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Performance of Personal Pension Schemes in the UK

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Abstract

This paper examines the performance of personal pensions (exempt unit trusts) in the UK 1980-2000. Unitised personal pension schemes are a type of mutual fund that is constituted as a contractual savings scheme, whose value can only be accessed at retirement. By studying the performance of these schemes we are able to assess the role of illiquidity in retail savings products. The paper examines those personal pension schemes that invest predominantly in UK equities, and first reports on the growth in personal pension schemes over this twenty-year period. The paper then assesses the performance of these pension funds relative to various asset pricing benchmarks, and finds that average performance is not significantly different from zero. The paper goes on to examine persistence in performance of these pension schemes and identifies negative persistent at short horizons, but at time-intervals of six months to one year finds significant positive persistence, though this positive persistence weakens at longer time intervals. We find that the performance persistence at the six to twelve month horizon is robust to a range of benchmarks, including a four factor benchmark that allows for momentum in stock returns, time-varying style coefficients, allowing for market timing and conditioning on macroeconomic variables, all of which might have been expected to explain the documented persistence.

Keyword: pensions, performance measurement, persistence

I Introduction

There has been a substantial growth in UK personal pensions over the last twenty years. According to the Sandler Report (2002) between 1988 and 1995 the share of total pensions assets represented by personal pensions increased from 12 to over 20 per cent. Personal pension schemes are *funded* and pay a pension at retirement on a *defined contribution* basis, and are broadly similar to the US's 401k individual pension plans, in that individuals have some choice over the type of investments in the fund, but the investment vehicle is a pooled investment fund, in which the individual participates with many other individuals. As a funded scheme, individuals make contributions into a personal pension fund over time, and this fund is managed and invested by a financial institution. Our aim in this paper is to examine the performance of these managed contractual savings schemes.

In the case of personal pensions the financial institutions managing the portfolios, are typically insurance companies, though they may in turn employ external fund managers. We will examine the performance of unit-linked personal pensions managed by these financial institutions as pooled investment funds. Unit-linked exempt schemes are a specific type of mutual fund but where contributions to personal pensions are set up as a contractual savings scheme.[1] These contractual savings schemes are a very illiquid form of investment, since the cumulated funds can only be accessed at retirement,[2] and we are interested in investigating the role of this illiquidity, in terms of fund performance. Recently Blake and Timmerman (1998), Allen and Tan (1999), Fletcher and Forbes (2002), Giles, Wilson and Worboys (2002) have all investigated performance persistence in UK mutual funds (unit trusts) over the last two decades. Typically these papers have found some evidence of performance persistence, but that it tends to be caused by poor performers continuing to under-perform. We will be concerned to compare the performance of the unit-linked personal pensions with the performance of mutual funds in general, to study the importance of long-term contractual savings on fund performance. Berk and

[1] Personal pensions funds also benefits from tax-privileged status, so that no tax is paid on reinvested dividends or capital gains. In comparison standard unit trusts, in common with all corporate entities, do not pay tax on dividends received, nor since the Finance Act 1980 do authorised unit trusts pay tax on capital gains. So the returns on exempt unit trusts and authorised unit trusts are not affected by the tax system.
[2] In fact, savings in a personal pension are made even more illiquid, by an Inland Revenue rule that 75% of the value of the accumulated pension fund at retirement must be converted into an annuity.

Green (2004) suggest that monies flow out of underperforming into outperforming funds, ensuring that there is no persistence in performance. However long-term contractual savings schemes imply barriers to the movement of monies, and therefore we might expect to observe more performance persistence in these schemes.

II Personal pension schemes in the UK

Personal Pensions were introduced in the UK in the Finance Act 1987, and came into existence on 1st July 1988. Prior to that date similar schemes called "Retirement Annuity Contracts", had existed directed towards the self-employed. The innovation of the 1987 pension legislation was the introduction of a specific type of personal pension known as an "appropriate personal pension", which enabled an individual employee to contract out of the state scheme SERPS, so that the Department of Social Security pays a rebate of National Insurance contributions into the individual's personal pension. Appropriate personal pensions are not available to the self-employed, because they are excluded from SERPS, and therefore they are allowed to contribute into ordinary personal pensions, which are open to both the employed and self-employed

There are two types of investment vehicles which individuals may choose from at the outset of the contract when setting up a personal pension. Endowment Schemes may be either with-profits (typically with reversionary bonuses, which once announced cannot be withdrawn, and terminal bonuses) or non-profit options (though these may be guaranteed). The structure of with-profits policies means that investment returns are smoothed over time by the provider. In contrast, under the second type of investment vehicle, unit-linked schemes, contributions are used to buy units whose value is linked to a specific investment fund, and the value of the pension fund will rise or fall in line with the value of the underlying investments.[3] In this paper, it is the performance of this second type of investment vehicle that we examine.

Under any defined contribution (or money purchase) scheme, individuals pay contributions into a fund, which builds up over time and at retirement the value of the

[3] A third type of investment vehicle is a Deposit Administration Scheme which is similar to a bank account, where the interest on the fund is reinvested, so that the capital value of the fund cannot fall.

fund is converted into an annuity to provide the pension. The pensioner bears the risk of fund underperformance, and is also exposed to the risk of converting the fund into an annuity at retirement.[4] Contributions into these personal pension schemes are subject to tax relief, following approval by the Inland Revenue Pension Schemes Office. Personal pensions are open to both the self-employed and employees whose employer's occupational scheme is not available, though employers often do not contribute to personal pensions. Benefits that a personal pension may pay to a pensioner are a pension (compulsory purchase annuity), to be started between the ages 50-74, and a tax-free lump sum of up to 25% of the value of the pension fund.

The percentage of the working population in the UK covered by each of the second and third tier schemes [James (1997)] is given in Table 1. According to the government Green Paper Partnership in Pensions (1998) there were 10 million personal pensions held, with 5.6 million APPs, and 4.6 million ordinary personal pensions, though some persons will have more than one pension. Individuals in the UK have been able to save in an individual pension plan through an exempt unit trust for a number of years. Table 2 reports the growth in the number of personal pension unit trusts from the Micropal database used in the current study. According to Pensions World (1976), in 1976 there were 24 authorised exempt unit trusts in existence with a combined market value of £71 million. From Table 2 it can be seen that by 2000 there were 545 funds investing in UK securities with a total market value £52.7 billion. Sandler (2002) suggests that there are three factors behind the growth in Personal Pensions. First there has been an increase in self-employment over the same period; second, the Social Security Act 1986 encouraged individual employees to opt out of SERPS and occupational schemes into a funded personal pension schemes; and third, the more recent introduction in April 2001 of Stakeholder Pensions. According to the OFT Report (1997) "The take up of approved personal pensions was much more rapid than expected. Between their introduction in 1988 and April 1993, the number of employees with personal pensions reached 5.7 million" (p. 32). Tables 3 illustrates the take-up of personal pensions throughout the nineties, and reports the numbers of employees who are members of personal pensions operated by insurance

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[4] The 1995 Pensions Act allows a pensioner to defer the conversion of the fund into an annuity, and in the meantime "draw-down" the fund to provide an income

companies. Panel A shows the total numbers of policies outstanding at the end of each year and Panel B shows the number of new policies taken out in each year. Insurance companies distinguish between regular monthly (referred to as regular premiums) and premiums payable as a lump sum (referred to as single premiums). It appears from Panel A that there are more than 20 million personal pensions outstanding by the end of 1999. However, it can be seen that the average premium per policy in Panel A of personal pensions in force was only £335 in 1999. In contrast the average premium of a new policy was over £15,350 in the case of single one-off contributions and over £1,353 in the case of yearly regular contribution schemes. The low contributions rate for personal pensions is a cause for concern since these rates are about one percent of average earnings and are unlikely to build up to a fund value which would generate a pension to live off. The discrepancy between the premiums for outstanding and new schemes highlights the fact that a large percentage of personal pensions are terminated before maturity due to the cessation of contributions. In the event that a contributor stops paying into the personal pension, the pension scheme is converted to paid-up status, which typically has low maturity values because the plan provider continues to extract the same annual charges as with an active policy.

The UK financial markets regulator (now the Financial Services Authority) has been reporting the (contributions) persistency of personal pensions using surveys since 1993/94.[5] Smith (2004) reports on these contribution persistency rates up to 2001, and these figures are reproduced in Table 4. Contribution persistency rates vary across distribution channels, depending on whether the pension is sold through an agent tied to a particular financial institution, or through an independent financial advisor, but there is evidence of convergence between the rates from these different distribution channels. There was a trend towards improvements in contribution persistency rates in the mid-nineties, which has since been reversed. The FSA (2000) reports on why consumers stop contributing into long-run savings policies. In a survey of 400 "lapsers" the study found that 10 per cent were genuinely unpredictable; in 25 per cent of cases the reason for lapsing was to do with the product (poor performance; disappointment with or sale; or feeling product was not right). In 60 per cent of cases

[5] Rather confusingly, persistency is used in two different contexts. Persistency in the performance of a fund, and persistency in consumers continuing to contribute to the contractual savings schemes. We will subsequently refer to this second type of persistency as contributions persistency.

lapse occurred because product became unaffordable, and in one third of these cases the discontinuation could have been predicted.[6] The econometric evidence in Smith (2004) confirms these findings, and reports some evidence of a link between stock market performance and contribution persistence. She makes the point that it is not in the interests of either consumers or the financial services industry, for consumers to let these contractual savings schemes lapse. From the consumers' perspective, this is because of the costs that they incur [Chapman (1999)]; but also providers lose out from the reduced revenue of a static fund and a loss of goodwill/reputation. Consequently we might expect unitised personal pension fund providers to devote greater resources to ensuring the personal pension funds are managed more effectively than regular unit trusts. Equally consumers, before they enter a contractual scheme, might be expected to examine the past performance of the pension fund provider.

III Evidence on Performance of Managed Funds

Unit-linked personal pensions are a type of mutual fund. The early literature of the performance of mutual funds in the US [Jensen (1968)] and much of the subsequent literature found that simple tests of abnormal performance did not yield significant returns. More recent work by Daniel, Grinblatt, Titman and Wermers (1997) using normal portfolio analysis shows that mutual fund managers – in particular aggressive-growth funds, exhibit some selectivity ability but that funds exhibit no timing ability. They introduce measures that identify if a manager can time the market, size, book to market, or momentum strategies. For the UK Blake and Timmermann (1998) examine the returns on 2300 UK open ended unit trusts over 23 year period (1972- 1995) gross of fees. Over the period the data includes 973 dead and 1402 surviving funds, and by studying the termination of funds, they are able to shed light on the extent of survivorship bias. They find economically and statistically very significant underperformance that intensifies as the termination date approaches, and they conclude that survivorship does not alter the results significantly.

[6] Alfon (20002) reports ABI figures that show that less than 1% of consumers switch to another pension provider.

Ippolito and Turner (1987), Coggin, Fabozzi and Rahman (1993), Lakonishok, Shleifer and Vishney (1992) provide evidence on the performance of occupational pension funds relative to external benchmarks, but this has also been disappointing. Lakonishok, Shleifer and Vishney (1992) emphasise that although there is a long literature on the under-performance of mutual funds, pension funds also under-perform relative to mutual funds on average: they refer to a “double-agency” problem since trustees of occupational pension funds also employ fund managers. In the UK Blake, Lehmann, and Timmermann, (1999) examine the asset allocations of a sample of 364 UK occupational pension funds who retained the same fund manager over the period 1986-1994. They find that the total return is dominated by asset allocation. Average return from stock selection is negative, and average return to market timing very negative. Thomas and Tonks (2001) in a large sample of pension funds find little evidence of any abnormal performance, but find that pension funds seem to follow very similar investment strategies, so that identifying out-performance is difficult.

Although on average fund managers do not outperform, in any sample there is a distribution to the performance, and more recently research on performance measurement has investigated consistency in performance, and whether there is persistence among the out-performers in the sample. Grinblatt and Titman (1992) find that differences in mutual fund performance between funds persist over 5-year time horizons and this persistence is consistent with the ability of fund managers to earn abnormal returns. Hendricks, Patel and Zeckhauser (1993) analysed the short-term relative performance of no-load, growth orientated mutual funds, and found the strongest evidence for persistence in a one year evaluation horizon. Brown and Goetzmann (1995) examine the performance persistence of US mutual funds and claim that the persistence is mostly due to funds that lag the S&P. They demonstrates that relative performance pattern depends on period observed and is correlated across managers, suggesting that that persistence is probably not due to individual managers but due to a common strategy that is not captured by standard stylistic categories or risk adjustment procedures. They suggest that the market fails to discipline underperformers, and their presence in the sample contributes to the documented persistence. Carhart (1997) demonstrates that common factors in stock returns and investment expenses explain persistence in equity mutual funds’ mean and risk-adjusted returns. The only significant persistence not explained, is concentrated in strong underperformance by the worst return mutual funds. His results do not support the existence of skilled or informed mutual fund portfolio managers. Blake and Timmerman (1998), Allen and Tan (1999), Fletcher and Forbes (2002), Giles, Wilson and Worboys (2002) have all investigated performance persistence in UK mutual funds (unit trusts) over the last two decades, with conflicting results. Blake and Timmermann (1998), Allen and Tan (1999) and Giles et al (2002) all find evidence of persistence in performance, but Fletcher and Forbes (2002) report that the evidence of persistence can be explained by a momentum factor. To the extent that there is persistence, it tends to be explained by the persistently poor performance of some underperforming funds. The Financial Services Authority (1999) discusses the use of past performance figures by unit trusts.

Berk and Green (2004) suggest that although flows of monies will follow past performance, if there are diseconomies from operating large funds, then money flows into successful mutual funds will continue until the expected return net of costs is zero. They argue that there will be no persistence in mutual fund performance since flows of monies are the equilibriating mechanism to ensure future expected returns are zero. This argument relies on there being no restriction on the flow of funds. In fact with respect to exempt unit trusts, there are restriction on the flow of funds due to the large cost penalties from closing down a personal pension scheme and starting a new one. Therefore it is more likely that we will observe persistence in exempt unit trusts rather than the regular non-exempt unit trusts.

In the UK Brown, Draper and McKenzie (1997) and Blake, Lehmann, & Timmermann, (1999) have examined consistency in UK occupational pension fund performance. Both studies find only weak evidence of persistence in performance. In constructing their data samples, both the Brown *et al* (1997) and Blake *et al* (1999) studies of UK pension funds specify that the pension fund have the same single fund manager over the length of their respective samples. Tonks (2005) argues that this specification of the dataset may have induced survivorship bias in these data samples, since Grinblatt and Titman (1992) and Hendricks, Patel and Zeckhauser (1993) have argued that if fund survival depends on average performance over several periods, then survivorship induces spurious reversals: first-period losers must subsequently win in order to survive, and this biases persistence downwards. Tonks (2005) examines persistence in pension fund manager performance using data on UK occupational pension funds irrespective of whether they change manager. He finds strong evidence of persistence in abnormal returns generated by fund managers over one year time horizons. He then compares his sample with a restricted sample that imposes the Brown *et al* (1997), and Blake *et al* (1999) criteria that specify that the pension fund has the same fund manager over the length of their respective samples. With the restricted sample the evidence on persistence is weaker.

III Measuring Fund Performance

Using Jensen's technique we regress the excess returns above the risk free rate R_{FPt} - r_{ft} against a four factor model. The four factor model is represented by the standard Fama-French three factors, that are the excess return on the market R_{mt} - r_{ft}, the returns on a size factor SMB_t which is the difference between the returns on a portfolio of small companies and a portfolio of large companies, and a book-to-market factor HML_t which is the difference in returns on a portfolio of high book-to-market companies and low book-to-market companies. The fourth factor is a momentum factor MOM_t

$$R_{pt} - R_{ft} = \alpha_p + \beta_p\left(R_{mt} - R_{ft}\right) + \gamma_{1p} SMB_t + \delta_p HML_t + \lambda_{\mathrm{p}} MOM + \varepsilon_{\mathrm{pit}} \qquad (1)$$

We estimate this model for each fund p over the t data periods, and save the coefficients α_p , β_p, δ_p, γ_p and λ_p. Under the null hypothesis of no-abnormal performance the α_p coefficient should be equal to zero. For each fund we may test the significance of α_{p} as a measure of that funds abnormal performance. We may test for overall fund performance, by testing the significance of the mean α when there are N funds in the sample

$$\bar{\alpha} = \frac{1}{N}\sum_{p=1}^{N}\alpha_p \qquad (2)$$

Assuming that the performance of each fund is independent [$Cov(R_p, R_q) = 0$], the appropriate t-statistic is

$$t = \frac{1}{\sqrt{N}} \sum_{p=1}^{N} \frac{\alpha_p}{SE(\alpha_p)} \qquad (3)$$

Alternatively, in estimating equation (1) without making any assumption about the cross-section relationship of returns between funds, we follow Blake and Timmermann (1998) and regress an equally-weighted portfolio of excess returns on the schemes for each time period t on the four factors.

The original Jensen technique made no allowance for market timing abilities of fund managers when fund managers take an aggressive position in a bull market, but a defensive position in a bear market. When portfolio managers expect the market portfolio to rise in value, they may switch from bonds into equities and/or they may invest in more high beta stocks. When they expect the market to fall they will undertake the reverse strategy: sell high beta stocks and move into “defensive” stocks.

If managers successfully engage in market timing then, returns to the fund will be high when the market is high, and also relatively high when the market is low. The Treynor-Mazuy test for market timing imposes a quadratic term in the return regression to identify this curvature.

$$R_{pt} - r_f = \alpha_p + \beta_p(R_{mt} - r_f) + \gamma_p SMB_t + \delta_p HML_t + \lambda_p MOM_t + \eta_p(R_{mt} - r_f)^2 + \varepsilon_{pt} \qquad (4)$$

Significance of market timing is measured by η_{p}. Recently Ferson and Schadt (1996) advocate allowing for the benchmark parameters to be conditioned on economic conditions: called conditional performance evaluation, on the basis that some market timing skills may be incorrectly credited to fund managers, when in fact they are using publicly available information to determine future market movements. In which case Ferson and Schadt argue that the predictable component of market movements should be removed in order to assess fund managers private market timing skills. Under a conditional version of the CAPM, the Jensen regression becomes

$$R_{pt} - R_{ft} = \alpha_p + \beta_{0p}\left(R_{mt} - R_{ft}\right) + \beta'_{1p}\left(z_{t-1}\left[R_{mt} - R_{ft}\right]\right) + \varepsilon_{\mathrm{it}} \qquad (5)$$

where z_{t-1} is a vector of instruments for the information available at time t (and is therefore specified as t-1) and $\beta_i(z_t)$ are time conditional betas, and their functional form is specified as linear

$$\beta_i(z_t) = b_0 + B'z_{t-1} \qquad (6)$$

where $z_{t-1} = Z_{t-1} - E(Z)$ is a vector of deviations of the Zs from their unconditional means. Implementing this approach involves creating interaction terms between the market returns and the instruments. Instruments used are: lagged 3-month Treasury Bill rate, lagged dividend yield, the slope of the term structure (difference between long and short run government bond yields), and a dummy variable for January.

The associated test for market timing now isolates the effect of public information incorporated in the conditional beta in (5). The amended Treynor-Mazuy test is

$$R_{pt} - r_f = \alpha_p + b_p(R_{mt} - r_f) + B'z_{t-1}(R_{mt} - r_f) + \eta_p(R_{mt} - r_f)^2 + \varepsilon_{pt} \qquad (7)$$

where the sensitivity of the manager's beta to the private market timing signal is measured by η_p.

In addition to testing for evidence of fund out-performance, we also examine the consistency or persistence of fund performance. Recently Carpenter and Lynch (1999) have assessed the power of these difference persistence tests particularly in the presence of different types of survivorship bias. Carpenter and Lynch classify persistence tests into two types: performance ranked portfolio strategies, and contingency tables.

Performance ranked portfolio tests sort funds each year into portfolios based on past abnormal performance. The measure that we use of fund performance is the average abnormal returns on the funds under management, where the abnormal returns from equation (1) are averaged over each fund and over each quarter in the ranking period. We then compute the equally weighted average portfolio abnormal return of the top and bottom portfolios over the subsequent evaluation period. We report the average abnormal returns AV5 and AV1 of the top and bottom portfolios in the evaluation period, averaged over all time periods. These procedures are followed for overlapping periods throughout the full period of the dataset, and we compute DIF as AV5-AV1, and then report TDIF, which is a t-statistic on DIF, which is calculated after allowing for the autocorrelation induced by the overlapping observations. From their simulations Carpenter and Lynch find that the persistence test based on TDIF is the best specified under the hypothesis of no persistence, and the most powerful against the alternatives considered.

In these persistence tests we examine alternative ranking and evaluation time periods, since it may be the case that persistence is only apparent at particular time intervals. For example to test for long run persistence 36MR36ME means we form portfolios on the basis of three-year ranking period and three year evaluation period. To test for short-run persistence, or the "hot-hands" phenomenon, we examine 1MR1ME, which means one month ranking and one month evaluation period.

Contingency tables classify funds as winners or losers in each of two consecutive time periods, and the numbers of winner-winner (WW), winner-loser (WL), loser-winner (LW), and loser-loser (LL) combinations are counted. We compute the following related statistics: a) Cross-product ratio CP = (WW x LL)/(WL x LW); b) Chi-Squared test with 1 d.o.f. where CHI = $\{(WW - N/4)^2 + (WL - N/4)^2 + (LW - N/4)^2$ $(LL - N/4)^2\}/N/4$; c) Percentage of repeat winners, PRW = WW/(N/2); and d) TCS is the t-statistic for the slope coefficient in the cross-section OLS regression of evaluation period alphas on ranking period alphas. We may reject independence if CHI exceeds the critical value of 3.84 for a 5% test.

IV Data

The data used in this study has been obtained from Micropal, and consists of monthly returns on 506 exempt unit trusts which invest in UK equity portfolios from June 1980 to December 2000, a total of 247 months. Unlike unit trust data, Micropal continues to list prices for closed personal pension funds.

Tables 5 provides some descriptive statistics on the returns to, and the size of, the unitised personal pensions in our dataset. From Panel A, the average discrete quarterly return over all unitised schemes over all months is 1.11%, compared with an average discrete return of 1.49% for the FT-All Share Index. The overall standard deviation of these returns is 4.57%, and the distribution of returns also emphasises that there is some variability in these returns. But these pooled measures disguises an important statistic that that the between schemes standard deviation (0.97%) is much less than the within scheme distribution (5.95%). This implies that for a particular month the distribution of returns is tightly packed around the mean, but that over time the variability of returns is much higher.

Table 5 Panel A also report on the distribution of returns weighted by the value of the unit trust at the end of the dataset[7]. The value weighted average return of 1.25% is consistent with larger unit trusts have a higher return than smaller unit trusts, but given we use end of period values in the value weighting this result could also be due to "success" bias (i.e. successful funds will grow at a faster rate than unsuccessful one, so *ceteris paribus* will be larger). In the subsequent regression analysis, we require a minimum number of observations to undertake a meaningful statistical analysis, and we imposed the requirement that time series fund parameters are only estimated when there were 20 or more monthly returns for that unit trust. Table 5 Panel A reports the distribution of returns of the sub-sample of 399 unit trusts with at least 20 time series observations, and this may be compared with the distribution of returns across the whole sample, to check that the sub-sample is indeed representative. Similarly Panel A also reports the distribution of returns of those 20 unit trusts that remained in existence over all 247 months in our dataset.

Table 5, Panel B illustrates the Distribution of fund quarters over the dataset, and shows that 50 per cent funds have 152 or less monthly observations, and the average life of a fund in the data is just less than twelve years. As we have mentioned earlier there has been a tremendous growth in funds flowing into personal pensions, and this is in part represented by the number and type of funds in existence. In Panel C we report the characteristics of four different UK based personal pension funds: All UK

[7] Micropal only reports the latest fund value each month

Companies, Managed, Equity Income and Small. The returns on each of these types of personal pensions appear similar, though the small firm sector experienced poor returns in the first half of the sample and much larger returns throughout the ‘nineties. The number of funds in each category has increased by the second half of the sample, and the UK All Companies sector is by far the most popular.

Panel D of Table 5 shows that the distribution of scheme size is skewed: with the median fund value in 2000 being 8 million pounds, but the mean value is 106 million pounds. It can be seen that ten per cent of the funds have values over 220 million pounds.

V Results

We now turn to assessing the performance of these personal pension schemes over the period 1980-2000. Table 6 reports the results of estimating the average Jensen-alpha for alternative factor model benchmarks. The first row reports an average alpha value for the single factor model of -0.013% per month excess return obtained from estimating equation (1) for each of the 399 schemes imposing the restriction that $\gamma_p = \delta_p = \lambda_p = 0$. In the α-column of the table we report the average Jensen-alpha estimates from these regressions, and in the next column the overall t-statistic for the average value of each parameter, computed from equation (3). The next two rows report for the single-factor model the addition of a market timing term in the unconditional (equation (4)) and conditional models (equation (7)). In general the addition of the market timing term increases the value of the alpha, but identifies a negative market timing effect. For the 3-factor model $\lambda_p = 0$, and the average alpha is 0.029% although this is significantly *negative* at the 5% level[8]. The addition of the market timing terms again identifies negative timing abilities, but increase the value of the selectivity component.

For the four factor model the regression equation is the unrestricted version of (1), and the average alpha is 0.016% per month but significantly negative. The average market timing parameter from the Treynor regression in equation (4) and from the

[8] Note that the test statistic from (3) is weighted by 1/standard error. Thus the mean can be positive whilst the test statistic is negative.

conditional model in equation (5) are reported in the η-column with its relevant t-statistic in the adjacent column. It can be seen that the addition of the market timing term in both the conditional and unconditional models decomposes the abnormal performance into an insignificant positive selectivity but negative timing abilities, which become insignificantly negative under the conditional model.

Table 7 reports the results of estimating abnormal performance of personal pension schemes following Blake and Timmermann (1998) and uses the portfolio excess return on all unit trusts. The first column reports the loadings on each of the four factors for the portfolio excess return. The loadings on the market portfolio and the SMB factor are positive and significant, and on the HML and MOM factors the loadings are significantly negative. The adjacent two columns splits the sample period in two, but the loadings have similar values across the two sub-periods, with the exception of the momentum factor, whose loading coefficient changes sign. The Jensen-alpha over these two sub-periods is significantly negative. As in Table 6, for the conditional and unconditional models, when the timing term is added the selectivity coefficient is positive but the timing coefficient is negative. Note, though, that in contrast to Table 6 selection is significantly positive and timing is significantly negative. In the conditional model, the loading on HML becomes insignificant. However, including a timing variable reduces the explanatory power (adjusted R^2) substantially.

Table 8 reports the results of estimating performance of the personal pension funds by sector. It can be seen that the All UK Companies, Managed and Equity Income sectors have negative Jensen-alphas overall and in each of the two sub-periods. However the small firm sector has a significantly positive Jensen-alpha over the whole period, and it can be seen that this is explained by significant abnormal performance in the second sub-sample from 1991-2000.

The remaining tables examine the issue of persistence in performance. That is, rather than solely be concerned with whether a scheme out-performs over a specified time-period, we now assess whether a scheme fund that has out-performed in one period can repeat this feat in subsequent periods. Berk and Green (2004) suggest that flows of monies between funds will ensure that there is no performance persistence. Table 9 reports the results for abnormal returns obtained from the single factor CAPM model. It can be seen that at short-run intervals there is no evidence of persistence, and in fact there is significant evidence of abnormal return reversals for both the performance ranked portfolio strategies in Panel A, and the contingency tables in Panel B. However at medium-term time intervals of between 6 to 12 months there is some evidence of persistence: TDIF for 6MR6ME is positive at 1.73 (significant at 90 per cent), with DIF=0.0016 implying an annual outperformance of 1.9% of the top quintile over the bottom quintile. In Panel B focusing on the percentage of repeat winners, it can be seen that at the one month horizon 49 per cent of winners (greater than the median) in any period repeat the feat in the following month. As the horizon increases up to 12 months the percentage of repeat winners increases to 50 per cent, before falling to 46 per cent at three year intervals. The other criteria (odds ratio, CHI test, and cross-sectional t-test confirm this pattern), though the TDIF statistic in Panel A on the 36 month horizon, which according to Carpenter and Lynch (1999) is the preferred measure of persistence, documents weak evidence of persistence even at longer horizons.

Tables 10 and 11 report the results of the persistency tests for the 3-factor and CAPM models of abnormal returns. It can be seen that the findings in Table 10 for the 3-factor models are similar to those in Table 9 but with stronger degrees of significance: significant evidence of persistence in all tests at the 12 month horizon, with weaker positive persistence at longer horizons, and significant negative persistence at short horizons. In fact the measurement of persistence is similar to the values in Blake and Timmermann (1998) for general UK equity funds. They report that an equally-weighted risk adjusted winner-loser portfolio formed on the previous 24-month returns, yields a monthly return of 0.091%, whereas from Table 10 Panel A our winner-loser portfolio based on past 12-month returns (12MR12ME) yields a slightly larger monthly return of 0.153% (1.85% annualised). The 4-factor results of the more general specification from equation (1) are reported in Table 11, and are even stronger, as there is generally more evidence of positive persistence. The monthly return on the winner-loser performance for 12MR12ME is 0.16%. These results are surprising in light of the Fletcher and Forbes (2002) finding that including a momentum factor explains much of the persistence in mutual fund performance. In contrast, the results in Tables 9 to 11 suggest that positive performance persistence increases as we move from a single factor through a three-factor to the more general four-factor benchmark which includes a momentum factor.

We are interested in investigating whether this documented strong performance persistence at the six-month to twelve-month horizon is robust to alternative benchmark specifications, which potentially allow for the time-varying nature of performance. In table 12 we report the persistence tests for the conditional model described in equation (5). The conditional tests allow for the idea that the factors in the benchmark may be predicted from information available on macroeconomic variables, and separates out any abnormal performance due to this predictability. If there is any persistence in these macro variables, this could potentially explain the observed persistence in performance. However the figures in Table 12 suggest that performance persistence in abnormal returns is robust to this conditional benchmark. The monthly return on the winner-loser performance for 6MR6ME strategy is 0.18%., and the same pattern is observed in contingency tables in Panel B.

So far our estimates of the coefficients in equations (1) – (5) have been estimated over the whole sample for that fund which potentially introduces a look-ahead bias [Carhart (1997)]. Therefore in table 13 we report the results of the persistence tests, from a 4-factor benchmark in which the coefficients in equation (1) have been estimated from the previous 36 months' data. This reduces the number of observations for each fund, as can be seen from the first column of Table 13. In fact the results on persistence are strengthened by this change, with the monthly return on the winner-loser performance for 6MR6ME strategy increased to 0.21%. It appears that our results on fund persistence are robust to allowing for time-varying parameter estimates of abnormal returns.

Conclusions

This paper has examined the performance of personal pensions (exempt unit trusts) in the UK over the period 1980-2000. These last twenty years have seen a rapid growth in the amount of savings devoted to personal pensions. The paper has assessed the performance of these pension funds relative to a variety of benchmarks: a single factor (CAPM) model, Fama-French's 3-factor, and a four factor benchmark allowing for market timing and conditioning on macroeconomic variables, and finds that average performance is not significantly different from zero. This finding is consistent with much of the previous literature, that on average managed funds do not earn abnormal returns.

The paper went on to examine persistence in the performance of these pension schemes and for a 4-factor and 3-factor benchmarks identifies negative persistence at short horizons, but at time-intervals of six months to one year finds significant positive persistence, though this persistence weakens at longer time intervals.

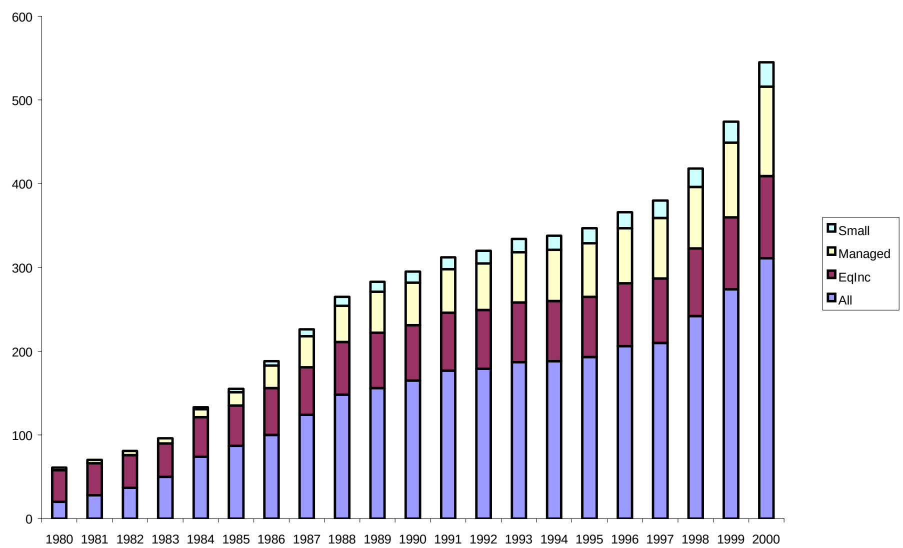
These results on significant positive persistence at 12-month horizons are consistent with some earlier work on the persistence of UK mutual funds, and indicates that contractual savings schemes are also associated with fund manager ability. Our findings on the performance persistence of united personal pensions are slightly stronger than the performance persistence in Blake and Timmermann (1998) for non-contractual unit trusts. They report that a winner-loser portfolio yields an annual return of 1.1%, whereas our winner-loser portfolio based on past 12-month returns yields an annual return of 1.8%. It is perhaps surprising that the persistence in performance of personal pensions is greater than for more general unit trusts, but this is consistent with Berk and Green (2004) who argue that performance persistence will be weakened by monies flowing out of the underperforming into the outperforming funds, since it is difficult for the out-performers to continue to generate excess returns with more money under management. The nature of the contractual arrangements for a personal pension scheme, and the high costs of switching to an alternative scheme, means that the equilibrating mechanism of flows of money in Berk and Green is absent in exempt unit trusts, and hence abnormal performance persists. An alternative reason for the abnormal performance is that pension fund providers devote more resources to managing personal pension funds than regular unit trusts.

Table 1: Employees Covered by Type of Pension in 1998

Type of Pension Scheme	Numbers of persons (Millions)	Percentage of Working Population Covered
Occupational Pensions	10.5	30
Appropriate Personal Pensions	5.6	16
Personal Pensions (Not Eligible for SERPS)	4.6	13
SERPS	7.1	20

Source: Government Green Paper (Chap 2, paras. 15, 25, December 1998), and own calculations.

Figure 2: Number of UK Exempt Unit Trusts 1980-2000



Source: Micropal

Table 3: Personal Pension Business Through Insurance Companies

	1983	1987	1991	1995	1999
Panel A: Personal Pensions in Force					
No. of Policies (000s)	2,971	5,697	15,212	19,922	20,890
Premiums (£million)	669	1,614	4,212	5,441	7,010
Average Premium per policy (£)	225	283	276	273	335
Panel B: New Personal Pensions					
No. of New Policies (000s)	431	912	2,440	1,077	1,360
of which: Single premium (000s)			745	230	294
Yearly (000s)			1,695	848	1,066
Premiums on New Single Policies (£m)	298	812	3,941	3,236	4,513
Premiums on New Yearly Policies (£m)	182	414	1,000	832	1,443
Average Premium per policy on New Single Policies (£)			5,289	14,070	15,350
Average Premium per policy on New Yearly Policies (£)			589	981	1,353

Yearly, means a regular savings scheme

Source: ABI Insurance Statistics Yearbook 1983-93, Tables 78,79; 1987-97 & 1989-99 Tables 28, 29.

Table 4: Persistency Rates for Personal Pensions

	Regular premium policies sold by tied advisors				Regular premium policies sold by IFAs			
	% of policies persisting after . . .				% of policies persisting after . . .			
Start year	**1 year**	**2-year**	**3-year**	**4-year**	**1 year**	**2-year**	**3-year**	**4-year**
1993	84.1	72.3	63.6	56.7	91.5	83.3	76.6	70.5
1994	83.7	72.6	64.2	57.1	90.9	81.2	73.6	66.9
1995	85.4	74.7	65.4	57.8	90.2	80.6	72.1	64.7
1996	86.4	74.6	65.1	57.2	89.8	79.8	69.8	62.3
1997	85.6	73.7	64.0	57.2	90.2	78.5	69.3	60.7
1998	85.2	73.6	64.1	56.8	88.3	75.8	64.7	53.9
1999	84.7	71.8	62.3		87.2	72.3	59.5	
2000	84.7	73.4			83.8	68.1		
2001	84.5				83.8			

Source: Smith (2004) and FSA Persistency Tables. A personal pension is a long term savings contract with agreed contribution rates specified in the contract. The persistency rates show the percentage of personal pension schemes to which consumers continue to make contributions (persistency) one year, two years, three years and four years after starting the personal pension scheme

Table 5: Descriptive Statistics on Exempt Unit Trust Personal Pension Schemes 1980-2000

Panel A: Returns Across Months and Schemes

Returns	All	Weighted by smv	>20 Months	= 247 Months	FT-All ShareRets
Mean	0.0111	0.0125	0.0112	0.0131	0.0149
Std. Dev.	0.0457	0.0470	0.0456	0.0460	0.0473
Between Std. Dev.	0.0097				
Within Std. Dev.	0.0595				
Distribution of returns:					
10%	-0.0447	-0.0453	-0.0455	-0.0418	
25%	-0.0118	-0.0101	-0.0116	-0.0089	
50%	0.0128	0.0148	0.0129	0.0156	
75%	0.0380	0.0400	0.0381	0.0410	
90%	0.0625	0.0645	0.0625	0.0649	
Obs.	55,879	55,205	54,876	4,940	247
No. of schemes	506	506	399	20	

Panel B: Distribution of Scheme-Months

No. of UK Sector Schemes		399		No. of Scheme-Months	54,876	
Distribution of Scheme-Months						
min	5%	25%	50%	75%	95%	max
20	25	75	152	191	247	247

Panel C: Returns Across Months and Schemes by sector >20 Months

Returns	All Companies	Managed	Equity Income	Small
Mean	0.0116	0.0100	0.0115	0.0106
Median	0.0134	0.0119	0.0130	0.0110
Std. Dev.	0.0462	0.0412	0.0442	0.0552
Obs.	35,635	10,575	5,922	2,744
No. of schemes	254	78	45	22
Before 31st Dec. 1990				
Mean	0.0128	0.0081	0.0122	0.0030
Obs.	10,798	2,700	1,493	551
No. of schemes	152	47	26	11
After 31st Dec. 1990				
Mean	0.0111	0.0107	0.0114	0.0127
Obs.	24,726	7,825	4,399	2,176
No. of schemes	254	78	45	22

Panel D: Distribution of Fund Size Across Funds

	# Obs.	Mean	Std. Dev.	10%	25%	50%	75%	90%
Size at end of Dec. 2000 (£ million)	495	106.55	297.21	0.53	2.15	8.09	46.60	220.50

Table 6 Performance Evaluation: selectivity and market timing with alternative factor benchmarks

	No. Funds	α	α t-stat	η	η t-stat	R^2
Average Coeffs. single factor	399	-0.00013	-6.43			0.743
Average Coeffs. single factor with market timing	399	0.00033	-1.07	-0.1538**	-14.12	0.750
Average Coeffs. Cond. Single factor with market timing	399	0.00052	-1.81	-0.0395**	-5.21	0.776
Average Coeffs. 3-factor	399	0.00029	-1.68			0.808
Average Coeffs. 3-factor with market timing	399	0.00030	0.68	0.1081**	-7.75	0.814
Average Coeffs. Cond. 3-factor with market timing	399	0.00033	-0.37	0.2444	-0.40	0.827
Average Coeffs. 4-factor	399	0.00016**	-2.45			0.814
Average Coeffs. 4-factor with market timing	399	0.00027	0.59	0.0474**	-8.10	0.819
Average Coeffs. Cond. 4-factor with market timing	399	0.00029	-0.45	0.1987	-0.62	0.832

For each scheme we regress the respective factor model and obtain the scheme's Jensen-alphas. For the four factor model the regression equation is (1): $R_{pt} - r_{ft} = \alpha_p + \beta_p (R_{mt} - r_{ft}) + \gamma_p SMB_t + \delta_p HML_t + \lambda_p MOM_t + \varepsilon_{pt.}$ For the single factor model $\gamma_p = \delta_p = \lambda_p = 0;$ and for the 3-factor model $\lambda_p = 0.$ In the α-column of the table we report the average Jensen-alpha estimates from these regressions, and the relevant overall t-statistic for the average value of each parameter, computed as in equation (3). The average market timing parameter from the Treynor regression in equation (4) and from the conditional model in equation (5) are reported in the η-column with its relevant t-statistic in the adjacent column. The final column reports the average R^2 for the regressions. All t-statistics are based on robust standard errors.

Table 7: Performance Evaluation of equally-weighted portfolio with 4-factor model over time

	Full sample period	**Sample period 1980-90**	**Sample period 1991-2000**	**Full sample period with market timing**	**Full sample period with Condit. model**
Jensen-alpha	-0.00003	-0.00038**	0.00010**	0.00065**	0.00037**
	(-0.68)	(-4.24)	(-2.77)	(5.78)	(9.02)
RALL	0.8795**	0.8343**	0.9129**	0.8698**	0.8852**
	(1064.96)	(589.17)	(943.68)	(371.83)	(953.2)
SMB	0.2317**	0.3741**	0.2010**	0.2269**	0.2354**
	(172.78)	(102.36)	(156.82)	(62.24)	(181.25)
HML	-0.0117**	-0.0500**	-0.0284**	-0.0125**	-0.0018
	(-8.53)	(-12.29)	(-21.51)	(-3.37)	(-1.34)
MOM	-0.0073**	0.1547**	-0.0294**	-0.0142**	-0.0125**
	(-4.88)	(32.73)	(-20.56)	(-3.46)	(-8.61)
$RALL^2$				-0.3038**	-0.1490**
				(-13.96)	(-12.16)
R^2	0.95	0.96	0.96	0.96	0.96

We regress the 4-factor model $R_{pt} - r_{ft} = \alpha_p + \beta_p (R_{mt} - r_{ft}) + \gamma_p SMB_t + \delta_p HML_t + \lambda_p MOM_t + \varepsilon_{pt},$ where the dependent variable is the equally-weighted excess return on an equally weighted portfolio *p* of funds at time *t* and we report the coefficients on the factors from these regressions. The market timing coefficient on $Rall^2$ from the Treynor regression in equation (4) and from the conditional model in equation (5) are also reported. Relevant t-statistics are reported underneath each parameter estimate.

Table 8: Performance Evaluation of equally-weighted portfolio by sector over time

	All companies	**Managed**	**Equity Income**	**Small**
All time periods				
Jensen-alpha	-0.00021**	-0.00014	-0.00007	0.0028**
t-stat	(-4.66)	(-1.00)	(-0.49)	(7.04)
# Obs	35,635	10,575	5,922	2,744
R^2	0.961	0.856	0.929	0.839
Sample period 1980-90				
Jensen-alpha	-0.00009	-0.00137**	-0.00005	-0.00342**
t-stat.	(-0.96)	(-3.66)	(-0.12)	(-3.71)
# Obs	10,798	2,700	1,493	551
R^2	0.967	0.849	0.935	0.89
Sample period 1991-2000				
Jensen-alpha	-0.00042**	-0.00009	-0.00034**	0.00423**
t-stat.	(-9.34)	(-0.64)	(-2.27)	(9.39)
# Obs	24,726	7,825	4,399	2,176
R^2	0.965	0.878	0.933	0.824

As in table 7, but for each scheme sector we regress the 4-factor model $R_{pt} - r_{ft} = \alpha_p + \beta_p (R_{mt} - r_{ft}) + \gamma_p SMB_t + \delta_p HML_t + \lambda_p MOM_t + \varepsilon_{pt,}$ where the dependent variable is the equally-weighted excess return on an equally weighted portfolio p of funds in that sector at time t. We report the Jensen-alpha for each sector and the relevant t-statistics are given underneath the parameter estimates.

Table 9: Persistence Tests based on single factor (CAPM) Abnormal Returns of Pension Scheme Performance

Panel A. Performance ranked portfolio tests of scheme performance

	# periods	AV5	AV1	DIF	TDIF
1MR1ME	246	-0.0014	0.0016	-0.0030	-2.35*
3MR3ME	242	-0.0001	-0.0002	0.0001	0.04
6MR6ME	236	0.0007	-0.0009	0.0016	1.73
12MR12ME	224	0.0006	-0.0007	0.0013	1.49
36MR36ME	176	0.0011	-0.0013	0.0002	0.27

For performance ranked tests, pension schemes are sorted each year into quintile portfolios based on past performance of the pension schemes - abnormal returns of each scheme over the ranking period. The equally weighted average portfolio abnormal returns of the top and bottom portfolios over the subsequent evaluation period is computed; AV5 and AV1 are the abnormal returns of the top and bottom portfolios in the evaluation period, averaged over all time periods in the sample. There are four different ranking and evaluation periods: 36MR36ME means three-year ranking period and three year evaluation period, and 1MR1ME means a one month ranking period and one month evaluation period. This procedure is followed for overlapping periods throughout the full period of the dataset, and DIF is AV5-AV1, and TDIF is a t-statistic on DIF, allowing for the autocorrelation induced by using overlapping observations. * denotes significance at 95 per cent.

Panel B: Contingency tables of scheme performance

	N	PRW	CP	Z-stat	CHI	TCS
1MR1ME	54,477	0.490	0.906*	-5.76	33.70*	-5.76*
3MR3ME	17,189	0.502	0.998	-0.05	0.16	-5.49*
6MR6ME	8,517	0.500	0.982	-0.52	0.24	-2.74*
12MR12ME	3,737	0.499	1.003	0.05	0.10	0.22
36MR36ME	719	0.462	0.085	-1.45	2.52	-4.29*

Schemes are classified as winners or losers based on abnormal returns in each of two consecutive time periods, and the numbers of winner-winner (WW), winner-loser (WL), loser winner (LW) and loser-loser (LL) are counted. The following statistics are computed: a) Percentage of repeat winners, PRW = WW/(N/2); b) Cross-product ratio CP = (WW x LL)/(WL x LW); where $\log(CP)/\sigma_{\log(CP)}$ has a standard normal distribution, and $\sigma_{\log(CP)} = \sqrt{[(1/WW) + (1/WL) + (1/LW) + (1/LL)]}$; c) Chi-Squared test with 1 d.o.f. where CHI = $\{(WW - N/4)^2 + (WL - N/4)^2 + (LW - N/4)^2 (LL - N/4)^2\}/N/4$, and N is the number of pairs; and d) TCS is the t-statistic for the slope coefficient in the pooled cross-section OLS regression of evaluation period abnormal returns on ranking period abnormal returns.

Table 10: Persistence Tests based on 3-factor Abnormal Returns of Pension Scheme Performance

Panel A. Performance ranked portfolio tests of scheme performance

	# periods	AV5	AV1	DIF	TDIF
1MR1ME	246	-0.0014	0.0016	-0.0030*	-2.35
3MR3ME	242	0.0001	0.0005	-0.0003	-0.47
6MR6ME	236	0.0008	-0.0005	0.0013*	2.39
12MR12ME	224	0.0011	-0.0005	0.0015*	2.42
36MR36ME	176	-0.0001	-0.0007	0.0006	1.52

For performance ranked tests, pension schemes are sorted each year into quintile portfolios based on past performance of the pension schemes - abnormal returns of each scheme over the ranking period. The equally weighted average portfolio abnormal returns of the top and bottom portfolios over the subsequent evaluation period is computed; AV5 and AV1 are the abnormal returns of the top and bottom portfolios in the evaluation period, averaged over all time periods in the sample. There are four different ranking and evaluation periods: 36MR36ME means three-year ranking period and three year evaluation period, and 1MR1ME means a one month ranking period and one month evaluation period. This procedure is followed for overlapping periods throughout the full period of the dataset, and DIF is AV5-AV1, and TDIF is a t-statistic on DIF, allowing for the autocorrelation induced by using overlapping observations. * denotes significance at 95 per cent.

Panel B: Contingency tables of scheme performance

	N	PRW	CP	Z-stat	CHI	TCS
1MR1ME	54,477	0.469	0.768*	-15.38	237.53*	-33.32*
3MR3ME	17,189	0.507	1.041	1.319	1.94	-2.97*
6MR6ME	8,517	0.528	1.215*	4.494	20.46*	4.63*
12MR12ME	3,737	0.528	1.243*	3.319	11.06*	9.26*
36MR36ME	719	0.451	0.736*	-2.049	4.61	-1.14

Schemes are classified as winners or losers based on abnormal returns in each of two consecutive time periods, and the numbers of winner-winner (WW), winner-loser (WL), loser winner (LW) and loser-loser (LL) are counted. The following statistics are computed: a) Percentage of repeat winners, PRW = WW/(N/2); b) Cross-product ratio CP = (WW x LL)/(WL x LW); where $\log(CP)/\sigma_{\log(CP)}$ has a standard normal distribution, and $\sigma_{\log(CP)} = \sqrt{[(1/WW) + (1/WL) + (1/LW) + (1/LL)]}$; c) Chi-Squared test with 1 d.o.f. where CHI = $\{(WW - N/4)^2 + (WL - N/4)^2 + (LW - N/4)^2 (LL - N/4)^2\}/N/4$, and N is the number of pairs; and d) TCS is the t-statistic for the slope coefficient in the pooled cross-section OLS regression of evaluation period abnormal returns on ranking period abnormal returns.

Table 11: Persistence Tests based on 4-factor Abnormal Returns of Pension Scheme Performance

Panel A. Performance ranked portfolio tests of scheme performance

	# periods	AV5	AV1	DIF	TDIF
1MR1ME	246	-0.0026	0.0035	-0.0061*	-5.93
3MR3ME	242	0.0002	0.0004	-0.0001	-0.21
6MR6ME	236	0.0009	-0.0006	0.0015*	2.75
12MR12ME	224	0.0011	-0.0006	0.0016*	2.62
36MR36ME	176	-0.0001	-0.0007	0.0007	1.64

For performance ranked tests, pension schemes are sorted each year into quintile portfolios based on past performance of the pension schemes - abnormal returns of each scheme over the ranking period. The equally weighted average portfolio abnormal returns of the top and bottom portfolios over the subsequent evaluation period is computed; AV5 and AV1 are the abnormal returns of the top and bottom portfolios in the evaluation period, averaged over all time periods in the sample. There are five different ranking and evaluation periods: 36MR36ME means three-year (36 months) ranking period and three year evaluation period, and 1MR1ME means a one month ranking period and one month evaluation period. This procedure is followed for overlapping periods throughout the full period of the dataset, and DIF is AV5-AV1, and TDIF is a t-statistic on DIF, allowing for the autocorrelation induced by using overlapping observations. * denotes significance at 95 per cent.

Panel B: Contingency tables of scheme performance

	N	PRW	CP	Z-stat	CHI	TCS
1MR1ME	54,477	0.470	0.775*	-14.88	222.23*	-33.24*
3MR3ME	17,189	0.510	1.063*	2.01	4.18	1.22
6MR6ME	8,517	0.533	1.267*	5.45	29.88*	6.16*
12MR12ME	3,737	0.537	1.340*	4.46	19.97*	9.17*
36MR36ME	719	0.456	0.787	-1.61	3.19	-1.13

Schemes are classified as winners or losers based on abnormal returns in each of two consecutive time periods, and the numbers of winner-winner (WW), winner-loser (WL), loser winner (LW) and loser-loser (LL) are counted. The following statistics are computed: a) Percentage of repeat winners, PRW = WW/(N/2); b) Cross-product ratio CP = (WW x LL)/(WL x LW); where $\log(CP)/\sigma_{\log(CP)}$ has a standard normal distribution, and $\sigma_{\log(CP)} = \sqrt{[(1/WW) + (1/WL) + (1/LW) + (1/LL)]}$; c) Chi-Squared test with 1 d.o.f. where CHI = $\{(WW - N/4)^2 + (WL - N/4)^2 + (LW - N/4)^2 (LL - N/4)^2\}/N/4$, and N is the number of pairs; and d) TCS is the t-statistic for the slope coefficient in the pooled cross-section OLS regression of evaluation period abnormal returns on ranking period abnormal returns.

Table 12: Persistence Tests based on a conditional 4-factor Abnormal Returns of Pension Scheme Performance

Panel A. Performance ranked portfolio tests of scheme performance

	# periods	AV5	AV1	DIF	TDIF
1MR1ME	246	-0.0019	0.0038	-0.0057*	-5.83
3MR3ME	242	0.0008	0.0005	0.0004	0.57
6MR6ME	236	0.0015	-0.0003	0.0018*	3.40
12MR12ME	224	0.0015	-0.0001	0.0016*	2.75
36MR36ME	176	0.0003	-0.0006	0.0009*	2.27

For performance ranked tests, pension schemes are sorted each year into quintile portfolios based on past performance of the pension schemes - abnormal returns of each scheme over the ranking period. The equally weighted average portfolio abnormal returns of the top and bottom portfolios over the subsequent evaluation period is computed; AV5 and AV1 are the abnormal returns of the top and bottom portfolios in the evaluation period, averaged over all time periods in the sample. There are four different ranking and evaluation periods: 36MR36ME means three-year ranking period and three year evaluation period, and 1MR1ME means a one month ranking period and one month evaluation period. This procedure is followed for overlapping periods throughout the full period of the dataset, and DIF is AV5-AV1, and TDIF is a t-statistic on DIF, allowing for the autocorrelation induced by using overlapping observations. * denotes significance at 95 per cent.

Panel B: Contingency tables of scheme performance

	N	PRW	CP	Z-stat	CHI	TCS
1MR1ME	54,477	0.476	0.807*	-12.51	157.22*	-26.77*
3MR3ME	17,189	0.512	1.084*	2.65	7.10	1.75
6MR6ME	8,517	0.533	1.274*	5.58	31.26*	3.61*
12MR12ME	3,737	0.542	1.384*	4.95	24.59*	8.52*
36MR36ME	719	0.484	0.941	-0.41	0.40	-1.46

Schemes are classified as winners or losers based on abnormal returns in each of two consecutive time periods, and the numbers of winner-winner (WW), winner-loser (WL), loser winner (LW) and loser-loser (LL) are counted. The following statistics are computed: a) Percentage of repeat winners, PRW = WW/(N/2); b) Cross-product ratio CP = (WW x LL)/(WL x LW); where $\log(CP)/\sigma_{\log(CP)}$ has a standard normal distribution, and $\sigma_{\log(CP)} = \sqrt{[(1/WW) + (1/WL) + (1/LW) + (1/LL)]}$; c) Chi-Squared test with 1 d.o.f. where CHI = $\{(WW - N/4)^2 + (WL - N/4)^2 + (LW - N/4)^2 (LL - N/4)^2\}/N/4$, and N is the number of pairs; and d) TCS is the t-statistic for the slope coefficient in the pooled cross-section OLS regression of evaluation period abnormal returns on ranking period abnormal returns.

Table 13: Persistence Tests based on a 4-factor Rolling Coefficients Abnormal Returns of Pension Scheme Performance

Panel A. Performance ranked portfolio tests of scheme performance

	# periods	AV5	AV1	DIF	TDIF
1MR1ME	196	-0.0001	0.0020	-0.0021	-1.63
3MR3ME	186	0.0011	-0.0007	0.0019	1.56
6MR6ME	176	0.0014	-0.0007	0.0021*	2.39
12MR12ME	148	0.0006	-0.0013	0.0020*	2.20
36MR36ME	121	-0.0009	-0.0008	0.0000	0.13

For performance ranked tests, pension schemes are sorted each year into quintile portfolios based on past performance of the pension schemes - abnormal returns of each scheme over the ranking period. The equally weighted average portfolio abnormal returns of the top and bottom portfolios over the subsequent evaluation period is computed; AV5 and AV1 are the abnormal returns of the top and bottom portfolios in the evaluation period, averaged over all time periods in the sample. There are four different ranking and evaluation periods: 36MR36ME means three-year ranking period and three year evaluation period, and 1MR1ME means a one month ranking period and one month evaluation period. This procedure is followed for overlapping periods throughout the full period of the dataset, and DIF is AV5-AV1, and TDIF is a t-statistic on DIF, allowing for the autocorrelation induced by using overlapping observations. * denotes significance at 95 per cent.

Panel B: Contingency tables of scheme performance

	N	PRW	CP	Z-stat	CHI	TCS
1MR1ME	35,350	0.480	0.829*	-8.79	77.89*	-0.20
3MR3ME	11,080	0.529	1.208*	4.97	25.37*	-2.99*
6MR6ME	5,332	0.537	1.289*	4.62	21.74*	3.70*
12MR12ME	2,238	0.532	1.230*	2.45	6.16	5.64*
36MR36ME	324	0.469	0.707	-1.56	2.52	-3.19*

Schemes are classified as winners or losers based on abnormal returns in each of two consecutive time periods, and the numbers of winner-winner (WW), winner-loser (WL), loser winner (LW) and loser-loser (LL) are counted. The following statistics are computed: a) Percentage of repeat winners, PRW = WW/(N/2); b) Cross-product ratio CP = (WW x LL)/(WL x LW); where $\log(CP)/\sigma_{\log(CP)}$ has a standard normal distribution, and $\sigma_{\log(CP)} = \sqrt{[(1/WW) + (1/WL) + (1/LW) + (1/LL)]}$; c) Chi-Squared test with 1 d.o.f. where CHI = $\{(WW - N/4)^2 + (WL - N/4)^2 + (LW - N/4)^2 (LL - N/4)^2\}/N/4$, and N is the number of pairs; and d) TCS is the t-statistic for the slope coefficient in the pooled cross-section OLS regression of evaluation period abnormal returns on ranking period abnormal returns.

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