MS15/2.3: Annex 4

Market Study

Asset Management Market Study

Final Report: Annex 4 – Assessing the relationship between the price and performance of retail equity funds in the UK

June 2017

Annex 4: Assessing the relationship between the price and performance of retail equity funds in the UK

Summary

1. Our interim report summarised results from studies of the US mutual funds industry, which pointed towards there being a negative relationship between the cost of a mutual fund and the performance of the fund manager. The interim report also included initial results from the UK retail active fund industry, suggesting that there was no clear relationship between price and performance.

2. If there is a negative relationship between price and gross performance for UK active funds this would suggest a breakdown in the effective functioning of competition between active fund managers as it would indicate that all else being equal, asset managers are able to charge more for worse performing products.

3. Following the interim report we have performed further analysis of the relationship between the OCF of retail active funds in the UK and performance and have found that:
   - Overall, there does not appear to be a clear linear relationship between fund charges and the gross performance generated by the fund manager.
   - Looking at the relationship between charges and performance net of fees we find some evidence that more expensive active funds underperformed cheaper active funds. However, the strength of this relationship varies according to the investment category and performance metric being assessed.
   - The majority of funds cluster within a narrow price range but often deliver very different levels of return.

Introduction

4. Many investors in asset management products aim to maximise their risk-adjusted net return. Since investors do not know when selecting a fund the returns they will earn in the future, investors often rely on indicators that they believe will act as a predictor of the future performance of the investment product. One indicator that could be used by investors in funds is the fund charge, and in particular, the on-going charges figure (OCF). In using this, some investors may choose to invest in funds with a higher charge, in the expectation that the higher charge is justified by higher future returns (for the same risk), or lower risk (for the same return).

5. A number of responses to our interim report commented on the results included in our interim report. One respondent suggested that lower cost funds improve the likelihood of outperformance and pointed towards further research in this area.

Other responses suggested that investors value more than just performance against the benchmark and there was also a suggestion that using headline prices may be misleading as investors might obtain different prices when going through intermediaries.

6. This annex sets out our further analysis of the performance of active retail funds in the UK industry and seeks to examine whether an investor paying more for a fund can expect to receive greater returns.

7. In assessing the relationship between gross performance and charges, our view is that a negative relationship would indicate ineffective competition, a positive relationship would be consistent with effective competition, and absence of a relationship a potential concern.[1]

8. An absence of a clear relationship between charges and gross performance may also suggest that competition between asset managers is not working effectively, so long as risk and other factors are comparable across funds, or controlled for when assessing the relationship between charges and gross performance. This is because the lack of a relationship would indicate that higher-priced funds do not on average generate higher gross performance than cheaper funds, and therefore higher-priced funds would be expected to generate worse returns for investors once fees are taken into account.

9. When examining the relationship between net performance and charges, our view is that a negative relationship would not be consistent with effective competition, but that either a positive or an absence of a relationship would be consistent with effective competition.

Analysis Challenges

10. Analysing investment performance is not straightforward and to assess its relationship with fees in the UK we have faced a number of issues. Some of the key challenges in the analysis are listed below:

Measuring cost – A cost measure must be used which is both consistent across time and funds and which also reflects the actual costs paid by consumers to the asset manager. This is a challenge as the fee structure in the asset management industry has evolved over time and there are a variety of different ways to measure the cost of asset management products.

Accounting for risk – Alongside the level of returns provided, the volatility of returns and risk profile is also typically a consideration for investors when choosing their most appropriate fund. As it is possible that there is a correlation between the amount a firm charges and the amount of risk being taken, when assessing performance it is important to ensure funds with similar risk profiles are compared.

Selecting an appropriate sample – As well as ensuring performance measures take into account different fund risk profiles, an appropriate time period must be selected which is long enough to allow robust inference to be taken and which does not introduce survivorship bias.

[1] We assume that the level of assets in more expensive funds are not immaterial i.e. more expensive funds are not losing customers rapidly due to higher prices.

Approach

11. Our methodology tries to account for the challenges outlined above by utilising a range of performance measures and samples.

12. We use the OCF as the measure of fund charges. The RDR led to a change in the pricing structure for most fund share classes sold in the UK. To prevent unfair comparisons between share classes that include distribution fees (bundled share classes) and those which do not (clean share classes), we removed distribution fees from bundled share classes, so that they can be analysed alongside clean share classes. We have used historical share class level rebate data provided to the FCA by an investment platform to remove the commission (i.e. the distribution fee) received by the platform from the asset manager.[2]

13. Where we use returns net of fees we also adjust the returns upwards by the value of the commission to ensure the net return reflects the return to the investor prior to distribution costs being paid.

14. To ensure each fund's performance is only measured once, we strip out multiple share classes.[3]

15. We have not included index-tracker funds since gross performance for these funds is largely determined by the characteristics of the underlying index that is being tracked, as opposed to the ability of a manager to generate returns by executing an effective active trading strategy. We would expect that index-tracker fund performance would have no relationship with price gross of fees and a negative relationship with price net of fees.

Regression analysis

16. We are seeking to understand the historical relationship between price and performance. To estimate this statistically we use OLS regression with fund performance as the dependent variable and the OCF as the independent variable of interest. The value of assets in each fund and a binary variable indicating the time period being measured are also included as independent variables.

17. We estimated the following equation:

$$\widehat{\alpha_{it}} = \delta_{0t} + \delta_1 X_{it} + \delta_2 Y_{it} + \delta_3 Z_t + \theta_{it}$$

With i=1,….,N and t=1, ….,T.

X_{it} is the fund's expense variable (Ongoing Charges Figure in our case)

Y_{it} is the log transformation of the value of assets held in the fund

Z_t is a set of binary variables indicating the time period

$\widehat{\alpha_{it}}$ is the performance metric

δ_1 is the coefficient of interest in our analysis

18. The regression model and inference tests seek to examine whether the coefficient δ_1 of the price variable is positive, insignificant from zero or negative. If positive it

[2] The commission payments also include any rebates given to the investor by the platform.

[3] If a share class is flagged by Morningstar Direct or the firm as being 'institutional' the share class is removed. Accumulation share classes are used. If there is more than one accumulation share class available the simple average between the remaining share classes is used for the OCF and net return of the fund.

would demonstrate that, for the period examined, paying more for funds has on average led to relatively higher performance, if not different from zero it would suggest that prices charged have not been related to the performance and if negative it would suggest that paying more has meant relatively worse performance.

Performance measures

19. As highlighted in the section on analytical challenges, measuring performance of different funds requires selecting an appropriate measurement period as well as a sample of funds which have similar risk profiles and therefore offer a fair comparison.

20. We have used Morningstar Global categories to separate out samples of funds with similar risk profiles. We focused on three large cap equity categories: UK Large Cap Equities, Europe Large Cap Equities and Global Large Cap Equities. We selected these categories as they are the three largest equity fund categories by number of funds, and examining funds at a more granular level would lead to sample sizes being too small.

21. We have assessed performance using two performance measures (returns against benchmark and the Sharpe ratio) for all three equity categories. For the UK equity market we are able to examine an additional performance measure (factor model risk adjustment) due to the availability of domestic factor data. This allows us to account for additional factors that can explain fund performance. We discuss the three performance measures below.

Returns against benchmark

22. Our primary approach to measuring performance is to assess returns against a benchmark. The benchmark categories we used (assigned by Morningstar) are more granular than the three equity samples used. For example, within the UK equity large cap category there will be funds which are growth focused, income focused or blended. These will, in any period, have different risk profiles and be measured against different benchmarks.

23. The benchmarks we utilise for the majority of our analysis are defined by each fund's Morningstar Category benchmark (assigned by Morningstar). Returns are calculated on an annual basis, with funds not present for the entire year excluded.

24. This performance measure does not capture differences in volatility between fund returns within a category, or any potential differences between funds in their holdings of small cap or momentum stocks. By using more granular investment categories for benchmark categories we reduce the extent to which fund volatility and stock holdings are not comparable between funds.

Sharpe ratio

25. It may be the case that investors place value on having lower volatility of returns so that if they need to withdraw their investment quickly they can do so with less risk of losing large amounts of money. Returns against a benchmark does not directly take volatility into consideration, therefore as a further test we also assessed the Sharpe ratio, a commonly-used investment performance metric. A higher Sharpe ratio means that a fund has performed relatively well given the amount of volatility it has incurred during the year. The Sharpe ratio adjusts performance for risk by scaling returns against the standard deviation of the fund's return over the risk-risk rate.

$$S = \frac{Mean[R-RFR]}{\sqrt{Var[R]}} \quad (2)$$

26. To calculate the Sharpe ratio we compute a fund's return in excess of the risk free rate in each month, take the mean of these over a year, and then divide this mean by the standard deviation of the monthly returns in the same year. Funds with a larger variance of returns within a year will have a lower Sharpe ratio to reflect investor preferences for lower volatility.

Factor model risk adjustment (used for UK equities only)

27. As discussed above, funds assigned the same benchmark by Morningstar could be sufficiently different that comparisons are not justified. In particular, the benchmark adjusted return measure does not directly take into account the volatility of a fund's performance. The Sharpe ratio is an understandable and simple way to measure volatility (i.e. a measure of risk). As a sensitivity we have also calculated a risk-adjusted performance measure using a more sophisticated measure of risk. In particular, we have estimated 'alpha' using a multi-factor model. This risk-adjusted performance measure is calculated using Carhart's four-factor model.[4] The model estimates the following regression:

$$r_{it} = \alpha_i + \beta_{i,t} rm_t + \gamma_{i,t} smb_t + \lambda_{i,t} hml_t + \rho_{i,t} py_t + \varepsilon_{it} \quad (3)$$

28. Where:
    - r_{it} is fund i's before-expense return in month t in excess of the 30-day risk-free interest rate
    - rm_t is the market portfolio return in excess of the risk-free rate in month t
    - smb_t reports the return on portfolios that proxy for common risk factors associated with size in month t
    - hml_t reports the return on portfolios that proxy for common risk factors associated with book-to-market in month t
    - py_t represents the passive momentum strategies by mutual funds in month t

29. The alpha estimation follows Carhart's methodology with a two-stage estimation procedure. First, we regress the funds' returns in excess of the risk free rate on risk factors over the previous three years.[5] Second, we calculate the realized risk premium by multiplying the estimates with the risk factors. Alphas are obtained as the difference between the fund's before-fee excess return and the realized risk premium.

Results

Scatter plots

30. Before performing the regression analysis we plotted the average excess return against the average OCF of each fund across the ten year period to see if there is an obvious relationship between price and performance. As shown in Figures 1 and 2, even within a narrow asset class such as retail active UK Equity Large Cap funds there is a wide dispersion of average annual performance against the benchmark.

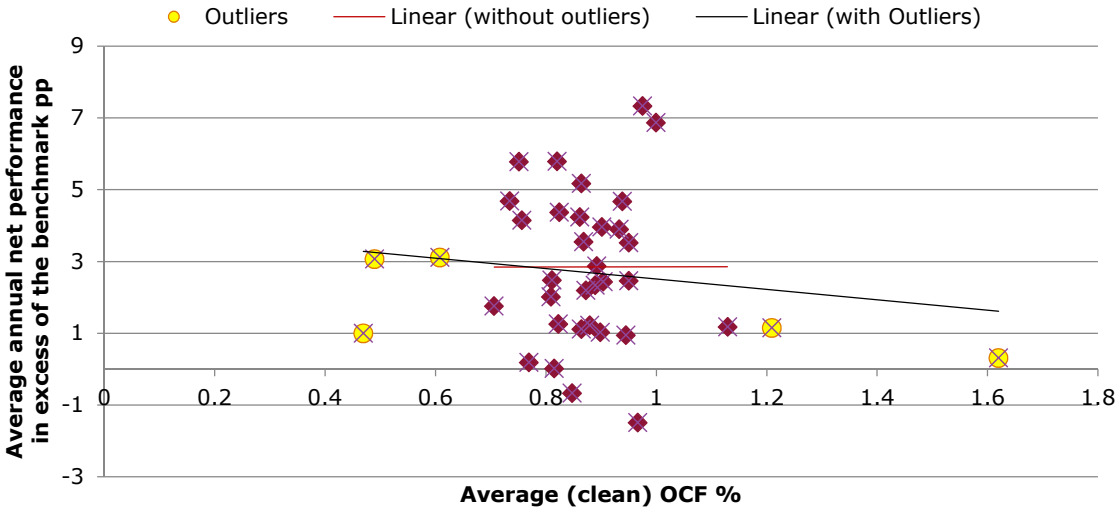
[4] Carhart, (1997), "On Persistence in Mutual Fund Performance", The Journal of Finance.

[5] A drawback of this metric is that by having to calculate a fund's correlation with the factors first, potential error is introduced into the estimation mode and only observations with 36 months of continuous prior information are included. The analysis is also carried out at a monthly rather than annual level to allow for more observations in the initial regressions.

The relative variation in performance in excess of the benchmark compared to variation in charges makes identifying a clear relationship between price and performance difficult.

31. From Figure 1 we see that there are only a small number of very cheap or very expensive funds and outlying funds have a substantial effect on the line of best fit.[6] Once these outliers are excluded there does not appear to be a clear relationship between the OCF and fund performance against benchmark gross of fees, with the line of best fit being flat. However, when including these outliers the slope of the line of best fit becomes negative.

Figure 1 – Annual gross excess performance Vs. OCF, 2006-2015, UK LC equity funds

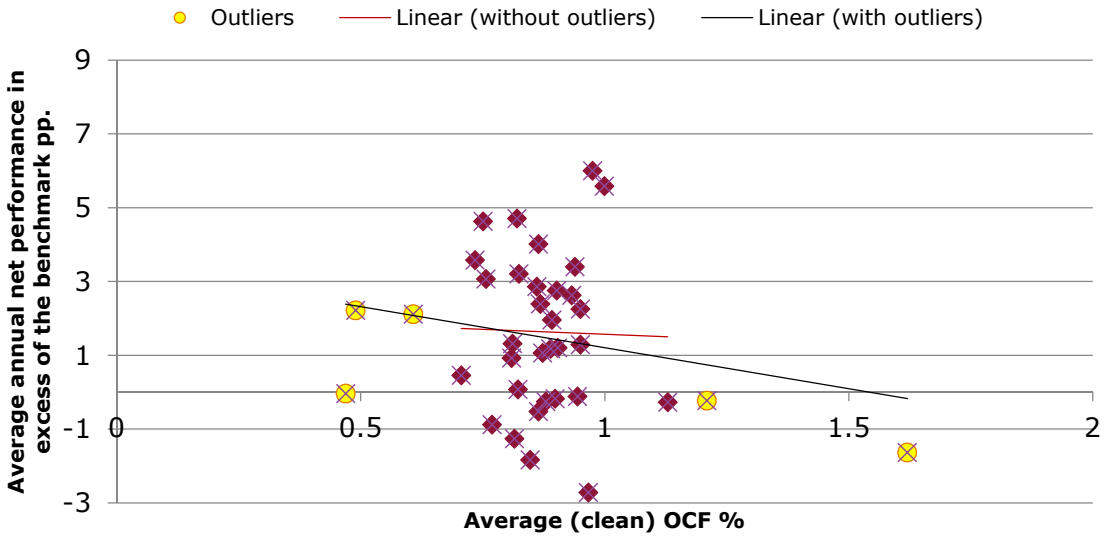


Source: Morningstar Direct and FCA data collected from asset managers and an investment platform.

32. Net of fees (Figure 2) the gradient of the line of best fit is downward-sloping with or without the outliers. This suggests on average for the period examined more expensive funds have produced worse returns for the investor.

[6] We have very few observations outside of a clustered price range. Those observations outside of the range can have a significant influence on the line of best fit. Therefore we have labelled observations with a price outside of a multiple of 1.5 of the interquartile range as outliers, and show the chart with and without these observations. We do the same for performance for consistency: if an observation is labelled as an outlier gross of fees we also exclude from the chart net of fees.

Figure 2 – Annual net excess performance Vs. OCF, 2006-2015, UK LC equity funds



Source: Morningstar Direct and FCA data collected from asset managers and an investment platform.

33. For these charts we have selected funds which have been present for the whole 2006-2015 period. This step was taken to ensure that we are presenting observations on a like-for-like basis. For the full regression analysis we include all funds that existed for any full year within this period, which almost doubles the number of funds included in the sample. While these charts provide a useful indication of the likely relationship between price and long-term fund performance, they are likely to be subject to survivorship bias because they condition on funds which existed for the full assessment period. In addition, they do not take into account any impact of the magnitude of assets in different funds, and there is no indication as to whether the slopes of the lines of best fit are statistically significant.[7] We incorporate these aspects in our regression analysis, set out in the next section.

Regression Results

34. Although the scatter plots provide a useful visual representation, we rely on regression analysis for more robust insights into the relationship between active fund charges and performance in the UK.

[7] Regressions include a log transformation of the net asset value of the fund to account for the fact that both price and performance may potentially be correlated with the net assets of a fund.

Table 1: Regression results of gross performance against 'clean' OCF, 2006-15

Performance measure	Annual returns in excess of benchmark	Sharpe ratio	Alpha
Asset class	**Coefficient of 'clean' OCF (δ_1)** (P-value)		
UK Equity Large Cap[8]	-0.2406 (0.687)	-0.0071 (0.445)	0.0016 (0.971)
Global Equity Large Cap[9]	-0.3106 (0.501)	0.0029 (0.757)	-
Europe Equity Large Cap[10]	0.4075 (0.642)	0.0013 (0.922)	-

T-Test rejects the null hypothesis that the coefficient is statistically equal to zero using:
* 90% confidence level ** 95% confidence level *** 99% confidence level

Source: Morningstar Direct and FCA data collected from asset managers and an investment platform.

35. We find that the results for all performance measures are statistically insignificant on a gross performance basis (see Table 1). However, we see some evidence of a statistically negative relationship net of fees (see Table 2). To ensure that the results are not unduly influenced by outlying observations we also repeated the regression using a robust regression model.[11] This led to no material change in results.

[8] The sample size for the Excess return and Sharpe ratio regressions = 905 annual observations from 151 funds, the sample size for alpha regression = 5670 monthly observations from 99 funds.

[9] The sample size for the Excess return and Sharpe ratio regressions = 1052 annual observations from 180 funds.

[10] The sample size for the Excess return and Sharpe ratio regressions = 743 annual observations from 117 funds.

[11] Li, G. 1985. Robust regression. In Exploring Data Tables, Trends, and Shapes, ed. D. C. Hoaglin, C. F. Mosteller, and J. W. Tukey, 281–340. New York: Wiley.

Table 2: Regression results of net performance against 'clean' OCF, 2006-15.

Performance measure	Annual returns in excess of benchmark	Sharpe ratio	Alpha
Asset class	**Coefficient of 'clean' OCF (δ_1)** (P-value)		
UK Equity Large Cap[12]	-1.1864** (0.044)	-0.0269*** (0.003)	-0.0841* (0.05)
Global Equity Large Cap[13]	-1.2320*** (0.007)	-0.0214** (0.020)	-
Europe Equity Large Cap[14]	-0.4522 (0.599)	-0.0173[15] (0.193)	-

T-Test rejects the null hypothesis that the coefficient is statistically equal to zero using:
* 90% confidence level ** 95% confidence level *** 99% confidence level

Source: Morningstar Direct and FCA data collected from asset managers and an investment platform.

Conclusion

36. We conclude from the evidence available that there has been no clear linear relationship between the gross performance of retail active equity funds in the UK and the level of on-going charges figure in the period examined.

37. Looking at the relationship between performance net of fees and the level of on-going charges figure we find some evidence that the impact of higher fees for more expensive active funds on average has meant that they underperformed cheaper active funds.

38. However, we also note that our results vary according to different sampling methodologies, and our overall conclusion drawn from this piece of analysis reflects this sensitivity. We have presented results from a series of different methodologies in the appendices to this annex.

[12] The sample size for the Excess return and Sharpe ratio regressions = 905 annual observations from 151 funds, the sample size for alpha regression = 5670 monthly observations from 99 funds.

[13] The sample size for the Excess return and Sharpe ratio regressions = 1052 annual observations from 180 funds.

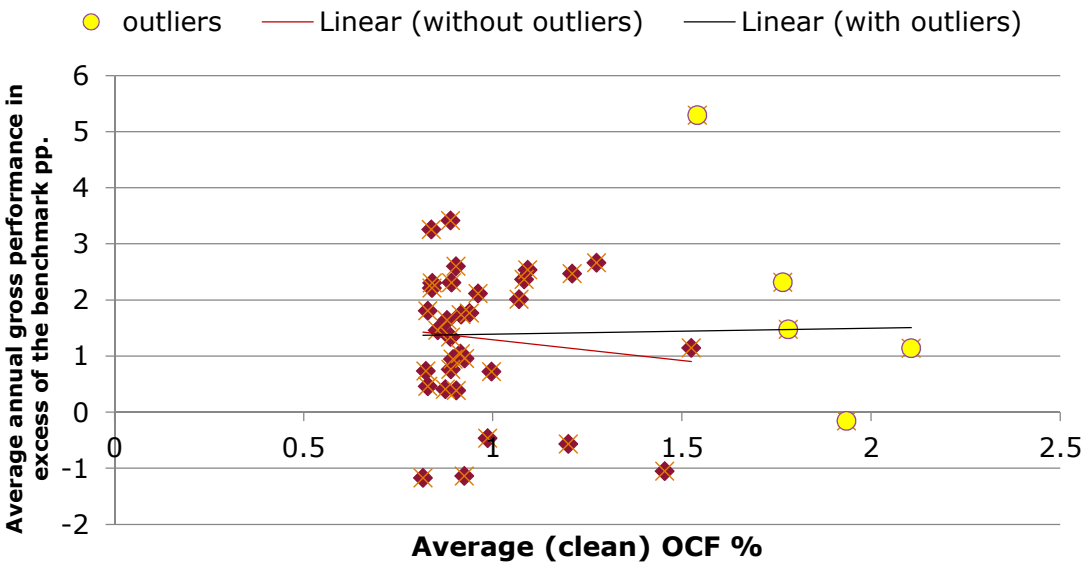
[14] The sample size for the Excess return and Sharpe ratio regressions = 743 annual observations from 117 funds.

[15] If the net asset value of the fund is not included as a co-variate in the regression the coefficient for the Sharpe ratio in the Europe equity regression becomes statistically significant at the 90% confidence level. The significance of the other regressions remains unchanged.

Appendix 1: Additional charts

39. Figures 3 and 4 show the average annual performance of global large cap equity funds which were in our dataset for the full ten year period of 2006-2015. This sample of funds will be likely to have on average outperformed their peers as the constraints imposed have introduced survivorship bias. We see a wide range of performance outcomes at the same price points and no clear indication that more expensive active funds provided better performance on average than those charging lower prices.

Figure 3: Annual gross excess performance versus. OCF, 2006-15, Global Large Cap Equity funds

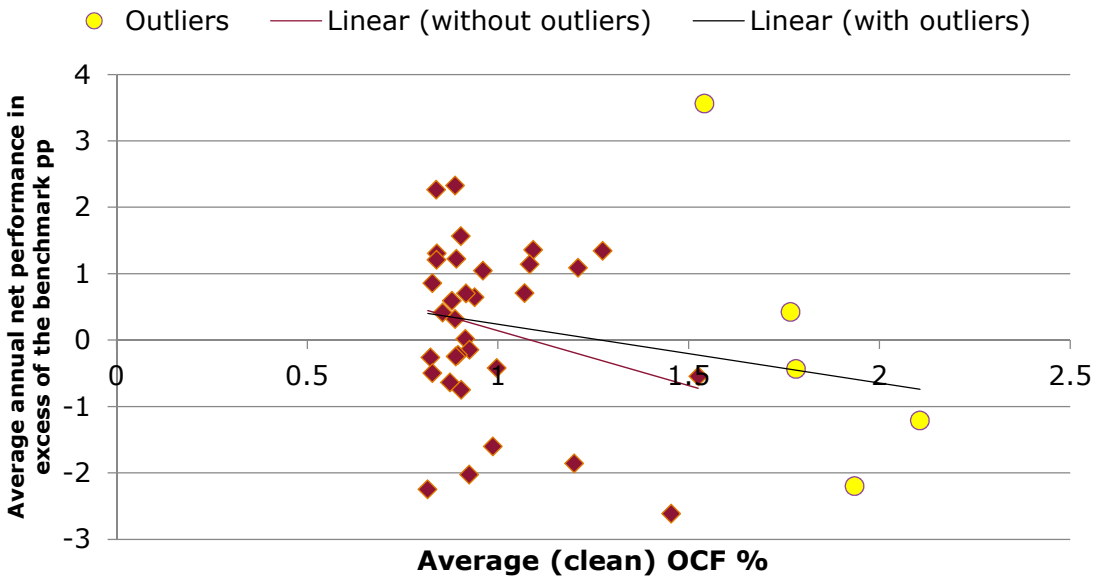


Source: Morningstar Direct and FCA data collected from asset managers and an investment platform.

40. Compared to the UK large cap equity category there is greater price variation and the effect on performance of paying more in charges becomes clear when looking at the net performance chart. The line of best fit slope is negative under each version (both with and without outliers). However, again this result is sensitive to a relatively small number of very expensive funds.[16]

[16] We have very few observations outside of a clustered price range. Those observations outside of the range can have a significant influence on the line of best fit. Therefore we have labelled observations with a price outside of a multiple of 1.5 of the interquartile range as outliers, and show the chart with and without these observations. We do the same for performance for consistency: if an observation is labelled as an outlier gross of fees we also exclude from the chart net of fees.

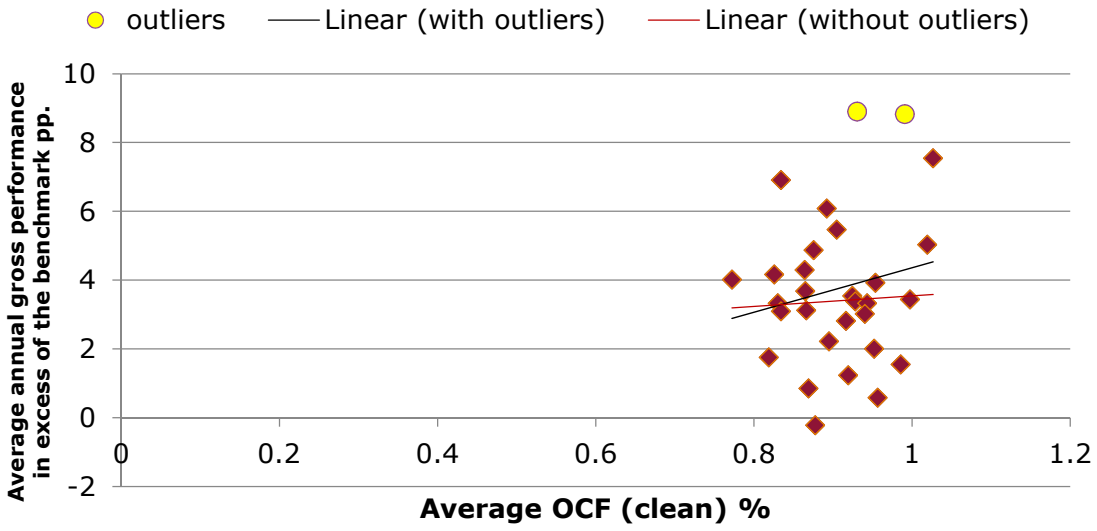
Figure 4: Annual net excess performance versus. OCF, 2006-15, Global Large Cap Equity funds



Source: Morningstar Direct and FCA data collected from asset managers and an investment platform.

41. Figures 5 and 6 show the average annual performance of Europe large cap equity funds which were in our dataset for the full ten year period 2006-2015. As with the other categories this sample of funds is likely to have on average outperformed their peers as the constraints imposed are likely to have introduced survivorship bias. As with UK large cap equity funds we see a wide range of performance outcomes at the same price points. The line of best fit indicates that relatively more expensive active funds have on average provided better gross performance than those charging lower prices.

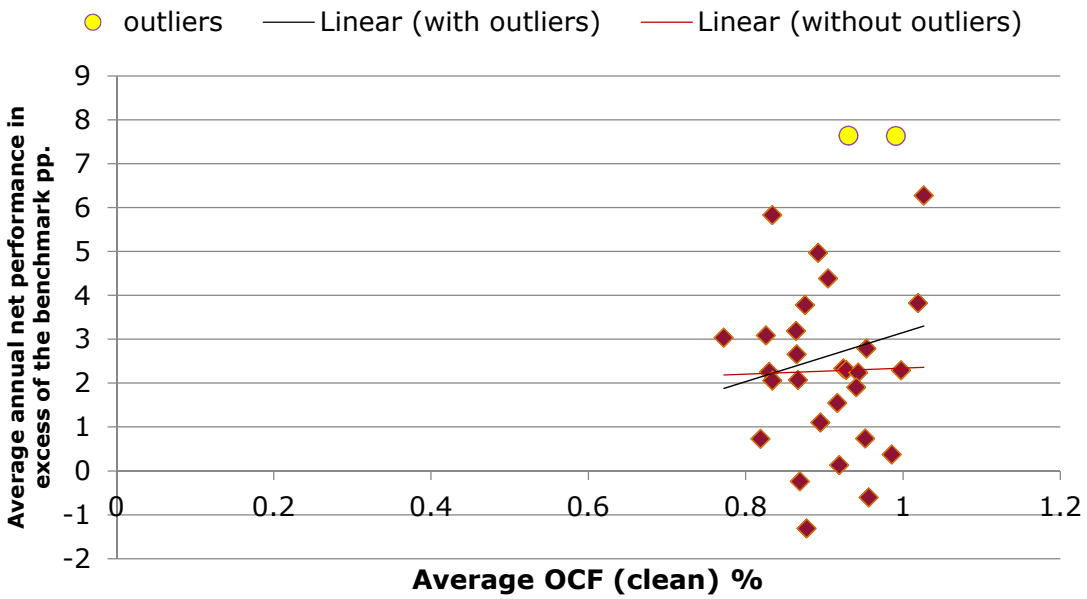
Figure 5: Annual gross excess performance versus OCF, 2006-15, Europe Large Cap Equity funds



Source: Morningstar Direct and FCA data collected from asset managers and an investment platform.

42. The same appears to apply net of fees. However, once again we see that the slope of the line of best fit is very sensitive to a few funds with outlying performance.

Figure 6: Annual net excess performance versus. OCF, 2006-15, Europe Large Cap Equity funds



Source: Morningstar Direct and FCA data collected from asset managers and an investment platform.

Appendix 2: Results from alternative sampling methodologies

Repeating approach including small cap funds

43. To further increase the sample size we also repeat our analysis by broadening the equity categories to include small/mid cap categories.

Table 3: Regression results of gross performance against 'clean' OCF, 2006-15

Performance measure	Annual returns in excess of benchmark	Sharpe ratio	Alpha
Asset class	**Coefficient of 'clean' OCF (δ_1)** (P-value)		
UK Equity[17]	-0.5212 (0.572)	-0.0079 (0.662)	-0.0449 (0.456)
Global Equity[18]	-0.4127 (0.375)	-0.0009 (0.920)	-
Europe Equity[19]	0.1448 (0.864)	-0.0129 (0.382)	-

T-Test rejects the null hypothesis that the coefficient is statistically equal to zero using:
* 90% confidence level ** 95% confidence level *** 99% confidence level

Source: Morningstar Direct and FCA data collected from asset managers and an investment platform.

44. As shown in Table 3 and consistent with our main results, we find that the relationship between gross performance and the OCF is not significantly different from zero across all categories and performance metrics examined.

45. After taking fees into account there is some evidence, as shown in Table 4, that the net return to the end investor is lower for more expensive funds. This is consistent with our main results. However, there are some key differences between these results and our main results. First, we see that at the 90% confidence level the negative result for the Sharpe ratio coefficient in the Europe equity sample becomes significant. This could be down to the improved sample size. We also see that the excess returns and Sharpe ratio coefficient for the UK equities sample become

[17] The sample size for the Excess return and Sharpe ratio regressions = 1964 annual observations from 151 funds, the sample size for alpha regression = 12441 monthly observations from 318 funds.

[18] The sample size for the Excess return and Sharpe ratio regressions = 1252 annual observations from 151 funds.

[19] The sample size for the Excess return and Sharpe ratio regressions = 835 annual observations from 147 funds.

insignificant at the 5% significance level. This could either demonstrate that the relationship is different for the sample of small cap funds or that these two performance measures do not capture appropriately the difference in risk profile between large cap and small cap equity funds.

Table 4: Regression results of net performance against 'clean' OCF, 2006-15

Performance measure	Annual returns in excess of benchmark	Sharpe ratio	Alpha
Asset class	**Coefficient of 'clean' OCF (δ_1)** (P-value)		
UK Equity[20]	-1.199 (0.162)	-0.0253 (0.172)	-0.1156* (0.056)
Global Equity[21]	-1.3317*** (0.004)	-0.0255*** (0.003)	-
Europe Equity[22]	-0.7149 (0.390)	-0.0280* (0.055)	-

T-Test rejects the null hypothesis that the coefficient is statistically equal to zero using:
* 90% confidence level ** 95% confidence level *** 99% confidence level

Source: Morningstar Direct and FCA data collected from asset managers and an investment platform.

Sensitivity using a sub-sample of asset managers

46. In this sensitivity we have repeated our analysis but we keep only those asset management firms from which we requested pricing data. The pricing data received from this sample of firms represented an improvement in the coverage of the OCF variable in Morningstar Direct, but also represents a smaller sample than for our main results.[23]

47. Table 5 shows that for each of the three equity categories analysed we find no statistically significant correlation between price and gross performance in excess of the benchmark (see first column).

[20] The sample size for the Excess return and Sharpe ratio regressions = 905 annual observations from 151 funds, the sample size for alpha regression = 5670 monthly observations from 99 funds.

[21] The sample size for the Excess return and Sharpe ratio regressions = 1052 annual observations from 180 funds.

[22] The sample size for the Excess return and Sharpe ratio regressions = 743 annual observations from 117 funds.

[23] For share classes listed on the investment platform in the equity categories examined, the OCF value was missing for 10% of our sample for the main results. For the sub-sample of 30 fund managers the missing rate fell to less than 2% of the sample.

Table 5: Regression results of gross performance against 'clean' OCF, 2006-15

Performance measure	Annual returns in excess of benchmark	Sharpe ratio	Alpha
Asset class	**Coefficient of 'clean' OCF (δ_1)** (P-value)		
UK Equity Large Cap[24]	-0.4624 (0.620)	0.0098 (0.616)	0.00885 (0.917)
Global Equity Large Cap[25]	0.2483 (0.670)	0.0240** (0.037)	-
Europe Equity Large Cap[26]	0.0693 (0.954)	-0.0069 (0.743)	-

T-Test rejects the null hypothesis that the coefficient is statistically equal to zero using:
* 90% confidence level ** 95% confidence level *** 99% confidence level

Source: Morningstar Direct and FCA data collected from asset managers and an investment platform.

48. A similar picture is seen after adjusting for the volatility of returns within the year as a proxy for risk. We find that the Sharpe ratio is also uncorrelated with price for two out of the three equity categories (see second column in Table 5).

49. This is further confirmed for UK equity funds by looking at the four factor alpha measure (see third column in Table 5) which shows that there is no significant relationship between four factor alpha (a measure of stock picking skill) and charges.

50. Table 6 shows that while we see the coefficient on each of the seven measures is negative, we do not find a statistically significant negative relationship, likely due to the smaller sample size used compared to our main result.

51. Overall the results from this sub-sample provide inconclusive evidence on the relationship between price and performance.

[24] The sample size for the Excess return and Sharpe ratio regressions = 500 annual observations from 72 funds, the sample size for alpha regression = 3566 monthly observations from 55 funds.

[25] The sample size for the Excess return and Sharpe ratio regressions = 515 annual observations from 74 funds.

[26] The sample size for the Excess return and Sharpe ratio regressions = 467 annual observations from 64 funds.

Table 6: Regression results of net performance against 'clean' OCF, 2006-15

Performance measure	**Annual returns in excess of benchmark**	**Sharpe ratio**	**Alpha**
Asset class	**Coefficient of 'clean' OCF (δ_1)** (P-value)		
UK Equity Large Cap[27]	-1.2157 (0.188)	-0.0077 (0.688)	-0.0459 (0.588)
Global Equity Large Cap[28]	-0.6802 (0.235)	-0.0002 (0.983)	-
Europe Equity Large Cap[29]	-0.7359 (0.538)	-0.0228 (0.270)	-

T-Test rejects the null hypothesis that the coefficient is statistically equal to zero using:
* 90% confidence level ** 95% confidence level *** 99% confidence level

Source: Morningstar Direct and FCA data collected from asset managers and an investment platform.

Pre RDR - Bundled data

52. Our main result focused on funds which were listed on an investment platform. For this platform we had access to data at a share class level on historical rebates paid to the platform from asset management firms. This allowed us to remove rebates from the OCF to create a pooled sample of clean and bundled share classes that could be compared with each other on a like-for-like basis.

53. However, we recognise that platforms are not the only distribution route available, and that the analysis underpinning the main result is based on just one platform's data. Therefore, we have run a sensitivity in which we assess bundled share classes only during the pre-RDR period.[30]

[27] The sample size for the Excess return and Sharpe ratio regressions = 500 annual observations from 72 funds, the sample size for alpha regression = 3566 monthly observations from 55 funds.

[28] The sample size for the Excess return and Sharpe ratio regressions = 515 annual observations from 74 funds.

[29] The sample size for the Excess return and Sharpe ratio regressions = 467 annual observations from 64 funds.

[30] The % of missing OCF values is higher for this sample with around 30% of the OCF observations missing.

Table 7: Regression results of gross performance against 'bundled OCF, 2006-12

Performance measure	Annual returns in excess of benchmark	Sharpe ratio	Alpha
Asset class	**Coefficient of 'bundled' OCF (δ_1)** (P-value)		
UK Equity Large Cap[31]	1.2003** (0.045)	0.0097 (0.375)	0.0321 (0.504)
Global Equity Large Cap[32]	0.3215 (0.441)	-0.0015 (0.861)	-
Europe Equity Large Cap[33]	1.7592** (0.033)	0.0332*** (0.009)	-

T-Test rejects the null hypothesis that the coefficient is statistically equal to zero using:
* 90% confidence level ** 95% confidence level *** 99% confidence level

Source: Morningstar Direct and FCA data collected from asset managers and an investment platform.

54. For gross performance we find that there is some evidence of a positive relationship between price and performance (see Table 7). This contrasts with our main findings presented above.

55. On a net performance basis for most categories we find no significant relationship between performance and charges (se Table 8). This suggests that where more expensive funds are able to generate higher before-fee performance the higher charges on these funds appear to drag the performance down by at least the equivalent of the additional performance.

[31] The sample size for the Excess return and Sharpe ratio regressions = 752 annual observations from 130 funds, the sample size for alpha regression = 4425 monthly observations from 99 funds.

[32] The sample size for the Excess return and Sharpe ratio regressions = 942 annual observations from 192 funds.

[33] The sample size for the Excess return and Sharpe ratio regressions = 637 annual observations from 111 funds.

Table 8: Regression results of net performance against 'bundled OCF -2006-2012.

Performance measure	**Annual returns in excess of benchmark**	**Sharpe ratio**	**Alpha**
Asset class	**Coefficient of 'bundled' OCF (δ_1)** (P-value)		
UK Equity Large Cap[34]	0.307 (0.603)	-0.0067 (0.535)	-0.0331 (0.490)
Global equity Large Cap[35]	-0.5302 (0.194)	-0.0210** (0.017)	-
Europe equity Large Cap[36]	0.9711 (0.251)	0.0185 (0.159)	-

T-Test rejects the null hypothesis that the coefficient is statistically equal to zero using:
* 90% confidence level ** 95% confidence level *** 99% confidence level

Source: Morningstar Direct and FCA data collected from asset managers and an investment platform.

Post-RDR Clean data

56. Post-RDR, most funds now offer a clean shareclass version of the fund. We have performed a sensitivity test in which we select funds in this period by identifying the 'primary share class.' However, since we only have three years of data available for this period we are not able to rely on these results.

[34] The sample size for the Excess return and Sharpe ratio regressions = 752 annual observations from 130 funds, the sample size for alpha regression = 4425 monthly observations from 99 funds.

[35] The sample size for the Excess return and Sharpe ratio regressions = 942 annual observations from 192 funds.

[36] The sample size for the Excess return and Sharpe ratio regressions = 637 annual observations from 111 funds.

Table 9: Regression results of gross performance against 'clean' OCF, 2013-15

Performance measure	Annual returns in excess of benchmark	Sharpe ratio	Alpha[37]
Asset class	**Coefficient of 'clean' OCF (δ_1)** (P-value)		
UK Equity Large Cap[38]	0.1202 (0.900)	0.0619** (0.013)	-0.0944 (0.423)
Global Equity Large Cap[39]	-2.5968*** (0.000)	-0.0339* (0.068)	-
Europe Equity Large Cap[40]	0.7889 (0.778)	0.0523 (0.400)	-

T-Test rejects the null hypothesis that the coefficient is statistically equal to zero using:
* 90% confidence level ** 95% confidence level *** 99% confidence level

Source: Morningstar Direct and FCA data collected from asset managers and an investment platform.

57. We find mixed results across different equity categories for gross performance (see Table 9). UK equity large cap shows either no statistically significant relationhip or a postive relationship depending on the metric assessed, Global equity shows a negative relationship, and Europe equity shows no statistically significant relationship.

[37] Due to the shorter time period the initial regression constraint is shortened to require the data be available for the preceding 24 months.

[38] The sample size for the Excess return and Sharpe ratio regressions = 173 annual observations from 69 funds, the sample size for alpha regression = 585 monthly observations from 45 funds.

[39] The sample size for the Excess return and Sharpe ratio regressions = 255 annual observations from 113 funds.

[40] The sample size for the Excess return and Sharpe ratio regressions = 128 annual observations from 51 funds.

Table 10: Regression results of net performance against 'clean' OCF, 2013-15.

Performance measure	**Annual returns in excess of benchmark**	**Sharpe ratio**	**Alpha**
Asset class	**Coefficient of 'clean' OCF (δ_1)** (P-value)		
UK Equity Large Cap[41]	-0.8357 (0.378)	0.0368 (0.137)	-0.1570 (0.178)
Global Equity Large Cap[42]	-3.5867*** (0.000)	-0.0639*** (0.000)	-
Europe Equity Large Cap[43]	0.0491 (0.986)	0.0363 (0.555)	-

T-Test rejects the null hypothesis that the coefficient is statistically equal to zero using:
* 90% confidence level ** 95% confidence level *** 99% confidence level

Source: Morningstar Direct and FCA data collected from asset managers and an investment platform.

58. Consisent with our other results for performance net of fees, we find the relationship between price and performance to be either absent or negative (see Table 10).

[41] The sample size for the Excess return and Sharpe ratio regressions = 173 annual observations from 69 funds, the sample size for alpha regression = 585 monthly observations from 45 funds.

[42] The sample size for the Excess return and Sharpe ratio regressions = 255 annual observations from 113 funds.

[43] The sample size for the Excess return and Sharpe ratio regressions = 138 annual observations from 51 funds.

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