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THE MARKET TIMING ABILITY OF UK EQUITY MUTUAL FUNDS

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THE MARKET TIMING ABILITY OF UK EQUITY MUTUAL FUNDS

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Abstract:
We apply a recent nonparametric methodology to test the market timing skills of UK equity mutual funds. The methodology has a number of advantages over the widely used regression based tests of Treynor-Mazuy (1966) and Henriksson-Merton (1981). We find a relatively small number of funds (around 1.5%) demonstrate positive market timing ability at a 5% significance level, while around 20% of funds exhibit negative (perverse) timing and on average funds mis-time the market. Our findings indicate that the few skillful market timers possess private market timing signals so their performance cannot be attributed to publicly available information. In terms of fund classifications, there are a small number of successful positive market timers amongst equity income and general equity funds, while a few small company funds time a small company index rather than a broad market index. We also apply regression based tests of volatility timing and find evidence that a slightly larger (around 5%) of funds successfully time market volatility.

Keywords : Mutual funds performance, market timing.

JEL Classification: C14, G11

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1. Introduction

The question of market timing has attracted relatively little attention among studies of UK fund performance. One form of market timing is tactical asset allocation which keeps the composition of a portfolio of risky assets constant but alters the proportion of the portfolio held in cash (non-risky assets) according to the expected future direction of the market. Market timing may also be achieved by using index futures or other derivate positions.[1] Alternatively, market timing may be implemented by rebalancing the fund's equity holdings to increase (decrease) the fund's market beta in response to an expected bull (bear) market. To test tactical asset allocation requires information on a portfolio's composition over time and such data are not readily available for UK mutual funds. However, tests of whether the portfolio beta is conditional on a market benchmark may be conducted with available fund and market returns data.

In this paper we apply regression approaches and, for the first time on UK data, a nonparametric test to examine the market timing performance of *individual* UK domestic equity funds. Our large survivorship-bias free data base of around 800 (non-tracker, non second-unit) funds is also the most comprehensive used to-date and we extend the data set from the mid-1990s to include the market downturn after 2000.

The nonparametric procedure has several advantages. First, it measures the quality of a fund manager's timing information rather than the aggressiveness of his response - whereas the widely used regression based methods of Treynor-Mazuy (TM) (1966) and Henriksson-Merton (HM) (1981) do not separate these two elements. The quality of timing information is of more interest to the investor as he can control the aggressiveness of his position himself simply by adjusting his holdings of risky/non-risky assets. In addition, the nonparametric method requires less restrictive behavioural

[1] UK mutual funds are restricted in their use of derivative securities since the assets of the fund must be able to fully cover any liabilities that are created when employing derivative contracts. In practice this prevents the fund from achieving any real gearing and ensures that the fund is able to meet its liabilities if called upon to do so.

assumptions and unlike the TM and HM tests which assume the fund's timing frequency is fixed at the same frequency as the sampling interval in the data set used, the non-parametric approach is flexible in this respect. This raises a question concerning the power of different tests for market timing when actual fund timing frequencies differ from data sampling frequencies, and this is discussed further below (Goetzmann et al 2000, Bollen and Busse 2001). Furthermore, in this paper we also examine whether mutual fund managers can improve investor returns based on the quality of the manager's *private* market timing information (timing signals) rather than simply relying on publicly available information (Becker et al 1999, Ferson and Khang 2002).

The performance of actively managed mutual (and other) funds, in particular relative to passive funds, is central to recent policy debates. An important question is whether voluntary saving in mutual and pension funds will be sufficient to meet a predicted future savings gap given both projected state pensions and increasing longevity, (Turner 2004, OECD 2003). It is important to evaluate the relative performance of UK actively managed funds to determine the extent to which such funds truly add value to investors/savers as a means of efficiently allocating their scarce resources to saving instruments for the future. Recent studies have examined this question in relation to security selection skill, usually measured by a fund's alpha (Cuthbertson et al 2005, Keswani and Stolin 2005, Fletcher and Forbes 2002, Quigley and Sinquefield 2000) - here we assess fund's market timing skills.

The paper proceeds as follows. In section 2 we survey recent findings in the market timing literature. Section 3 describes the nonparametric testing methodology. In section 4 we describe the UK data set, empirical results are reported in section 5 and section 6 concludes.

2. Recent Literature

Two widely applied models of market timing are Treynor and Mazuy (1966) and Henriksson and Merton (1981), henceforth TM and HM respectively. The TM test specifies a quadratic regression of the form

(1) $$r_{i,t+1} = \alpha_i + \theta_i(r_{m,t+1}) + \gamma_{iu}(r_{m,t+1})^2 + \varepsilon_{i,t+1}$$

where the coefficient γ_{iu} measures market timing ability. $r_{i,t+1}$ and $r_{m,t+1}$ are the fund and market *excess* returns respectively. Admati et al (1986) demonstrate that the model is consistent with a manager with constant absolute risk aversion whose beta at time *t* is a linear function of $r_{m,t+1}$. The null hypothesis of no market timing implies $\gamma_{iu} = 0$. In the HM model the conditional portfolio beta follows a binary response function depending on the manager's forecast of whether next period's market return will exceed the risk free rate. The authors show that if the manager can successfully time the market then the coefficient γ_{iu} in (2) will be positive.

(2) $$r_{i,t+1} = \alpha_i + \theta_i(r_{m,t+1}) + \gamma_{iu}(r_{m,t+1})^+ + \varepsilon_{i,t+1}$$

where $(r_{m,t+1})^+$ is defined as $\max(0, r_{m,t+1})$. Here $\max(0, r_{m,t+1})$ may also be interpreted as the payoff to an option on the market portfolio with a strike price equal to the risk free rate. Based on similar models, Ferson and Schadt (1996) control for timing skills which may be attributable to public information by specifying the portfolio beta to be a function of a set of relevant public information variables. The null is then a test of the quality of the fund manager's *private* timing signal[2].

Several difficulties may arise with the TM and HM tests. The HM regression may exhibit heteroscedasticity and Breen at al (1986) show, using simulation techniques, that

[2] See also Becker et al (1999) and Ferson and Khang (2002) for further discussion of the effects of conditioning information on timing performance measures. Portfolio managers may also adjust a fund's exposure to risk factors other than the market or indeed to other benchmark indices according to their year-to-date performance in response to incentives they may face (Chevalier and Ellison, 1997; Brown, Harlow and Starks, 1996).

the HM test which ignores heteroscedasticity is poor both in terms of size and power. [3] A further difficulty with the TM and HM tests concerns their inability to decompose overall fund abnormal performance into its market timing and security selection components, (Admati et al 1986, Grinblatt and Titman 1989). Many studies point to a negative correlation between the market timing and selectivity measures of performance (Jagannathan and Korajczyk 1986, Coggin et al 1993, Goetzmann et al 2000, Jiang 2003). For example, Jiang (2003) reports that simulations show a negative correlation between the two performance measures in the TM and HM models, even where none exists, whereas the correlation between the nonparametric timing measure and the security selection measure in the regression models is very small (indistinguishable from zero for larger sample sizes). Jagannathan and Korajczyk (1986) suggest that a spurious negative correlation may arise due to the nonlinear pay-off structure of options and option-like securities in fund portfolios. Holding a call option on the market yields a high pay-off in a rising market but in a steady or falling market the premium payment lowers return and appears as poor security selection[4]. However, using (quarterly) holdings data Jiang, Yao and Yu (2005) apply a methodology which controls for this option effect and find significant positive timing ability among some US mutual funds using monthly returns.

A further difficulty in assessing fund timing ability arises if the frequency of the researcher's observed data differs from the frequency of the manager's timing strategy (where the latter may not be uniform or even known). Using standard regression tests for market timing and a bootstrap simulation technique, Bollen and Busse (2001) generate synthetic fund returns which mimic the holdings of actual funds using both daily and monthly data and show that while the tests for market timing on daily data yield expected results, the results using monthly data are biased. Then using actual daily data, Bollen and Busse provide stronger evidence of positive market timing ability than when using actual monthly data. Goetzmann et al (2000) similarly demonstrate that the HM test is

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[3] For further discussion on the power of standard regression based tests of abnormal performance see Kothari and Warner (2001).

[4] The returns on the common stock of highly geared firms may create a similar effect.

biased downwards when applied to the monthly returns of daily timers. Bollen and Busse (2005) is the only study to examine *persistence* in market timing and finds evidence of short term persistence when using daily data.

The bulk of the US empirical evidence on market timing demonstrates no market timing or perverse negative market timing (Wermers 2000[5], Ferson and Schadt 1996, Becker at al 1999, Goetzmann et al 2000, Jiang, 2003) - although conditioning on public information is shown to improve the model specification (Ferson and Warther 1996, Ferson and Schadt 1996, Becker at al 1999). Mamaysky et al (2004) use the Kalman filter to model time varying betas (and alphas). With dynamic estimates the authors explore which trading strategies are associated with outperformance. The findings indicate that superior and inferior returns are linked to attempts at market timing rather than stock selection, though in aggregate there is little evidence that investors earn superior returns.

A possible explanation of poor market timing may lie in mutual fund cashflows (Bollen and Busse 2001, Edelen 1999, Warther 1995, Ferson and Warther 1996). Investors increase net cashflows into mutual funds during periods when the market return is relatively high, increasing the fund's cash position, causing a concurrent lower overall portfolio return. As noted by Bollen and Busse (2001), in the HM model the market timing coefficient is estimated only when the market (excess) return is positive and so the cash-flow hypothesis is asymmetric: it can bias the coefficient downwards but not upwards. The authors also argue that the timing coefficient in the TM test is similarly biased downward.

A further question in the market timing literature is that of volatility timing. If market return and market volatility are unrelated, fund managers may be able to enhance investor utility by reducing market exposure when conditional volatility is high. The latter

[5] Wermers (2000) also examines market timing using holdings data and controls for size, book-to-market and momentum effects. However, the methodological approaches of Wermers (2000) and the Jiang, Yao and Yu (2005) study are quite different.

is often predictable since it persists: periods of high (low) volatility are often followed by high (low) volatility. Busse (1999) has shown that US funds do attempt to reduce market exposure when market volatility is high. However, if market return and volatility are positively related then attempts to time volatility may appear as negative market timing. In this paper, we also test for volatility timing as well as joint return and volatility timing.

Overall using standard parametric tests, US daily data provides some evidence of successful market timing but when using monthly data successful market timing seems weak or non-existent. Jiang (2003) proposes a nonparametric test of market timing in order to address some of the issues above and this methodology is described in section 3.

While there have been several recent studies on the performance and performance persistence of UK funds (Cuthbertson et al 2005, Keswani and Stolin 2005, Fletcher and Forbes 2002), there has been relatively little research carried out on the market timing skills of UK equity unit and investment trusts. Fletcher (1995) applies both the Chen and Stockum (1986) test (similar to TM) and the HM test. Evaluating 101 unit trusts between 1980 and 1989, Fletcher reports the cross sectional average timing measures to be negative and strongly significant. This is found to be the case for both models of market timing and alternative market benchmark indices. Leger (1997) evaluates UK equity investment trusts between 1974 and 1993 and finds similar results - negative and statistically significant market timing.

3. Nonparametric Test of Market Timing

Because of the difficulties noted above with regression based tests of market timing, Jiang (2003) proposes a non-parametric test (applied to US mutual funds), which we outline below. The market model is:

$$(3) \qquad r_{i,t+1} = \alpha_i + \beta_{i,t} r_{m,t+1} + \varepsilon_{i,t+1}$$

where $r_{i,t+1}$ is the excess return on fund *i*, $r_{m,t+1}$ is the relevant benchmark market excess return, α_i is a security selectivity measure (assumed to be independent of market timing) and the fund's beta, $\beta_{i,t}$, is assumed to vary with the fund manager's market timing information at time *t*. The fund's timing skill is determined by the ability to correctly predict market movements. Let $\hat{r}_{m,t+1} = E(r_{m,t+1} | I_t)$ be the manager's forecast for the next period's market return based on the information set I_t. The parameter *v* is defined as

$$(4) \qquad v = \Pr(\hat{r}_{m,t_2+1} > \hat{r}_{m,t_1+1} | r_{m,t_2+1} > r_{m,t_1+1}) - \Pr(\hat{r}_{m,t_2+1} < \hat{r}_{m,t_1+1} | r_{m,t_2+1} > r_{m,t_1+1})$$

and under the null hypothesis of no market timing ability $v = 0$ since the probability of a correct forecast then equals the probability of an incorrect forecast. $v \in [-1,1]$ where the two extreme values represent perfect negative and perfect positive (i.e. successful) market timing respectively. Equation (4) may also be written as:

$$(5) \qquad v = 2\Pr(\hat{r}_{m,t_2+1} > \hat{r}_{m,t_1+1} | r_{m,t_2+1} > r_{m,t_1+1}) - 1$$

The next step is to link the manager's forecast of the market return with his response in adjusting $\beta_{i,t}$ in (3). For any triplet of market return observations $\{r_{m,t_1}, r_{m,t_2}, r_{m,t_3}\}$ sampled from *any* three time periods (not necessarily in consecutive order) with $\{r_{m,t_1} < r_{m,t_2} < r_{m,t_3}\}$ an informed market timer will maintain a higher exposure to the market over the $[r_{m,t_2}, r_{m,t_3}]$ range than in the $[r_{m,t_1}, r_{m,t_2}]$ range. Nonparametric beta estimates for both time ranges are $\beta_{t_1} = (r_{i,t_2} - r_{i,t_1})/(r_{m,t_2} - r_{m,t_1})$ and $\beta_{t_2} = (r_{i,t_3} - r_{i,t_2})/(r_{m,t_3} - r_{m,t_2})$. Here beta embodies both the precision of the market return forecast and the aggressiveness of the manager's response where the latter is affected by risk aversion. Grinblatt and Titman (1989) show that for a fund *i* with non-increasing absolute risk aversion and independent timing and selectivity information $\frac{\delta\beta_t}{\delta\hat{r}_{m,t+1}} > 0$ yielding a convex fund return/market return relationship

$$(6)\qquad \frac{r_{i,t_3} - r_{i,t_2}}{r_{m,t_3} - r_{m,t_2}} > \frac{r_{i,t_2} - r_{i,t_1}}{r_{m,t_2} - r_{m,t_1}}$$

which allows (5) to be written as $v = 2\Pr(\beta_{t_2} > \beta_{t_1} \mid r_{m,t_2+1} > r_{m,t_1+1}) - 1$. A sample statistic of a fund's timing ability may be constructed as:

$$(7)\qquad \hat{\theta}_n = \binom{n}{3}^{-1} \sum_{r_{m,t_1} < r_{m,t_2} < r_{m,t_3}} \operatorname{sign}\left(\frac{r_{i,t_3} - r_{i,t_2}}{r_{m,t_3} - r_{m,t_2}} > \frac{r_{i,t_2} - r_{i,t_1}}{r_{m,t_2} - r_{m,t_1}} \right)$$

where sign (·) = (1, -1, 0) for positive, negative and zero market timing respectively. $\hat{\theta}_n$ is the average sign across all triplets taken from *n* observations and is a U-statistic with kernel of order three. $\hat{\theta}_n$ can be shown to be √n-consistent and asymptotically normal (Abrevaya and Jiang 2001, Serfling 1980) with variance:

$$(8)\qquad \hat{\sigma}^2_{\hat{\theta}_n} = \frac{9}{n} \sum_{t_1=1}^{n} \left(\binom{n}{2}^{-1} \sum_{t_2 < t_3, t_1 \neq t_2, t_1 \neq t_3} h(z_{t_1}, z_{t_2}, z_{t_3}) - \hat{\theta}_n \right)^2$$

where

$$(9)\qquad h(z_{t_1}, z_{t_2}, z_{t_3}) = \operatorname{sign}\left(\frac{r_{i,t_3} - r_{i,t_2}}{r_{m,t_3} - r_{m,t_2}} > \frac{r_{i,t_2} - r_{i,t_1}}{r_{m,t_2} - r_{m,t_1}} \mid r_{m,t_1} < r_{m,t_2} < r_{m,t_3} \right)$$

Under the null hypothesis of no market timing $z = \sqrt{n}.\hat{\theta}_n / \hat{\sigma}_{\hat{\theta}_n}$ is asymptotically N(0,1). Note, the calculation in (9) includes triplets $h(z_{t_1}, z_{t_2}, z_{t_3}), h(z_{t_2}, z_{t_1}, z_{t_3}), h(z_{t_3}, z_{t_1}, z_{t_2})$, that is the same three market return observations drawn in different combinations. However, the sign in (10) is equal in all three cases since it is conditional on $r_{m,t_1} < r_{m,t_2} < r_{m,t_3}$. That is, irrespective of the order in which the market return observations are drawn they are first sorted in ascending order and there can only be one such sorting.

As discussed, one difficulty in examining a fund's market timing skill is decomposing the quality of the manager's information regarding the future market return and the aggressiveness of his response in changing the fund's beta. A rational investor is more concerned with the former as he can control the latter himself by choosing the proportion of his wealth to invest in the fund. The TM and HM market timing measures test for both information quality and aggressiveness of response and hence such tests cannot separate out the two effects. For example, Henriksson-Merton (1981) show that $(p_1 + p_2 - 1).(\eta_2 - \eta_1)$ is a consistent estimate of γ_{iu} in (2) where p_1 and p_2 are the conditional probabilities of the manager correctly forecasting negative and positive market excess returns respectively in period *t+1* and η_1 and η_2 are the fund target betas in each case. Hence the estimated HM timing measure in (2) incorporates both the quality of manager information, $p_1 + p_2 - 1$, and the aggressiveness of response, $\eta_2 - \eta_1$. The nonparametric measure on the other hand simply measures how often a manager correctly forecasts a market movement and acts on it - irrespective of how aggressively he acts on it. This is reflected in the fact that the sign function in (8) assigns a value of 1(-1) if the argument is positive (negative) regardless of the size of the argument.

A further advantage of the nonparametric measure is that it is more robust in testing for timing skill among managers whose timing frequency may differ from the frequency of the sample data and/or whose timing frequency may not be uniform. The timing statistic in (8) investigates timing over *all* triplets of fund returns rather than just consecutive observations and consequently uses more information than parametric tests. Therefore, the nonparametric measure permits the cross-section of fund managers to have different timing frequencies whereas the regression based approaches of TM and HM are more restrictive since they assume the timing frequency of each manager is known and that this (on average) is the same across managers.

However, the nonparametric test also embodies some relatively mild restrictions on behaviour. The test requires β_t be a non-decreasing function of $\hat{r}_{m,t+1}$. Grinblatt and Titman (1989) demonstrate that this requires non-increasing absolute risk aversion. This is less restrictive than that of the TM and HM measures which require specific linear and binary response functions respectively. For example, the linear response function embodied in the TM measure is consistent with the manager maximising a Constant Absolute Risk Aversion (CARA) preference function (Admati et al, 1986). However, such an assumption is questionable if there is non-linearity in the payment to fund managers in respect of benchmark evaluation (Admati and Pfleiderer, 1997), option compensation (Carpenter, 2000) and a non-linear performance-flow responses by investors (Chevalier and Ellison, 1997).

Finally, the HM regression approach suffers size and power distortion under heteroscedasticty but the asymptotic distribution of the nonparametric timing measure in (8) is unaffected by heteroscedasticity in fund returns.

Conditional Market Timing: Public versus Private Information

The nonparametric test can be applied as a conditional statistic after allowing for market timing skill attributable to public information. This conditional measure involves first calculating both sets of residuals from regressions of the mutual fund returns and market returns on the lagged public information variables. Clearly, these residuals represent the variation in the fund and market returns not explained by the public information. Denote the pairwise fund and market regression residuals as $\tilde{r}_{i,t}$ and $\tilde{r}_{m,t}$ respectively. The procedure described above in (8) may then be applied to the residuals to yield a conditional timing measure

$$\tilde{\theta}_n = \binom{n}{3}^{-1} \sum_{\tilde{r}_{m,t_1} < \tilde{r}_{m,t_2} < \tilde{r}_{m,t_3}} \operatorname{sign}\left(\frac{\tilde{r}_{i,t_3} - \tilde{r}_{i,t_2}}{\tilde{r}_{m,t_3} - \tilde{r}_{m,t_2}} > \frac{\tilde{r}_{i,t_2} - \tilde{r}_{i,t_1}}{\tilde{r}_{m,t_2} - \tilde{r}_{m,t_1}} \right) \tag{10}$$

Note, $\hat{\theta}_n$ in (8) and $\tilde{\theta}_n$ in (11) can clearly be of different magnitudes but may also be of different sign. For example, $\hat{\theta}_n > 0$ but $\tilde{\theta}_n < 0$ may indicate a successful market timing manager whose skill is attributable to public information.

We examine conditional market timing using a set of public information variables which may provide market return predictability (Ferson and Schadt 1996). They include (i) the one month UK Tbill rate, (ii) the market divided yield, (iii) the term spread (20 year – 1 month yields) and (iv) the gilt/equity yield ratio. The gilt/equity yield ratio is the ratio of the coupon yield on a long term government bond to the market dividend yield. It captures the relative attractiveness of bonds versus equity and as such may help predict returns in both markets, (Clare, Wickens and Thomas 1994). We use the yield on a 30 year UK government bond.

Volatility Timing

In addition to timing the market return, fund managers may also attempt to time volatility in the market return - ceteris paribus, the manager will reduce market exposure in anticipation of higher (conditional) volatility. Expressing the fund market beta as a linear function of market (demeaned) volatility and substituting in a *k* factor linear model gives (Busse 1999):

(11) $$r_{i,t+1} = \alpha + \sum_{j=1}^{k} \beta_j r_{j,t+1} + \lambda r_{m,t+1}(\sigma_{m,t+1} - \bar{\sigma}_m) + \varepsilon_{t+1}$$

where $\sigma_{m,t+1}$ represents market volatility. Similar to Busse (1999) we estimate conditional volatility as[6]

[6] Other measures of volatility may also be applied such as implied volatility or GARCH estimates. See Busse (1999), Chen and Liang (2006).

(12) $$\sigma_{mt} = \left[\sum_{i=1}^{n_t} (r_{mti} - \bar{r}_{mt})^2 \right]^{\frac{1}{2}}$$

where r_{mti} are the n_t daily market returns during month *t* and $r_{j,t+1}$ (j = 1,2..k) are risk factors in the equilibrium model of security returns. Successful volatility timing is indicated by a negative value of λ in (11).

Fund managers may also pursue a strategy of *jointly timing* both the level and the volatility of the market portfolio. Writing beta as a linear function of both market return and volatility yields a joint timing model of the form:

(13) $$r_{i,t+1} = \alpha + \sum_{j=1}^{k} \beta_j r_{j,t+1} + \gamma r_{m,t+1}{}^2 + \lambda r_{m,t+1}(\sigma_{m,t+1} - \bar{\sigma}_m) + \varepsilon_{t+1}$$

where $\gamma > 0$ and $\lambda < 0$ measure successful market return and volatility timing respectively.

Alternatively, to jointly test market return and volatility timing Chen and Liang (2006) propose a model of the form

(14) $$r_{i,t+1} = \alpha + \sum_{j=1}^{k} \beta_j r_{j,t+1} + \gamma \left(\frac{r_{m,t+1}}{\sigma_{m,t+1}} \right)^2 + \varepsilon_{t+1}$$

where the coefficient γ on the square of the conditional Sharpe ratio of the market portfolio has the intuitive appeal of measuring the manager's ability to time periods of high market return relative to volatility. Here such successful timing is indicated by $\gamma > 0$. We estimate these three timing models on UK equity mutual funds.

4. Data

Our mutual fund data set contains monthly returns on 842 (actively managed) UK equity Unit Trusts and Open Ended Investment Companies. 'UK Equity' funds have at least 80%

of the fund invested in UK equity. This data set represents almost the entire set of UK equity funds which existed at any point during the period January 1988 – December 2002[7]. By restricting funds to those investing in UK equity, more accurate market benchmarks may be used.

The data set includes both surviving funds (626) and nonsurviving funds (216) in order to control for survivorship bias. Nonsurviving funds are those which cease to exist at some point prior to the end of the sample period. Failure to include nonsurviving funds may bias performance findings upwards if their closure is related to poor performance. Funds are also categorised by investment objectives: equity income funds (162), 'All Company' or 'general equity ' funds (553) and smaller company funds (127). In addition, funds are also categorized by the location of operation - onshore funds (662) are domiciled in the UK while offshore funds (180) are domiciled in locations such as Dublin, Luxembourg, the Channel Islands and some other European locations, although all funds are UK equity funds. Fund returns are measured before taxes on dividends and capital gains but net of management fees. Hence, we follow the usual convention in using net returns (bid-price to bid-price, with gross income reinvested). Fund 'second units' have been excluded from the analysis. These arise for the most part when a single fund is sold under different pricing structures to different groups of investors such as retail and institutional or when the same fund is sold under agreed but slightly different pricing structures through life assurance companies etc. Second units do not represent separate independent portfolios and hence we exclude them. The market benchmark is the FT All Share Index of total returns (i.e. including reinvested dividends)[8]. Excess returns are calculated using the one-month UK T-bill rate.

5. Empirical Results

[7] Data Source: Standard & Poor's Copyright the McGraw Hill Company 2006.
[8] Results are similar when we use the FT 100 index as the market benchmark.

The unconditional market timing tests are presented in Table 1. Row 1 displays the market timing test statistic, $z = \sqrt{n}.\hat{\theta}_n / \hat{\sigma}_{\hat{\theta}_n}$ at various points in the cross-section of performance ranging from the best fund to the worst fund and this is distributed asymptotically as N(0,1) under the null of no market timing. Row 2 displays the market timing coefficient, $\hat{\theta}_n$, corresponding to the fund in row 1.[9] From the z-statistic in row 1, it is evident that there are only a small number of skilled market timers: the top 12 ranked funds demonstrate statistically significant positive market timing ability at the 5% significance level (one-tail test) – around 1.5% of the sample of funds[10]. The cross-sectional average test statistic is z = -0.738. More specifically, 77% of funds demonstrate negative market timing while 20% are statistically significant negative market timers. Figure 1 plots a histogram of the cross-sectional distribution of the z-statistic where it is clear the distribution is centered on a value less than zero with some funds in the tails exhibiting both statistically significant positive and negative market timing.

Overall, the nonparametric test fails to find evidence of timing ability among more than a 'handful' of UK equity mutual funds. For comparison, Table 1 (row 3 and row 4) also reports the t-statistics of the market timing coefficients of the TM and HM tests (for the funds as ranked in row 1)[11]. Interestingly, 10 (11) of the top 12 funds which are found to be statistically significant positive market timers using the nonparametric test are also found to be successful market timers using the TM (HM) procedure at the 5% significance level. However overall, the regression tests indicate somewhat stronger evidence of market timing than the non-parametric z-statistic, since for the TM and HM models 31 and 22 funds respectively, are found to have statistically significant positive timing skill. Correlation coefficients between the market timing test statistics of the three procedures

[9] To improve statistical reliability results are reported for funds with a minimum of 12 observations which leaves 791 funds in the analysis.
[10] When discussing the *proportion* (or total number) of funds that have a statistically significant value for z , then strictly speaking we are in a multiple testing framework so the significance level for the overall *proportion* of significant funds will be different from the 5% significance level for each fund taken individually (because of compound type-I errors).
[11] The TM and HM t-statistics are based on Newey-West heteroscedasticity and autocorrelation adjusted standard errors.

reveal a higher coefficient of 0.95 between the TM and HM procedures than the nonparametric/TM correlation coefficient of 0.81 or the nonparametric/HM correlation coefficient of 0.86. Jiang (2003) reports similar findings and suggests that the higher correlation between the TM and HM measures may arise because these methods capture not only the quality of the fund manager’s timing information but also the aggressiveness of response - the nonparametric measure, on the other hand, is unaffected by the aggressiveness of response. This methodological difference may also account for the slightly higher prevalence of positive timing found by the TM and HM methods relative to the nonparametric procedure.

To mitigate survivorship bias we include nonsurviving funds in the analysis. Of the 791 funds examined, 208 are nonsurvivors. In Table 1, the row denoted ‘Survival’ indicates whether the ranked funds were survivors or nonsurvivors: 1 denotes a survivor, 0 a nonsurvivor. None of the funds which demonstrate statistically significant positive timing ability are nonsurvivors and of the top 20 ranked funds only one is a nonsurvivor. However, nonsurviving funds are not notably bad market timers.

Our (unconditional) market timing results for UK mutual funds are broadly in line with those of Jiang (2003) for the US who reports that between 2% and 5% of funds possess statistically significant positive timing skill (depending on the alternative market indices used) and also reports that the average US fund displays negative timing ability. To examine the question of whether market timing ability is related to the age of the fund, the final row of Table 1 reports the number of (monthly) observations for each of the funds. It is evident that better performing market timers are generally shorter-lived funds[12].

[12] In results not shown, the average market timing test statistic among funds of between 1 and 5 years maturity is z = -0.493 while among funds of greater than 10 years maturity is z = -0.936, although both figures are negative and statistically insignificant. Jiang (2003) also reports negative and statistically insignificant market timing (on average) among these different age categories of funds.

Market Timing Performance by Investment Style and Location

To explore possible differences in timing skill between funds of different investment objectives, i.e. income funds, general equity funds and small stock funds, we present more detailed results by investment objective in Table 2. However, there is some potential for spurious timing inferences across fund investment styles. One difficulty is the assumed independence between security selection and market timing information. A manager's information in both these areas may be correlated and consequently selectivity and market timing inferences may be difficult to 'disentangle' (Admati et al 1986, Grinblatt and Titman 1989). For example, it has been argued that small stock funds may exhibit spurious timing against a market benchmark comprised of large stocks as small stocks may have (call) option-like characteristics, (Jagannathan and Korajczyk, 1986). Alternatively, it may be argued that general equity funds select from the broadest universe of stocks which make up the benchmark market portfolio, again creating an overlap between selectivity and timing decisions.

Notwithstanding these caveats, comparing row 1 of each panel in Table 2 it is clear that there is some evidence of positive market timing ability using the nonparametric z-statistic both for equity income funds and general equity funds in the extreme right tails of the distribution, while no small company funds exhibit statistically significant positive market timing. For small stock funds, the average timing coefficient is z = -1.55 compared to z = -0.62 and z = -0.57 among the equity income and general equity funds respectively. This comparatively poor performance is also evident in Figure 2 which shows histograms for the performance distributions of the three investment styles - around 15% of funds in equity income and general equity and up to 47% of funds in the small company sectors show statistically significant negative timing. The results of the TM and HM regression tests point to similar conclusions on investment style and timing performance.

We next investigate whether the small company funds attempt to time a small capitalisation market benchmark rather than a broader market benchmark. In Panel C, (Table 2) the row denoted 'HGSC' reports the nonparametric test statistics for small company funds measured against the Hoare Govett Small Capitalisation index for UK small stocks. The cross-sectional distribution reported in this row lies further to the right of the distribution presented in row 2 using the broader FTSE All Share market returns. The z-statistics suggest that around 7 small company funds have some success in timing the small-cap index and there is considerably less negative market timing. Broadly similar results on market timing performance by investment sector are reported for the US by Jiang (2003) who demonstrates very few significant differences in timing ability between funds of different investment objectives – and all sectors except a specialist technology sector are shown, on average, to mis-time the market.

Table 3 presents the market timing test statistics of funds categorised by the fund location. Panel A presents results for the 623 onshore UK funds while Panel B reports results for the 168 offshore funds. A small number of both onshore and offshore funds (around 1% and 2% respectively) exhibit statistically significant positive market timing (at a 5% significance level) when using the nonparametric z-statistic while among onshore funds a higher proportion of funds exhibit statistically significant negative market timing (21%) compared to 14% of offshore funds[13].

Conditional Market Timing

Tests of conditional market timing can determine whether the successful market timing of a small number of funds is attributable to public information or whether it arises from private timing signals. Table 4 reports the results from a selection of conditional tests using public information variables: Z1 = 1 month UK Tbill rate, Z2 = term spread, Z3 =

[13] Cuthbertson et al (2005) reveal substantial differences between onshore and offshore funds in terms of *ex-post* alphas and suggest informational asymmetry, differences in fees and/or genuine skill differentials as possible explanations. These differences in alphas do not transfer to differences in market timing skill between onshore/offshore funds. This may be because there is less (or no) informational asymmetry when predicting 'macro' level market movements compared to the 'micro' level security selection required for generating a positive alpha.

market dividend yield and Z4 = gilt/equity yield ratio.[14]. (The first row is taken from the unconditional tests in Table 1 for ease of comparison). The conditional test statistics correspond to the funds as ranked in row 1. The conditional test results are similar to those of the unconditional tests and are largely invariant to the choice of conditioning variables, Z. Across the conditional tests there is evidence that around 7 funds (top 1%) have genuine market timing skill (with few exceptions outside the top 7). Hence we cannot reject the hypothesis that a small number of funds skillfully time the market based on private timing signals - on the other hand around 20% of funds demonstrate statistically significant negative market timing.

Volatility Timing

Funds may attempt to time market volatility as well as market return. We implement the regression based tests of market return timing and volatility timing in equations (11), (13) and (14) above. Assessing volatility timing from equation (11) we find evidence (not tabulated) that around 7% of funds successfully time volatility (at 5% significance level using a one-tail test). A test of the hypothesis of joint return and volatility timing (using the Sharpe ratio formulation of equation 14) reveals that only 32 funds (4%) provide evidence of skillful market timing. Finally, using the joint timing test of equation (13), we find that 25 funds positively time the market return with $\gamma > 0$ while a subset of 9 of these funds also successfully time market volatility, $\lambda < 0$. A slightly higher 48 funds are successful volatility timers, where a subset of 9 of these are also positive market return timers[15],[16].

In Table 5 we report the extent of the overlap between funds which successfully time market return by the nonparametric test and funds which successfully time market volatility by the alternative regression based tests. The table reports results for the top 12 funds sorted by the nonparametric tests statistic. (Previously, 12 funds were found to be

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[14] In results not shown, conditional tests using a number of alternative combinations of the public information variables were applied and results are similar to those presented.
[15] All tests use Newey-West autocorrelation adjusted standard errors.
[16] Funds which successfully time market volatility are found in all three sectors of income, general equity and small stock funds as well as both onshore/offshore and survivors/nonsurvivor funds. However, similar to the return timing results reported previously, small stock funds are slightly under-represented.

significant positive market return timers by this test). Of the 12 positive market return timers, only 1 fund is found to successfully time market volatility (row 2) but 8 funds are shown to jointly time return and volatility (row 3).

Overall, the evidence of volatility timing among UK equity mutual funds appears to be slightly more prevalent than return timing. However, we find no evidence of a positive relation between market return and volatility in the UK (the correlation between the two measures in our data is – 0.02) indicating that volatility timing does not offer an explanation for the poor market return timing results[17].

6. Conclusion

In this paper we have used standard parametric tests and, for the first time on UK data, non-parametric tests to assess the market timing performance of *individual* UK mutual funds. Our large survivorship free data base of around 800 (non-tracker, non second-unit) funds is also the most comprehensive used to-date and we extend the data set from the mid-1990s to include the market downturn after 2000. The non-parametric approach is less restrictive in its behavioural assumptions than the standard regression based tests. It also has the advantage that it is based on the quality of the manager's timing signals rather than the aggressiveness of his response – it is the former which is of greater interest to investors.

On the basis of our non-parametric tests we find that a relatively small number (around 1.5%) of UK equity mutual funds possess significant positive market timing skill, while a larger proportion of around 20% are shown to mis-time the market. This evidence of market timing (both positive and negative) is found to be less than is suggested by the regression based approaches of Treynor-Mazuy and Henriksson–Merton and this may be because the latter tests incorporate the aggressiveness of the manager's response to

[17] Busse (1999) also finds a (larger) negative correlation between market returns and volatility in the US ranging between –0.025 and –0.50 depending on the market indices used.

timing signals while the nonparametric measure does not. Similarly, our nonparametric results suggest that while the cross-sectional average timing measure is negative it is not significantly so - this is in contrast to previous UK studies such as Fletcher (1995) and Leger (1997) which use the regression based tests. Our nonparametric results are robust with respect to the choice of benchmark market returns against which funds are evaluated, with respect to whether timing performance is measured unconditionally or conditionally upon public information and results broadly apply to all three investment styles analysed, though small company funds are found to time a small stock index rather than a broad market index.

Regression based tests provide evidence that a number of funds can time market volatility and reduce market exposure accordingly. A smaller number of funds appear to time market returns and volatility jointly. However, there is little evidence to suggest that volatility timing gives rise to spurious negative return timing. One possible explanation of the poor market return timing results lies in the open ended nature of the funds. In a rising market the funds may experience higher investor cash inflows, a relatively high (short term) cash position, lower overall exposure to the market and hence lower returns. Conversely, a falling market may be associated with higher redemptions, causing the fund to liquidate its cash position leading to higher market exposure. Nevertheless, it remains difficult for investors to find UK funds that use private information to successfully predict the direction of market indexes.

References

Abrevaya, J. and W. Jiang (2001), Pairwise slope statistics for testing curvature, working paper, University of Chicago Graduate School of Business.

Admati, A., S. Bhattacharya and P. Pfleiderer (1986), On timing and selectivity, *Journal of Finance*, Vol. 41, No. 3, pp. 715-730.

Admati, A. and P. Pfleiderer (1997), Does it all add up? Benchmarks and the compensation of active portfolio managers, *Journal of Business*, Vol. 70, No. 3, pp. 323-350.

Becker, C., W. Ferson, D. Myers and M. Schill (1999), Conditional market timing with benchmark investors, *Journal of Financial Economics*, Vol. 52, No. 1, pp. 119-148.

Bollen, N. and J. Busse (2001), On the timing ability of mutual fund managers, *Journal of Finance*, Vol. 56, No. 3, pp. 1075-1094.

Bollen, N. and J. Busse (2005), Short term persistence in mutual fund performance, *Review of Financial Studies*, Vol. 18, No. 2, pp. 569-597.

Breen, W., R. Jagannathan and A. Ofer (1986), Correcting for heteroscedasticity in tests for market timing ability, *Journal of Business*, Vol. 59, No. 4, pp. 585-598.

Brown, K., W. Harlow and L. Starks (1996), Of tournaments and temptations: an analysis of managerial incentives in the mutual fund industry, *Journal of Finance*, Vol. 51, No. 1, pp. 85-110.

Busse, J. (1999). Volatility timing in mutual funds: evidence from daily returns, *Review of Financial Studies*, Vol. 12, No. 5, pp. 1009-1041.

Carpenter, J. (2000), Does option compensation increase managerial risk appetite, *Journal of Finance*, Vol. 55, No. 5, pp. 2311-2331.

Chen, C. and S. Stockum (1986), Selectivity, market timing and random behaviour of mutual funds: a generalized model, *Journal of Financial Research*, Spring, pp. 87-96.

Chen, Y. and B. Liang (2006), Do market timing hedge funds time the market?, Working Paper, SSRN.

Chevalier, J. and G. Ellison (1997), Risk taking by mutual funds as a response to incentives, *Journal of Political Economy*, Vol. 105, No. 6, pp. 1167-1200.

Clare, A., S. Thomas and M. Wickens (1994), Is the Gilt-Equity yield ratio useful for predicting UK stock returns?, *The Economic Journal*, Vol. 104, No. 423, pp. 303-315.

Coggin, D., F. Fabozzi and S. Rahman (1993), The investment performance of US equity pension fund managers: an empirical investigation, *Journal of Finance*, Vol. 48, No. 3, pp. 1039-1055.

Cuthbertson, K., D. Nitzsche and N. O' Sullivan (2005), Mutual fund Performance: Skill or Luck?, Working Paper, SSRN.

Edelen, R.M. (1999), Investor flows and the assessed performance of open-end mutual funds, *Journal of Financial Economics*, Vol. 53, No. 3, pp. 439-466.

Ferson, W. and K. Khang (2002), Conditional performance measurement using portfolio weights: evidence for pension funds, *Journal of Financial Economics*, Vol. 65, No. 2, pp. 249-282.

Ferson, W. and R. Schadt (1996), Measuring fund strategy and performance in changing economic conditions, *Journal of Finance*, Vol. 51, No. 2, pp. 425-462.

Ferson, W. and V. Warther (1996), Evaluating fund performance in a dynamic market, *Financial Analysts Journal*, Vol. 52, No. 6, pp. 20-28.

Fletcher, J. (1995), An examination of the selectivity and market timing performance of UK unit trusts, *Journal of Business Finance and Accounting*, Vol. 22, No. 1, pp. 143-156.

Fletcher, J. and D. Forbes (2002), An exploration of the persistence of UK unit trust performance, *Journal of Empirical Finance*, Vol. 9, No. 5, pp. 475-493.

Goetzmann, W., J. Ingersoll Jr. and Z. Ivkovich (2000), Monthly measurement of daily timers, *Journal of Financial and Quantitative Analysis*, Vol. 35, No. 3, pp. 257-290.

Grinblatt, M. and S. Titman (1989), Portfolio performance evaluation: old issues and new insights, *Review of Financial Studies*, Vol. 2, No. 3, pp. 393-421.

Henriksson, R. and R. Merton (1981), On market timing and investment performance II: statistical procedures for evaluating forecasting skills, *Journal of Business*, Vol. 54, No. 4, pp. 513-33.

Jagannathan, R. and R. Korajczyk (1986), Assessing the market timing performance of managed portfolios, *Journal of Business*, Vol. 59, No. 2, pp. 217-235.

Jiang, W. (2003), A nonparametric test of market timing, *Journal of Empirical Finance*, Vol. 10, No. 4, pp. 399-425.

Jiang, G., T. Yao and T. Yu (2005), Do mutual funds time the market? Evidence from portfolio holdings. AFA 2005 Philadelphia Meetings Papers. Available at SSRN.

Keswani, A. and D. Stolin (2005), Mutual Fund Performance Persistence and Competition: A Cross-Sector Analysis, Working Paper, SSRN.

Kothari, S. and J. Warner (2001), Evaluating mutual fund performance, *Journal of Finance*, Vol. 56, No. 5, pp. 1985-2010.

Leger, L. (1997), UK investment trusts: performance, timing and selectivity, *Applied Economics Letters*, Vol. 4, No. 2, pp. 207-210.

Mamaysky, H., M. Spiegel and H. Zhang (2004), Estimating the dynamics of mutual fund alphas and betas. Yale ICF Working Paper No. 03-03, EFA 2003 Annual Conference No. 803, AFA 2004 San Diego Meetings. Available at SSRN.

OECD, 2003, Monitoring the Future Social Implication of Today's Pension Policies, *OECD*, Paris, unpublished.

Quigley, G, and R. Sinquefield (2000), Performance of UK Equity Unit Trusts, *Journal of Asset Management,* Vol. 1, No. 1, pp. 72-92.

Scruggs, J. (1998). Resolving the puzzling intertemporal relation between the market risk premium and conditional market variance: a two-factor approach, *Journal of Finance*, Measuring fund strategy and performance in changing economic conditions, Vol. 53, No. 2, pp. 575-603.

Serfling, R. (1980). Approximation theorems of mathematical statistics, Wiley, New York.

Treynor, J. and K. Mazuy (1966), Can mutual funds outguess the market?, *Harvard Business Review*, Vol. 44, No. 4, pp. 131-136.

Turner, Adair, 2004, Pensions : Challenges and Choices : The First Report of the Pensions Commission, The Pensions Commission, *The Stationary Office*, London.

Warther, V. (1995), Aggregate mutual fund flows and security returns, *Journal of Financial Economics*, Vol. 39, No. 2, pp. 209-235.

Wermers, R. (2000), Mutual fund performance: an empirical decomposition into stock-picking talent, style, transactions costs and expenses, *Journal of Finance*, Vol. 55, No. 4, pp. 1655-1695.

Table 1: Mutual Fund Market Timing Performance – Unconditional Tests

Table 1 presents results for the unconditional market timing tests. Row 1 reports the nonparametric test statistic, $z = \sqrt{n}.\hat{\theta}_n \big/ \hat{\sigma}_{\hat{\theta}_n}$ which is asymptotically distributed as N(0,1) under the null hypothesis of no market timing. Funds are presented from worst to best based on this statistic. Row 2 reports $\hat{\theta}_n$, the market timing coefficient, of the funds in row 1. Row 3 and row 4 show the t-statistics of the TM and HM timing coefficients respectively. Row 5 reports the nonparametric test statistic, z, using the FT100, rather than the FTSE All Share index, as the market benchmark. Row 6 describes the investment objective of the funds in row 1 where, 1 = equity income fund, 2 = general equity fund, 3 = small stock fund. Row 7 indicates whether the fund is a survivor or a nonsurvivor: 1 = survivor, 0 = nonsurvivor. Row 8 describes the fund location: 1 = onshore, 0 = offshore. Row 9 displays the number of fund observations. Results relate to the period 1988M1:2002M12 and are restricted to funds with a minimum of 12 observations, leaving 791 funds in the analysis.

Unconditional Market Timing Results

	min	5.min	min5%	min10%	min40%	max30%	max10%	max5%	max3%	20max	15max	12max	10max	7max	5.max	3.max	2.max	max
Test Stat, z.	-4.927	-3.054	-2.398	-2.071	-1.026	-0.174	0.563	0.956	1.343	1.407	1.549	1.668	1.812	1.952	2.028	2.801	2.861	3.868
$\hat{\theta}_n$	-0.472	-0.093	-0.077	-0.063	-0.030	-0.007	0.020	0.052	0.127	0.133	0.117	0.101	0.116	0.226	0.128	0.152	0.190	0.231
t(TM)	-6.438	-3.512	-2.179	-1.792	-1.811	-0.194	-0.330	3.280	1.957	2.394	1.796	1.032	1.119	5.996	3.128	3.025	2.848	4.318
t(HM)	-6.873	-3.569	-2.367	-1.747	-1.469	-0.580	-0.041	2.676	1.532	2.010	1.919	1.887	1.476	4.322	3.004	2.784	3.088	3.957
z (FT100)	-6.120	-3.509	-2.855	-2.508	-1.570	-0.808	0.044	0.566	0.817	0.929	1.177	1.285	1.300	1.542	1.814	2.563	3.078	3.092
Style	2	2	3	3	2	2	2	2	2	2	2	2	2	2	2	2	1	1
Survival	1	1	0	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1
Location	1	1	1	1	0	0	1	1	0	1	1	0	1	1	0	1	1	1
No. Obs.	15	180	132	180	147	143	157	105	30	25	41	25	36	17	79	55	44	39

Figure 1: Distribution of the Unconditional Market Timing Test Statistic

Figure 1 displays a histogram of the cross-section of unconditional market timing test statistics, z. The figure is based on 791 funds with a minimum of 12 monthly observations.

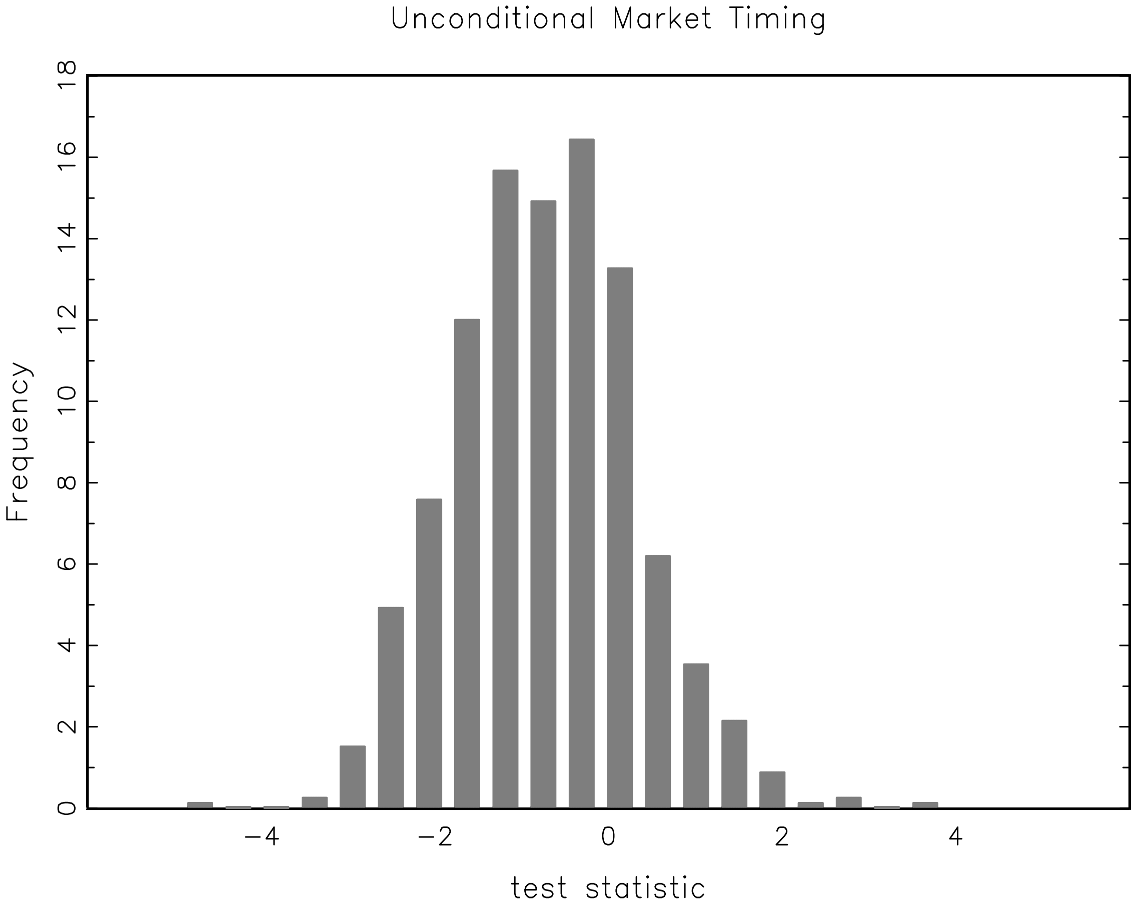

Table 2: Mutual Fund Market Timing Performance – By Investment Style

Table 2 presents results for the unconditional market timing tests by investment style. In each panel, Row 1 reports the nonparametric test statistic, $z = \sqrt{n}.\hat{\theta}_n / \hat{\sigma}_{\hat{\theta}_n}$, and the funds are presented from worst to best based on this statistic. Row 2 reports $\hat{\theta}_n$, the market timing coefficient of the funds in row 1. Row 3 and row 4 show the t-statistics of the TM and HM timing coefficients respectively. In Panel A, row 5 reports the nonparametric test statistic, z, using the FT100, rather than the FTSE All Share index, as the market benchmark. In Panel C, row 5 reports the test statistic, z, using the Hoare Govett Small Cap (HGSC) index as the market benchmark. In all panels, rows denoted 'survival' indicate whether the fund is a survivor or nonsurvivor: 1 = survivor, 0 = nonsurvivor. Rows denoted 'Location' indicates fund location: 1 = onshore, 0 = offshore. The final row in each panel displays the number of fund observations. Results relate to the period 1988M1:2002M12 with 155 equity income, 514 equity and 122 small stock funds.

Unconditional Market Timing – By Investment Style

Panel A : Equity Income

	min	5.min	min5%	min10%	min20%	min40%	max30%	max20%	max10%	10max	7max	5.max	3.max	2.max	max
Test Stat, z	-3.137	-2.275	-1.969	-1.838	-1.520	-0.898	-0.202	0.081	0.517	0.762	1.066	1.401	2.179	2.861	3.868
$\hat{\theta}_n$	-0.082	-0.296	-0.062	-0.051	-0.048	-0.032	-0.007	0.002	0.022	0.023	0.062	0.044	0.229	0.190	0.232
t(TM)	-3.445	-2.943	-1.832	-0.820	-3.615	-0.611	-0.383	-0.109	-0.499	-0.373	3.062	0.121	2.084	2.848	4.318
t(HM)	-3.701	-3.821	-1.892	-1.250	-3.144	-0.556	-0.168	0.018	-0.513	0.056	2.669	0.481	2.090	3.088	3.957
z (FT100)	-3.717	-2.855	-2.576	-2.268	-1.907	-1.528	-0.863	-0.613	-0.031	0.346	0.711	0.914	2.563	3.078	3.092
Survival	1	1	1	1	1	0	0	1	1	0	1	0	1	1	1
Location	1	1	1	1	1	1	1	1	0	1	1	1	0	1	1
No. Obs.	180	14	180	180	180	132	132	177	105	132	83	129	32	44	39

Panel B : General Equity

	min	5min	min5%	min10%	min20%	min40%	max30%	max20%	max10%	10max	7max	5max	3max	2max	max
Test Stat, z	-4.927	-2.875	-2.331	-1.925	-1.394	-0.821	-0.055	0.221	0.744	1.617	1.812	1.922	2.019	2.028	2.801
$\hat{\theta}_n$	-0.472	-0.192	-0.144	-0.156	-0.043	-0.026	-0.002	0.007	0.080	0.169	0.116	0.121	0.216	0.128	0.152
t(TM)	-6.438	-3.065	-3.486	-1.727	-2.791	-1.757	-0.232	1.183	1.249	0.395	1.119	3.766	1.742	3.128	3.025
t(HM)	-6.873	-3.195	-2.473	-2.596	-2.281	-1.437	-0.204	1.134	0.904	0.549	1.476	3.049	1.924	3.004	2.784
Survival	1	1	0	1	1	1	0	0	1	1	1	1	1	1	1
Location	1	1	1	0	1	1	1	1	1	1	1	1	1	0	1
No. Obs.	15	39	36	34	178	180	132	132	25	30	36	73	13	79	55

Panel C : Smaller Companies

	min	5.min	min5%	min10%	min20%	min40%	max30%	max20%	max10%	10max	7max	5.max	3.max	2.max	max
Test Stat, z	-3.243	-2.752	-2.658	-2.439	-2.218	-1.806	-1.258	-1.079	-0.513	-0.248	-0.055	0.072	0.573	0.683	0.983
$\hat{\theta}_n$	-0.094	-0.085	-0.081	-0.132	-0.066	-0.053	-0.049	-0.062	-0.042	-0.022	-0.002	0.003	0.116	0.069	0.116
t(TM)	-3.178	-2.005	-2.289	-2.262	-3.530	-1.973	-1.299	-1.018	-0.495	-0.812	-1.062	-0.641	-0.728	0.859	0.389
t(HM)	-3.198	-2.491	-2.343	-1.778	-3.478	-2.130	-1.268	-1.336	-0.621	-0.723	-0.526	-0.372	-0.511	0.425	0.433
z (HGSC)	-1.781	-1.445	-1.195	-0.972	-0.567	0.309	0.510	0.787	1.186	1.232	1.698	1.722	1.966	2.058	2.167
Survival	0	0	1	0	1	1	1	1	1	1	0	1	1	1	1
Location	1	1	1	1	1	1	1	1	0	1	1	1	1	0	1
No. Obs.	132	132	180	54	180	180	115	71	50	46	71	116	15	28	30

Figure 2: Distributions of the Unconditional Market Timing Test Statistic – By Investment Style

Figure 2 shows a histogram of the cross-section of unconditional market timing test statistics, z, by investment style as indicated. The figures are based on 155 equity income, 514 equity and 122 small stock funds with at least 12 monthly observations.

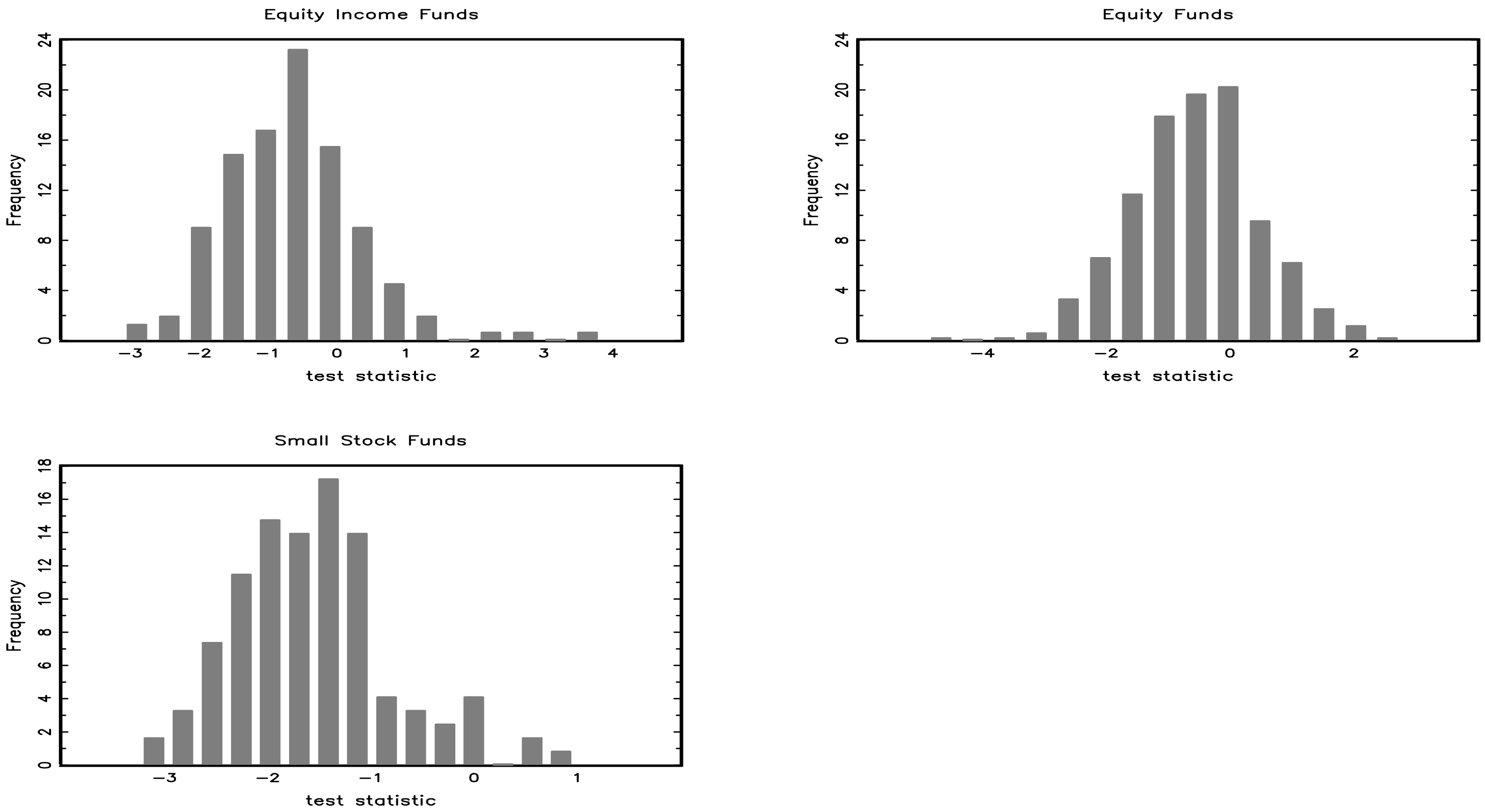

Table 3: Mutual Fund Market Timing Performance – By Fund Location

Table 3 presents results for the unconditional market timing tests by fund location. Row 1 reports the nonparametric test statistic, $z = \sqrt{n}.\hat{\theta}_n \big/ \hat{\sigma}_{\hat{\theta}_n}$, and funds are presented from worst to best based on this statistic. Row 2 reports $\hat{\theta}_n$, the market timing coefficient of the funds in row 1. Row 3 and row 4 show the t-statistics of the TM and HM timing coefficients respectively. Row 5 indicates whether the fund is a survivor or nonsurvivor: 1 = survivor, 0 = nonsurvivor. Row 6 describes the investment objective of the sorted funds: 1 = equity income fund, 2 = general equity fund, 3 = small stock fund. Row 7 displays the number of fund observations. Results relate to the period 1988M1:2002M12 with 623 onshore and 168 offshore funds.

Unconditional Market Timing – By Investment Location

Panel A : Onshore UK Funds

	min	5.min	min5%	min10%	min20%	min40%	max20%	max10%	20max	15max	10max	5.max	3.max	2.max	max
Test Stat, z	-4.927	-3.054	-2.430	-2.11	-1.693	-1.104	0.072	0.544	1.237	1.407	1.574	1.952	2.801	2.861	3.868
$\hat{\theta}_n$	-0.472	-0.093	-0.072	-0.065	-0.056	-0.032	0.002	0.022	0.066	0.133	0.075	0.226	0.152	0.190	0.232
t(TM)	-6.438	-3.512	-1.596	-2.548	-2.144	-1.415	0.420	0.014	2.691	2.394	1.271	5.996	3.025	2.848	4.318
t(HM)	-6.873	-3.659	-2.021	-2.721	-2.088	-1.396	0.026	0.329	2.574	2.010	1.259	4.322	2.784	3.088	3.957
Survival	2	2	2	3	2	2	2	2	2	2	2	2	2	1	1
Style	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1
No. Obs.	15	180	180	180	180	180	180	17	83	25	73	17	55	44	39

Panel B : Offshore Funds

	min	5min	min5%	min10%	min20%	min40%	max20%	max10%	20max	15max	10max	5max	3max	2max	max
Test Stat, z	-2.675	-2.505	-2.332	-1.919	-1.357	-0.754	0.217	0.741	0.525	0.804	1.115	1.473	1.893	2.028	2.179
$\hat{\theta}_n$	-0.127	-0.170	-0.179	-0.064	-0.059	-0.038	0.046	0.417	0.047	0.028	0.514	0.089	0.108	0.128	0.229
t(TM)	-2.392	-2.578	-1.926	-2.143	-1.018	0.412	0.612	-0.326	-0.188	0.982	0.389	2.978	1.876	3.128	2.084
t(HM)	-2.136	-2.434	-2.545	-1.845	-1.308	-0.338	0.047	0.026	-0.106	0.887	0.509	2.833	2.016	3.004	2.090
Survival	2	2	2	2	2	1	1	2	2	2	2	2	2	2	1
Style	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
No. Obs.	64	47	35	180	143	87	15	56	33	156	96	81	46	79	32

Table 4: Mutual Fund Market Timing Performance – Conditional Tests

Table 4 presents results for the conditional market timing tests. Rows report the nonparametric test statistic, $z = \sqrt{n}.\hat{\theta}_n \big/ \hat{\sigma}_{\hat{\theta}_n}$, and funds are presented from worst to best based on this statistic. For ease of comparison, row 1 shows the *unconditional* test statistics. Row 2 to row 6 report the nonparametric test statistics of the *conditional* market timing tests for the funds as presented in row 1. Public information variables are: Z1 = 1 month UK Tbill rate, Z2 = term spread, Z3 = market dividend yield and Z4 = gilt/equity yield ratio. Results relate to the period 1988M1:2002M12 and are restricted to funds with a minimum of 12 observations, leaving 791 funds in the analysis.

Conditional Market Timing																		
	min	5.min	min5%	min10%	min40%	max30%	max10%	max5%	max3%	20max	15max	12max	10max	7max	5.max	3.max	2.max	max
Test Stat, z	-4.927	-3.054	-2.398	-2.071	-1.026	-0.174	0.563	0.956	1.343	1.407	1.549	1.668	1.812	1.952	2.028	2.801	2.861	3.868
Z1	-3.833	-2.791	-2.015	-1.528	-0.318	0.121	0.528	1.182	1.323	1.133	1.897	1.616	2.068	1.846	2.448	2.083	2.482	2.353
Z2	-1.742	-2.673	-1.702	-1.503	-0.735	-0.117	0.086	1.012	1.253	1.301	1.874	1.522	1.962	2.325	2.753	2.305	2.426	2.114
Z3	-5.416	-2.103	-2.203	-1.512	-0.288	0.019	0.955	0.422	1.428	1.443	1.578	0.635	1.328	1.970	1.593	2.523	2.567	3.715
Z1,Z2,Z3	-1.646	-1.928	-1.665	-1.256	0.035	0.267	0.445	0.827	1.330	0.200	1.378	1.363	0.934	2.790	1.531	1.968	2.121	1.612
Z4	-3.103	-3.105	-1.860	-2.355	-0.865	-0.278	0.325	0.935	1.461	0.551	1.150	1.069	0.931	1.830	1.916	2.637	2.986	3.602

Table 5: Mutual Fund Market Return Timing and Volatility Timing

Table 5 presents results for the market volatility and joint market volatility and market return timing tests. Row 1 reports the nonparametric test statistic, $z = \sqrt{n}.\hat{\theta}_n / \hat{\sigma}_{\hat{\theta}_n}$, for the highest sorted 12 funds - significant at 5% (one-tail test). Row 2 shows the volatility timing coefficient, λ, of the funds as sorted in row 1. Row 3 presents the joint return and volatility timing coefficient, γ, of the funds as sorted in row 1. Row 4 reports the market return and volatility timing coefficients as indicated of the funds as sorted in row 1. In each case Newey-West adjusted t-statistic are shown in parentheses.

Market Return and Volatility Timing												
	12max	11max	10max	9max	8max	7max	6max	5max	4.max	3.max	2.max	max
Nonparametric test statistic, $z = \sqrt{n}.\hat{\theta}_n / \hat{\sigma}_{\hat{\theta}_n}$	1.668	1.686	1.812	1.893	1.922	1.952	2.019	2.028	2.179	2.801	2.862	3.868
$r_{i,t+1} = \alpha + \sum_{j=1}^{k} \beta_j r_{j,t+1} + \lambda r_{m,t+1}(\sigma_{m,t+1} - \bar{\sigma}_m) + \varepsilon_{t+1}$	0.001 (0.010)	0.021 (0.511)	0.023 (0.990)	0.031 (0.444)	-0.020 (-0.711)	0.095 (1.557)	1.142 (1.198)	-0.051 (-1.953)	0.011 (0.786)	0.007 (0.283)	0.029 (0.834)	0.032 (0.997)
$r_{i,t+1} = \alpha + \sum_{j=1}^{k} \beta_j r_{j,t+1} + \gamma \left(\frac{r_{m,t+1}}{\sigma_{m,t+1}} \right)^2 + \varepsilon_{t+1}$	0.065 (0.816)	0.060 (2.194)	0.085 (1.602)	0.019 (0.426)	0.108 (3.564)	0.155 (3.303)	0.233 (2.027)	0.109 (2.664)	0.093 (3.023)	0.073 (2.176)	0.129 (2.723)	0.095 (1.623)
$r_{i,t+1} = \alpha + \sum_{j=1}^{k} \beta_j r_{j,t+1} + \gamma r_{m,t+1}^2 + \lambda r_{m,t+1}(\sigma_{m,t+1} - \bar{\sigma}_m) + \varepsilon_{t+1}$	γ = 0.010 (0.959)	0.007 (1.468)	0.007 (0.203)	0.008 (1.293)	0.171 (4.668)	0.023 (3.421)	0.031 (1.546)	0.019 (4.325)	0.010 (2.565)	0.015 (2.954)	0.202 (3.249)	0.019 (4.391)
	λ = - .023 (-0.248)	0.005 (0.112)	0.007 (0.203)	0.015 (0.211)	-0.045 (-1.753)	-0.047 (-0.683)	-0.104 (-0.871)	-0.079 (-2.974)	-0.013 (-0.623)	-0.024 (-0.805)	-0.015 (-0.392)	-0.010 (-0.364)