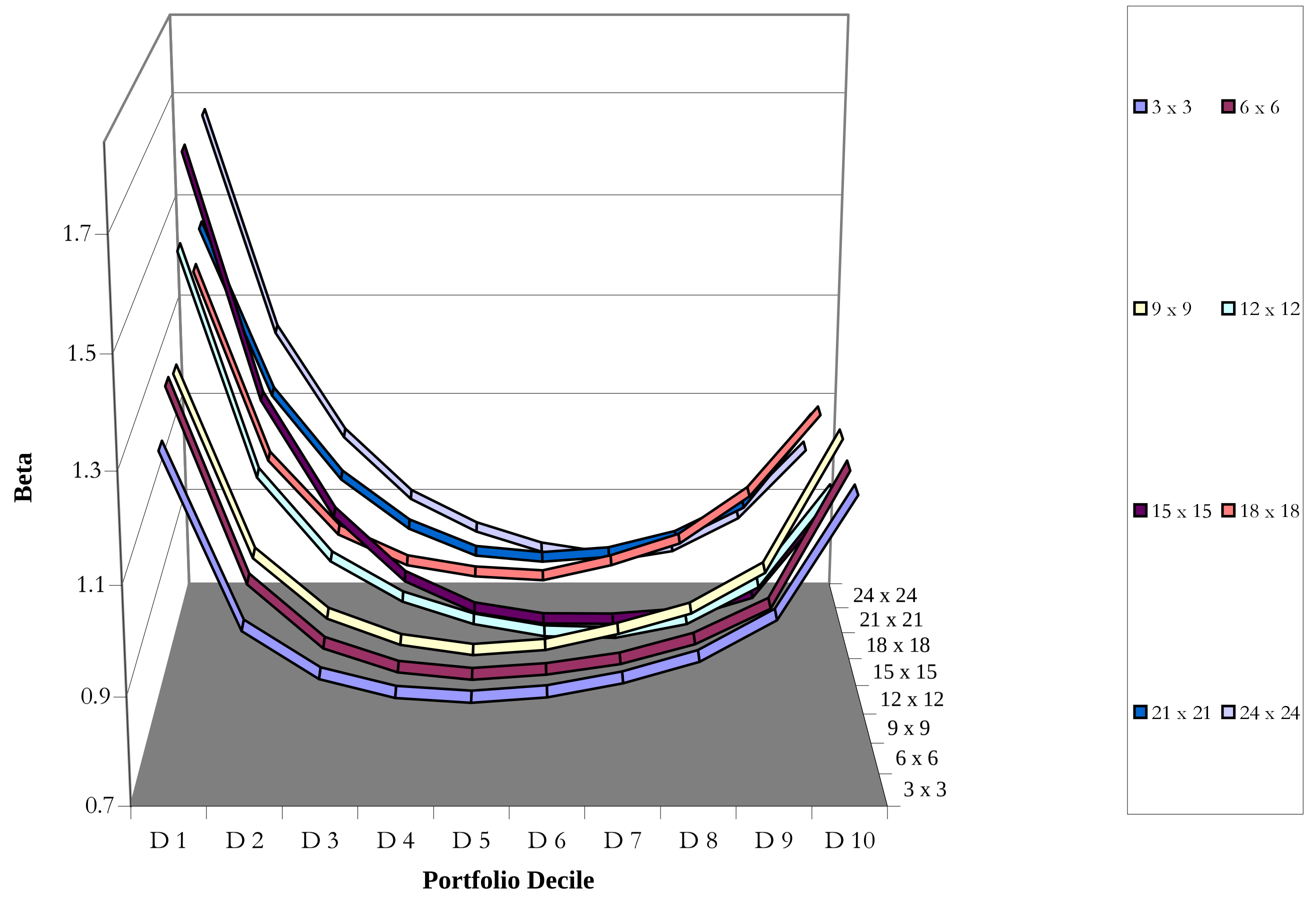

Figure 7
TEST PERIOD UNADJUSTED MARKET CAPITALISATION BASED ON HISTORICAL RETURNS
(JANUARY 1977 TO DECEMBER 1996)

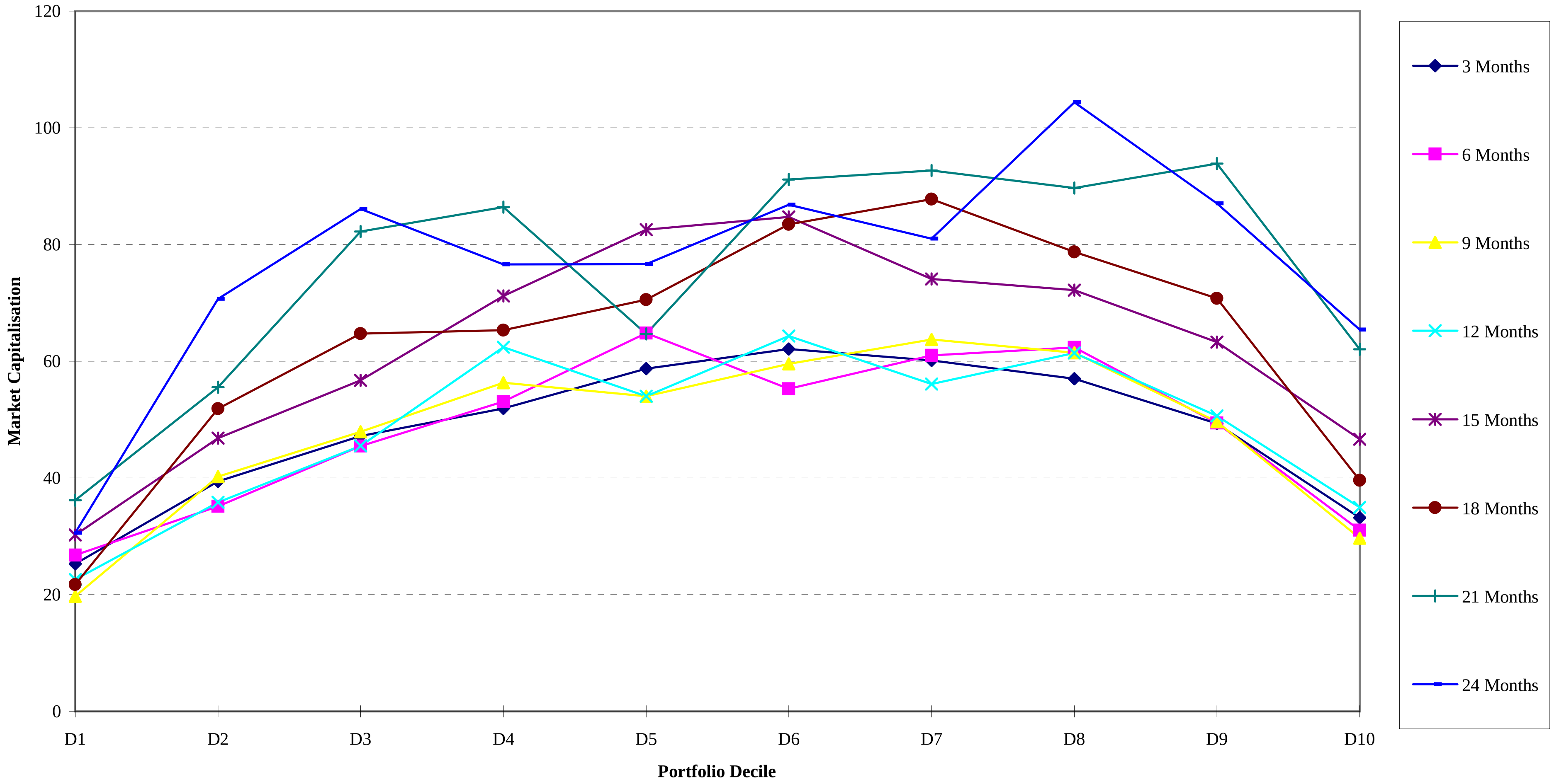

Figure 8
TEST PERIOD ADJUSTED MARKET CAPITALISATION BASED ON HISTORICAL RETURNS
(JANUARY 1977 TO DECEMBER 1996)