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ARE UK FUND INVESTORS ACHIEVING FUND RATES OF RETURN?

AN EXAMINATION OF THE DIFFERENCE BETWEEN UK FUND RETURNS AND UK FUND INVESTORS' RETURNS

Diplomarbeit

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Lukas Schneider, am 31. Juli 2007

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LIST OF ABBREVIATIONS

ACT	Advance Corporation Tax
AMEX	American Stock Exchange
BVCA	British Venture Capital Association
CAPM	Capital Asset Pricing Model
CF	Cash Flow
DFA	Dimensional Fund Advisors
DWR	Dollar-weighted Return
ETF	Exchange Traded Fund
FTSE All-Share Index	Financial Times Stock Exchange All Share Index
IFSL	International Financial Services, London
IMA	Investment Management Association
IPD	Investment Property Databank
IRR	Internal Rate of Return
NASDAQ	National Association of Securities Dealers Automated Quotations
NAV	Net Asset Value
NCF	Net Cash Flow
NYSE	New York Stock Exchange
OEICs	Open-ended Investment Companies
ONS	Office for National Statistics
S&P 500 Index	Standard and Poor's 500 Index
TNA	Total Net Assets
TWR	Time-weighted Return
U.S.	United States
UCITS	Undertakings for Collective Investment in Transferable Securities
UK	United Kingdom

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1 INTRODUCTION

The introductory chapter outlines the background of the thesis and specifies the research question. Also the organisation of the remaining paper is explained.

1.1 Background and research question

The United Kingdom (UK) has the third biggest fund management industry after the United States (U.S.) and Japan. Within the industry there is fierce competition between fund managers to attract assets from investors. In order to gather assets, fund managers make extensive use of marketing tools. Their marketing adverts show their most recent out performance, the 3 year track record of their 'star portfolio manager' or their 5 year top quartile performing flagship fund. When looking at fund managers marketing material it is important to be cautious. First of all, for the creation of marketing material, fund managers pick time periods in which the performance of the respective fund compares favourably versus its peer group or its benchmark index. Most of the time, the advertisements cover only short time periods of up to 3 or 5 years. As most of the fund managers are managing multiple funds, it is very likely that one of these funds is outperforming its peers at any given time and can therefore be used for advertising purposes. In a sense it can be said that most of the fund managers encourage return-chasing behaviour by promoting short-term performance and 'trendy' funds. On top of that, the marketing information is irrelevant anyway, because, as the disclaimer of fund managers' advertisement says: "*Past performance is not necessarily a guide to future performance.*" (Blackrock, 2007)

Apart from that there is also another very important issue. Fund managers promote fund performance. The media quotes fund performance. Research databases provide information on fund performance, but what about investors? What do they get? **Are UK fund investors achieving fund rates of return?** As mentioned above, fund managers or the media quote fund returns or buy-and-hold returns.[1] Buy and hold refers to the action of buying a fund and holding it throughout the entire quoted time period. However, the returns of the investors in the funds can be quite different. The actual returns of investors are determined not only by the returns of the funds they hold, but also by the timing and magnitude of their cash flows into and out of these funds (Dichev, 2007). While the time-

[1] In this thesis, the fund return will be referred to as either buy-and-hold return or time-weighted return and will be calculated as geometric average return.

weighted return (or buy-and-hold return) measures the performance of the fund manager, it ignores month-to-month variation in assets under management. To incorporate the variation in assets under management, the calculation of a dollar-weighted return [2] explicitly accounts for net cash flows into and out of the fund over time, and is therefore reflecting the average investors' performance during the observation period (Friesen and Sapp, 2006). The dollar-weighted return calculation sees the sequence of investors' cash flows as an investment project and is computed as the internal rate of return (IRR). The intuition for the concept of dollar-weighting returns can be best illustrated by an example.[3]

Consider a fund investor who buys 10 units of fund j at £50 each at the beginning of time period 1. Thereafter, the fund price doubles and the investor buys 10 more units at the price of £100 at the end of time period 1. Finally, the fund price goes back to £50 at the end of time period 2 and the investors sells all his fund units. There are no dividends in this example.

The average buy-and-hold return (R_{BH}) for fund j over the time periods 1 and 2 is calculated by the geometric average of the individual period returns (r):

(1)

$$R_{BH} = [(1 + r_1)*(1 + r_2)* \ldots *(1 + r_t)]\text{^}1/t - 1$$

$$= [(1 + 100\%)*(1 - 50\%)]\text{^}1/2 - 1$$

$$= 0$$

If you look at this example it is intuitively clear, that the geometric average return of 0 does not accurately reflect the investor experience, as the investor has spent a total of £1,500 to yield only £1,000. The loss was created because of poor cash flow timing. The investor doubled up his investment amount just before negative rates of return. The buy-and-hold return of 0 would just reflect the investment experience of those investors who bought at the beginning of time period 1, did not make any purchases or sales throughout the entire time period, and sold their total investment at the end of time period 2.

The example shows that it makes sense to give more weight to the negative return over time period 2, as double the amount of money was invested. After specifying the relevant

[2] Dollar-weighted return is the term most commonly used in the existing literature (mostly US orientated) so this term will be retained throughout the thesis even if the term money-weighted or pound-weighted would be more appropriate.

[3] Example similar as in Dichev (2007)

cash flows (CF), the internal rate of return (IRR) will calculate the dollar-weighted return for fund j. "*Formally, the IRR is defined as the rate of return that sets the discounted algebraic sum of all investment amounts equal to zero.*" (Dichev, 2007, p.387)

(2)

$$CF_0 + CF_1*(1 + IRR)^{-1} + CF_2*(1 + IRR)^{-2} + \ldots + CF_t*(1 + IRR)^{-t} = 0$$

$$-500 -1000*(1 + IRR)^{-1}+2000*(1 + IRR)^{-2} = 0$$

As the IRR calculation considers the fund investment as an investment project, the contributions go into equation (2) with negative signs and the terminal withdrawal with a positive sign. Solving for the internal rate of return gives a result of -26.8 per cent. The hypothetical example from above should not only explain the calculation of the dollar-weighted return but also demonstrate the great importance of this different return calculation.

Already in 1996 Vanguard founder John C. Bogle argued about the need for mutual funds to report dollar-weighted returns (Bogle, 2003). Eventually, it took the industry ten years to start catching up with Bogle's suggestion. In June 2006 Morningstar finally introduced the dollar-weighted return calculation on its research database under the term 'Morningstar Investor Return' (Morningstar, 2006). As of April 2007, 'Morningstar Investor Return' is just available for open-end mutual funds and exchange-traded funds based in the United States. Morningstar has no definitive date for the introduction of dollar-weighted returns for their European and UK databases (Buffenoir, 2007).

Research from the U.S. has pointed out, that in the past, dollar-weighted returns on both the aggregate stock market level (Dichev, 2007) and at the individual fund level (Nesbitt (1995), Friesen and Sapp (2006)) have been significantly lower than time-weighted returns. While Dichev has also examined dollar weighted returns for the aggregate UK stock market, to my knowledge, no studies have examined dollar weighted returns using cash flow data at the individual and at the aggregate fund level for the UK fund industry.

The purpose of this thesis is to answer the research question: "Are UK fund investors achieving fund rates of return?" This will be investigated by an examination of the difference between UK fund returns and UK fund investors' returns. The difference will be referred to as the 'performance gap'. In the previous hypothetical example, the

performance gap amounted to -26.8 per cent, which is the difference between the time-weighted and the dollar-weighted return.[4]

1.2 Thesis structure

In order to answer the research question the thesis is structured as follows. Chapter 2 presents facts and figures about the UK investment fund industry. Chapter 3 reviews the existing literature on investment performance measurement. Chapter 4 describes the data being used and comments on the construction of the data set. Chapter 5 explains the characteristics and calculations of the three main return measurement methods and elaborates on the concept of the performance gap and statistical significance testing. In Chapter 6 the results are brought together. Analysis Part 1 examines whether fund investors have achieved fund rates of returns. This analysis is similar to the research of U.S. researchers but is applied to a new data set (UK). Analysis Part 2 examines whether fund investors are successful in their cash flow timing decisions while controlling for factors that are not within the scope of fund investor decision making. In Chapter 7 explanations for the performance gap are explored. The discussion includes behavioural finance concepts as well as other possible explanations. Chapter 8 concludes.

[4] Performance gap = time weighted return – dollar weighted return = 0 – 26.8% = -26.8%

2 THE UK INVESTMENT FUND INDUSTRY

2.1 International comparison

The United Kingdom is one of the largest markets in the world for fund management, after the United States and Japan.[5] Assets of the global fund management industry have been increasing since 2002, reaching $ 55 trillion at the end of 2005.

Table 1: Sources of global assets under management (end 2005)

$billion

	Conventional investment management					
	Pension funds	Insurance assets	Mutual funds	Total conventional	Private wealth*	Alternative funds**
US	12,119	5,465	8,905	26,489	9,400	-
Japan	3,419	2,264	470	6,153	-	-
UK	1,607	1,907	547	4,061	-	-
France	165	1,527	1,363	3,055	-	-
Germany	114	1,370	297	1,781	-	-
Netherlands	693	385	94	1,172	-	-
Switzerland	469	337	117	923	-	-
Other	1,967	3,371	5,978	11,316	-	-
Total	**20,553**	**16,626**	**17,771**	**54,950**	**33,300**	**1,500**

* Around one-third of private wealth is incorporated in conventional investment management
** Estimate of hedge fund assets and private equity funds;
*** These figures only show domestically sourced funds for each country regardless where they are managed
**** No reliable international comparisons are available for total funds under management in each country

Source: IFSL (2006), IFSL estimates based on Watson Wyatt, Bridgewell, Merrill Lynch, ICI, SwissRe Hennessee Group

Table 1 shows that pension assets accounted for $20.6 trillion in 2005, whereas $17.8 trillion were invested with mutual funds and $16.6 trillion in insurance funds. Merill Lynch estimates the total value of private wealth at $ 33.3 trillion of which about one third is already incorporated in other forms of conventional management investment management. At the end of 2005, the U.S. was by far the largest source of global assets under management with about 48% of the world total, followed by Japan with 11% and the UK with 7%. However, this ranking can understate the position of the UK, as quite a substantial amount of funds is managed in the UK on behalf of overseas clients. The UK has the second highest ratio of funds as per cent of GDP with 178% in 2005 after the United States with 213%. The global average amounts to a total of 87%.

[5] This chapter uses the IFSL (2006) report as main source.

2.2 Fund management in the UK

The ISFL (International Financial Services, London) estimates the size of the UK fund management industry at £3.5 trillion as of year end 2005.[6]

Table 2: Funds under management in the UK[7] (end 2005)

Client type, £billion

	Total
Institutional	2,270
-insurance	902
-corporate pension funds	896
-other (local authority, charity, etc)	472
Retail	530
- UK domiciled unit trusts, OEICs, inv. trusts	347
- retail funds domiciled outside the UK	180
Total IMA members	**2,800**
Alternative funds	**374**
- hedge funds	120
- property funds	240
- private equity funds	14
Private client funds	**276**
Total funds under management in the UK	**3,450**

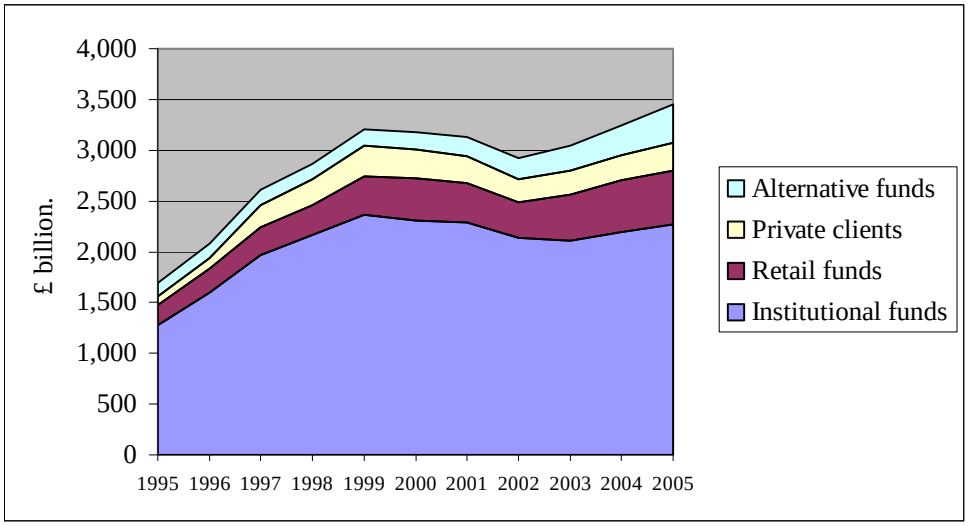
Source: IFSL (2006), based on data from IMA, ComPeer, Eurohedge, BVCA, IPD, IFSL estimates

Institutional funds accounted for the majority of funds under management in the UK (£2.27 trillion as of end 2005). Institutional assets have risen by over 40% over the past decade. Institutional funds include insurance funds, corporate pension funds, local authority and charity funds.

Retail funds accounted for about 15% of funds under management in the UK in 2005 or £530 billion. UK domiciled funds include unit trusts and OEICs (open-ended investment companies), investment trusts and other retail products and represent £347 billion. UK managed funds domiciled outside the UK such as UCITS (Undertakings for collective investment in transferable securities) and ETFs (exchange traded funds) accounted for about £180 billion. UK fund managers domicile funds offshore, mainly to profit from tax and regulatory advantages. In recent years, alternative funds and private client funds have increased their market share and have funds under management of £374 billion and £276 billion respectively (end 2005).

[6] This chapter uses the IFSL (2006) report as main source.
[7] Figures have been adjusted to take account of double-counting

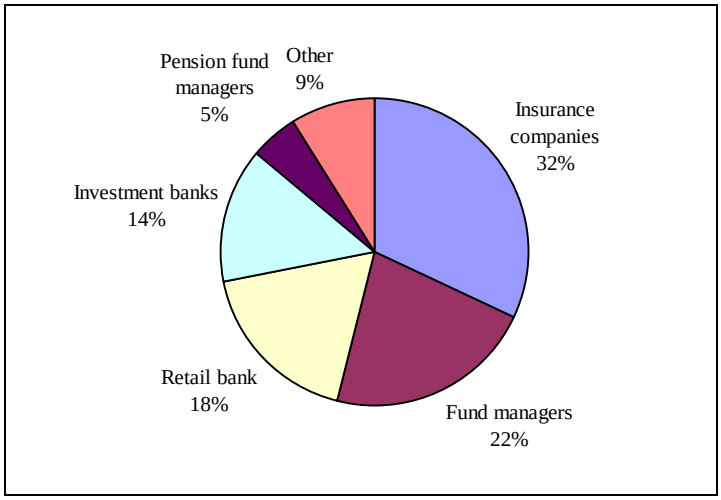
Figure 1: Growth of funds under management in the UK (1995-2005)



Source: Compiled by the author based on data from IFSL (2006), IFSL estimates based on IMA, ONS, ComPeer, Eurohedge, BVCA and IPD data

Figure 1 highlights the growth of funds under management for the four main fund categories in the UK. During the stock market crash in 2000/2001, all four main sectors experienced declining funds under management. From 2002 onwards, the growth in funds under management has picked up again, although the growth was weaker for the institutional sector.

Figure 2: Assets managed in the UK by manager type (end 2005)



Source: Compiled by the author, based on data from the IMA (2006)

Figure 2 reveals information about the percentage of assets managed by different manager types. In the UK, about one third of total funds are managed by insurance companies. Two thirds of the assets they manage originate from their clients and the remainder from

pension assets. The category fund manager represents independent investment managers that are not linked to any UK-based banking, securities or insurance-group. Retail and investment banks include banking and securities groups which often combine securities and fund management operations. Pension fund managers represent separate legal entities, established to manage a company's pension fund assets.

2.3 UK retail fund market

As shown in Chapter 2.2, the UK retail sector accounted for 15%[8] of total assets under management or about £530 billion as at December 2005. The UK retail segment can be split in two parts:

- Retail funds domiciled outside the UK (£180 billion)
- UK domiciled unit trusts and OEICs (£347 billion)

2.3.1 History of unit trusts and OEICs

The first unit trusts were launched in the early 1930s. By 1939 there existed about 100 unit trusts, managing funds in the range of £80 million (M&G, 2007). Unit trusts are collective funds, which allow private investors to pool their money within a single fund, therefore spreading their risk and reducing their dealing costs. Unit trusts are open-ended, which means that new units can be offered in response to demand. (Finance Glossary, 2007)

In 1996, unit trusts were superseded by OEICs (open-ended investment companies). Unit trusts have a bid and an offer price like individual securities whereas OEICs have just a single price for purchase and sale. In recent years, many unit trust managers have converted to OEICs. The motivation for the conversion is often cited as a simplification and precursor to distributing funds Europe wide under the new EU rules. (HM Treasury, 2007)

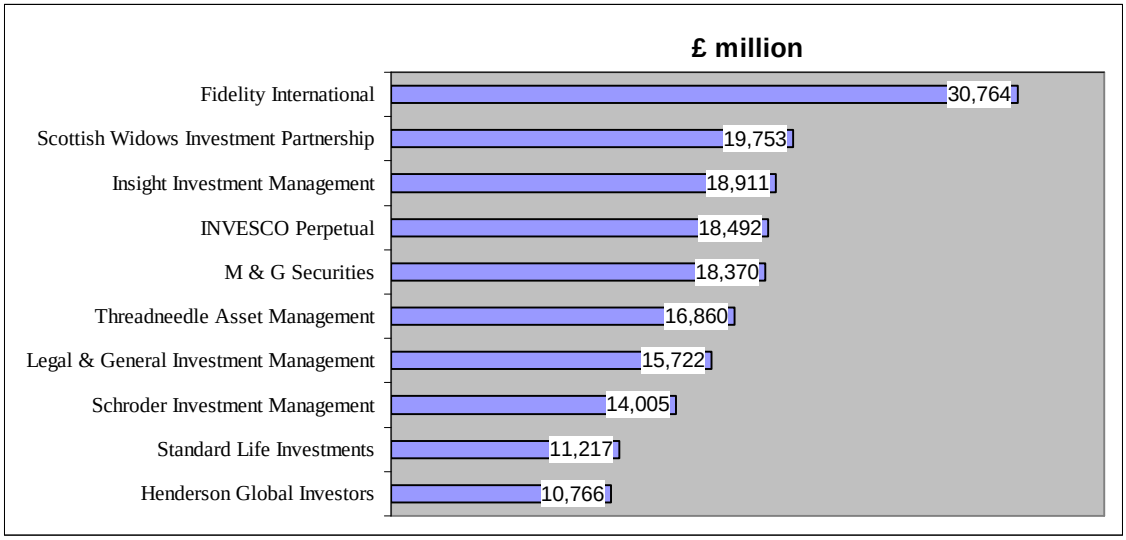
[8] 15% represents an IFSL (2006) estimate, which includes figures for alternative funds and private client funds. The IMA (2006) quantifies the retail sector with 19% and does not include alternative funds and private client funds. However, the absolute number of £530 billion is identical, due to the fact that IFSL uses IMA data as its source.

2.3.2 Characteristics of the UK retail fund market

Assets invested in unit trust and OEICs include both, retail and institutional investment in 'collective investment schemes'.[9] The IMA estimates the balance between these two investor groups as 90% retail investors and 10% institutional clients as of December 2005.

In December 2005, 118 companies were offering a total of 2007 funds with £347 billion under management.

Figure 3: Top 10 UK unit trust and OEIC managers (end 2005)[10]



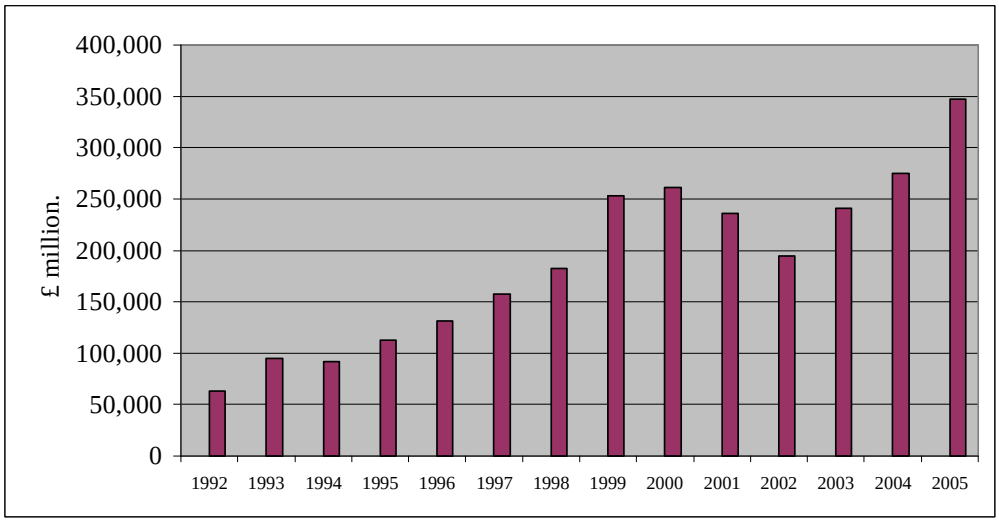
Source: Compiled by the author, based on data from the IMA (2006)

The top ten UK unit trust and OEIC managers accounted for 50% of the total or £175 billion. Fidelity International is the largest fund manager with £30.7 billion, followed by Scottish Widows Investment Partnership and Insight Investment Management with assets under management of £19.8 billion and £18.9 billion respectively. Since 2000 the volume of funds managed by the Top 10 firms has increased, as the number of firms has been consolidated.

[9] This chapter uses the IMA (2006) report as main source.
[10] The ranking here is calculated on the basis of asset management firms managing assets for funds branded under their own name or that of other parts of the same parent group.

Funds under management of the UK fund industry have recovered strongly after the bear market of 2000/2001.

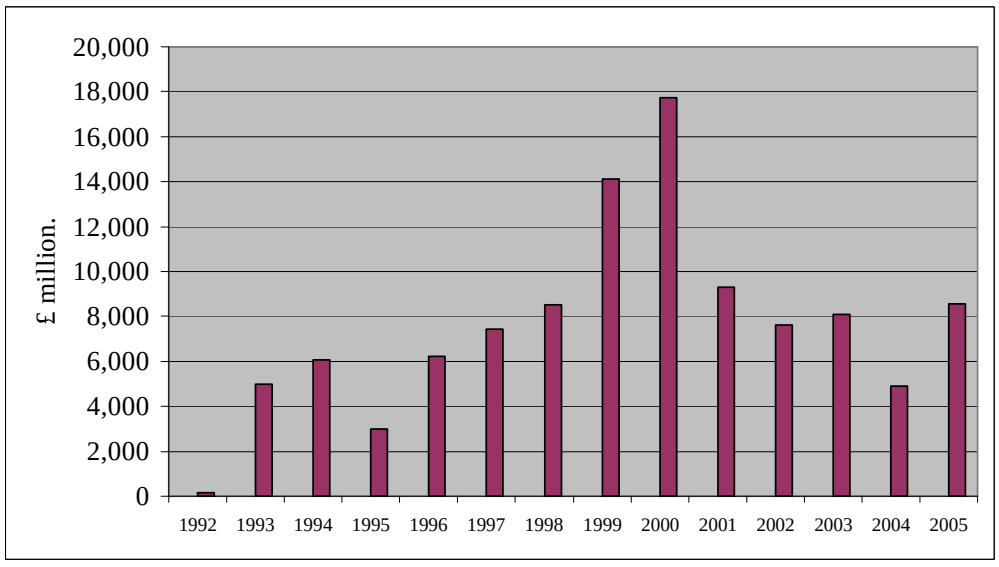
Figure 4: Funds under management of UK domiciled retail funds (1992-2005)



Source: Compiled by the author, based on data from the IMA (2006)

Figure 4 shows monotonically increasing funds under management for the UK retail fund sector from 1992 up to 2000. From thereon funds under management decreased because of the equity bear market as well as lower net retail sales. From 2002 onwards, funds under management started to grow again and breached the £300 billion mark for the first time in July 2005, due to strong markets and strong net retail sales. By December 2005, a total of £347 billion was reached, which represents a 26% increase from previous year.

Figure 5: Net retail sales of UK domiciled retail funds (1992-2005)

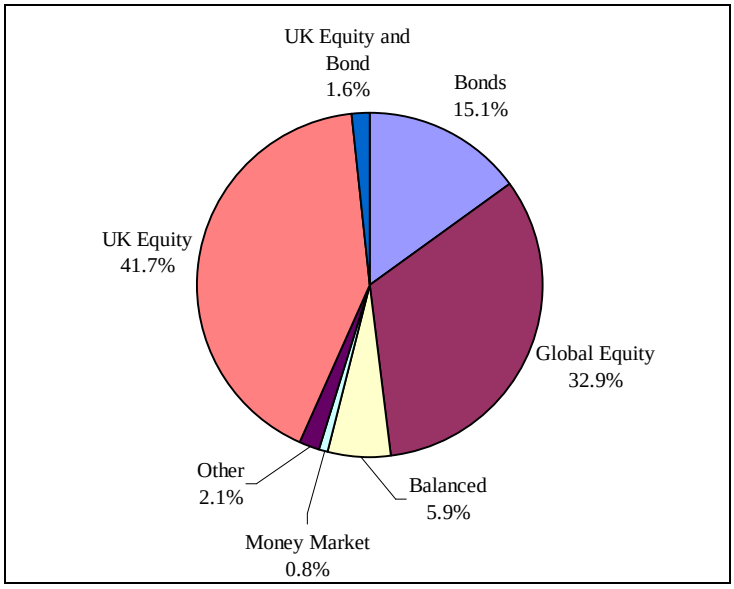


Source: Compiled by the author, based on data from the IMA (2006)

Figure 5 shows the amount of net retail sales per year. Net retail sales increased strongly in the second half of the 1990s reaching its peak in 2000 with £17.7 billion. From thereon net retail sales declined drastically to a low of £4.9 billion in 2004. In 2005, sales recovered again to a level of £8.5 billion.

Within UK domiciled funds, equity remains the dominant asset class, accounting for 74.6% of total funds under management.

Figure 6: UK funds under management by asset type (end 2005)

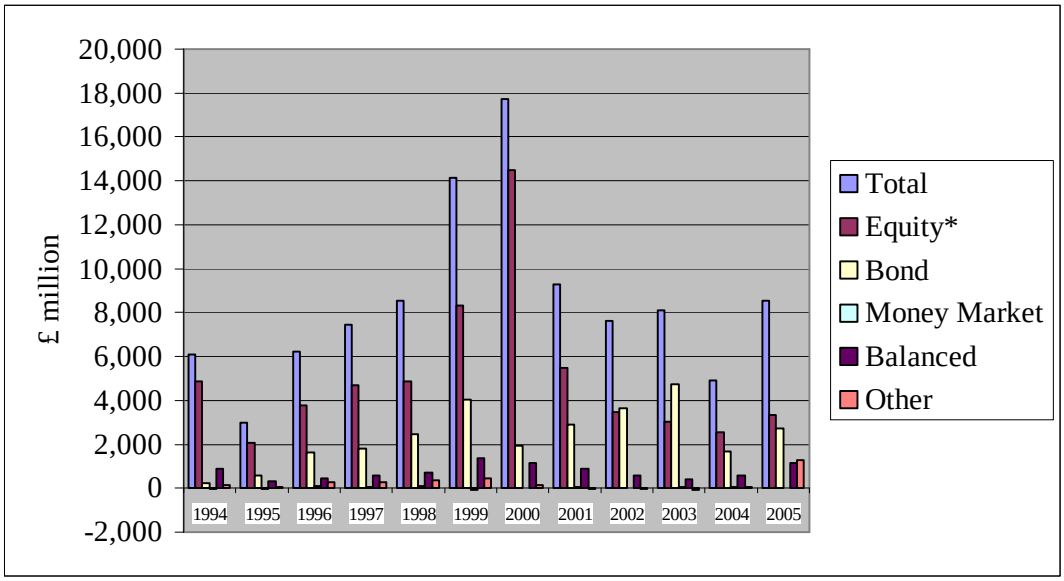


Source: Compiled by the author, based on data from the IMA (2006)

At the end of 2005, the biggest part of the equity portion was allocated towards UK Equities with 41.7% whereas 32.9% were invested in global equities. Within the sector global equities, Europe (ex UK) is the favoured region with an allocation of about 30% of assets. The bond portion makes up 15.1% of the total.

The period from 1992 to 2005 has seen strong variation in asset type preferences by investors.

Figure 7: Net retail sales by asset category (1994-2005)



* The equity asset class contains the 'specialist sector' which includes funds investing in property through direct, indirect or varied global investments.

Source: Compiled by the author, based on data from the IMA (2006)

In the second half of the 1990s, the proportion of equity net retail sales increased strongly, reaching about 80% of total net retail sales in 2000. From the year 2000 onwards, total sales decreased dramatically. Also the proportion of bond versus equity investment changed fundamentally. In 2002 and 2003, investors allocated more money in bond funds than in equity funds. When the equity markets recovered in 2004 and 2005 investors switched again and purchased a higher amount of equity funds than bond funds, although the lead of equities remained small.

2.3.3 UK equity funds

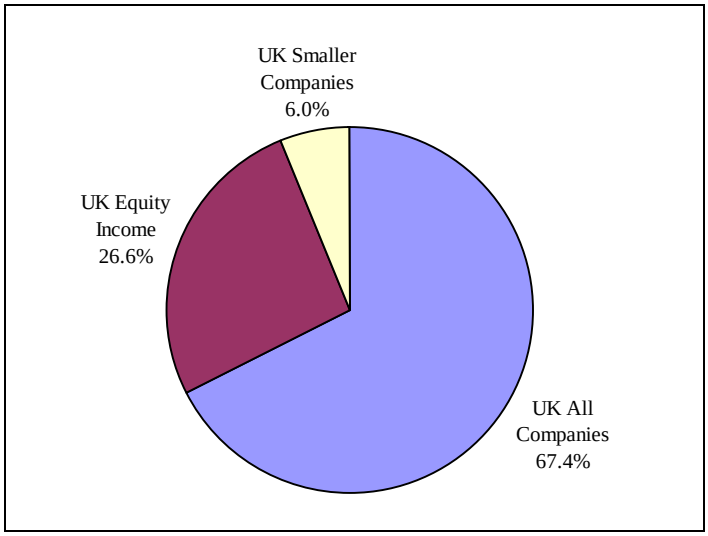
This chapter will look at the UK Equity sector more specifically, as this is the sector that is the focus of the subsequent analysis in Chapter 6.

As Figure 6 has shown, UK Equity accounts for about 41.7% of funds under management of UK domiciled funds. The UK Equity segment can be further disaggregated in its different IMA sectors.

The IMA defines the UK Equity sectors as follows (IMA, 2007a):

- UK Equity Income: Funds which invest at least 80% of their assets in UK equities and which aim to achieve a yield on the underlying portfolio in excess of 110% of the FTSE All Share yield (net of tax).
- UK All Companies: Funds which invest at least 80% of their assets in UK equities which have a primary objective of achieving capital growth.
- UK Smaller Companies: Funds which invest at least 80% of their assets in UK equities of companies which form the bottom 10% by market capitalisation.
- UK Growth[11]: To produce capital growth.[12]

Figure 8: UK equity funds under management by IMA sector (end 2005)



Source: Compiled by the author, based on data from the IMA (2006)

After disaggregating the UK Equity segment in its different constituents, UK All Companies accounted for the bulk of funds under management with 67.4% or £97.9 billion at the end of 2005. UK Equity Income amounted to 26.6% or £38.7 billion and the remaining 6% or £8.7 was accounted for by the UK Smaller Companies sector. (IMA, 2007b)

[11] The UK Growth sector is no longer in existence. However, its definition is mentioned because the sector UK Growth is relevant for the explanations in the data description chapter.
[12] definition by Quigley and Sinquefield (2000), p. 73

3 LITERATURE REVIEW

3.1 History of fund performance measurement

Prior to 1959 it was not possible to properly compare performance in the stock market relative to other investment vehicles.[13] In 1959 Louis Engel, Vice President at Merill Lynch, Pierce, Fenner & Smith, asked Professor James H. Lorie at Chicago's Graduate School of Business, if stock market performance versus other kinds of investment had been analyzed in the past. An analysis like this had not been done previously as there was no comprehensive stock market database available at this time. Professor Lorie suggested that Merill Lynch should provide funds to finance a project to create a stock database. The database would include prices, dividends and rates of returns of all stocks listed on the NYSE since 1926. Hence with a grant of $ 300,000 from Merill Lynch, the Center for Research in Security Prices (CRSP) was established in 1960 at the Chicago's Graduate School of Business. The original data set was hand collected and was completed in 1964. From there on, the advent of more advanced computer technologies made it possible to maintain more accurate stock market information. With the creation of the CRSP stock price data base it became possible to perform meaningful fund performance analysis for the U.S. market.

3.2 Databases

The CRSP database was primarily used by academics to address research questions. As the mutual fund industry continued to grow at a rapid pace, individuals also started questioning fund performance information. In 1973 Lipper Analytical Services was founded by Michael Lipper to provide performance analysis services for open-end funds, closed-end funds and variable annuities to the general public in the U.S.. Lipper was then acquired by Reuters PLC in 1988, which enabled the provision of global fund coverage. As of 2005, Lipper covered 130,000 funds. (Lipper, 2007)

In 1984 Morningstar was founded by Joe Mancuso with the aim to deliver comprehensive fund performance information to individual investors. In 2000 Morningstar Europe was launched. With operations in 15 countries Morningstar provides information on 190,000 'investment offerings' worldwide as of 2006. (Morningstar, 2007a)

[13] This chapter uses the CRSP (2007) homepage as main source.

Another important fund database in the United Kingdom is Micropal, which was founded in 1985. In 1997 the McGraw-Hill Companies acquired Micropal and organized it from there on under its Standard & Poor's brand (Business Wire, 1997). In March 2007 Morningstar acquired Standard & Poor's global fund data business (including Micropal) which provides information on 135,000 managed investment vehicles[14] (Morningstar, 2007b). The data set being used in this thesis is sourced from former Standard and Poor's Micropal, which will be explained in the section 'data set' in greater detail.

3.3 Survivorship bias

Survivorship bias is a major issue for the previously mentioned databases. In the context of mutual fund performance, survivorship bias occurs when funds with poor performance results are closed down or merged into other funds. Databases like Morningstar, Lipper or Micropal are just reporting on the funds which are still in existence. Closed down funds are removed from the databases. Several researchers find that survivorship bias significantly affects past performance numbers.

The first study to attract serious attention to the survivorship issue is by Brown, Goetzmann et al. (1992). They analyze the relationship between volatility and returns for a U.S. mutual fund sample that is truncated by survivorship and show that this relationship gives rise to the appearance of return predictability.

Malkiel (1995) examines Lipper data on U.S. funds from 1982 to 1991. Over this time period the average return of all general equity mutual funds is 17.09% per year. When he adjusts for survivorship bias the funds' average return is 15.69%. The survivorship bias free data demonstrates an annual underperformance of 1.83% versus the S&P 500's return (17.52%).

Carhart, Carpenter et al. (2000) find that funds disappear primarily because of poor multi-year performance. They find a significant survivorship bias of 1% for samples being longer than 15 years, using Carhart's survivorship-bias free sample of U.S. mutual funds from 1997.

Data providers Lipper and Morningstar acknowledge the survivorship bias, but they attribute less importance to this issue. Steven Clarke, a representative of Lipper, stated in

[14] The reason for the high number of managed investment vehicles across fund databases is presumably the inclusion of all the different fund share classes.

May 2005, that retail investors are just interested in which existing funds they should be buying and not in dead funds that have ceased business (International Herald Tribune, 2005). Nonetheless it can be argued that the survivorship bias inflates fund returns and that historic fund returns are therefore not reflecting the real experience of fund investors.

3.4 Fund manager performance studies

Fund manager performance studies are performed to evaluate whether portfolio managers or security analysts can increase portfolio returns through successful forecasting of security prices above an appropriate benchmark.

One of the earliest studies in this subject is performed by Jensen (1968). Based on the Capital Asset Pricing Model (CAPM), he derives a risk-adjusted measure of portfolio performance to estimate by how much portfolio managers can increase returns through successful forecasting. He finds that the 115 U.S. mutual funds in his sample are on average not able to outperform a passive strategy, which would buy the market and hold it through the whole observation period. No individual fund is able to do significantly better than it would be expected from random chance. He concludes in questioning the benefits of research and trading activities by fund managers in order to increase investors' risk adjusted returns.

One of the most influential fund manager performance studies is by Carhart (1997). To analyze the U.S. mutual fund performance data, he employs a 4-factor model, using the Fama/French 3-factor model, supplemented by a one-year momentum factor, capturing Jegadeesh and Titman's one-year momentum anomaly. He finds that the fund investment strategy, as captured by his 4-factor model and investment costs, accounts for almost all of the predictability in fund returns. The investment costs of expense ratios, transaction costs and load fees have an especially severe direct and negative impact on investment performance. His research provides hardly any evidence consistent with skilled or informed fund managers. Carhart's results are confirmed by Quigley and Sinquefield (2000) in the UK. They show that after controlling for market, size and value risk (as proposed by the Fama/French 3-factor model) UK fund managers in aggregate are unable to outperform the market. When addressing the separate question of persistence in performance, they find that losers repeat but winners do not. Especially in the segment of small company unit trusts, the performance failure of fund managers is persistent and reliable.

3.5 Individual investor performance studies

The advent of internet brokerage has substantially changed the investment landscape in recent years. It enabled individual investors to participate more actively in the markets through their online brokerage accounts. The fast growth of this market segment has also attracted researchers' interest.

Barber and Odean (2000) examine about 66,000 U.S. households with accounts at a large discount broker over a six year period ending in January 1997. They find that the average household turns over 75% of its portfolio annually and earns an annual return of 16.4% while the market returns 17.9%. The most dramatic evidence is provided by the 20 per cent of households that trade most often. Those households turn over their portfolio more than twice annually while their performance lags the market by 5.5% annually. The poor performance of the average household is related to the transaction costs associated with high levels of trading. Barber and Odean point out that the experience of individual investors is similar to the investment experience of actively managed mutual funds. Like mutual funds, after accounting for costs, the individual investor underperforms a simple market index. However, trading by individuals is even more harmful to performance because of the small trades and the higher proportional commissions. The authors attribute the poor investment experience to behavioural biases such as overconfidence. Overconfident investors tend to overestimate the value of their private information, turn over their portfolio more often and hence achieve below-market-returns. Barber and Odean phrase their basic findings very simple: "*Those who trade the most are hurt the most.*" (Barber and Odean, 2000, p.800)

Evidence from other countries shows similar bleak results. In Thailand it is documented that over a six month horizon, less than twenty per cent of day traders earned profits net of transaction costs (Barber, Lee et al., 2005). Research at a Dutch online broker shows that the average investor earns negative gross and net returns after adjusting for risk and style tilts. The results are mainly driven by the performance of investors which are trading derivatives. The authors of the study suggest that most investors would be better off by investing in an index fund. (Bauer, Cosemans et al., 2007)

Very recent findings by Barber and Odean (2006) indicate that individual investors in the U.S. buy 'attention grabbing stocks'. When buying a stock, investors are faced with the problem to choose from thousands of individual securities. To limit their choice, the

majority of investors seem to focus on stocks that recently have been in the news. Most investors hold relatively few securities in their portfolio and do not sell short, therefore their selling decisions are less complex. For institutional investors the search set for purchases and sales is identical, because they own more stocks and they also sell short. The buying behaviour of institutional investors is less influenced by the news. With more time and resources they are able to monitor a wider range of stocks. Barber and Odean conclude that attention-driven buying behaviour by individual investors does not generate higher returns and recommend that most individual investors would be better off with a diversified buy-and-hold portfolio.

3.6 Fund flow studies

It appears that the majority of investment performance studies reveal that the performance of active managers on average is inferior to index funds. Thus, the question remains, why individual investors are still very much attracted to actively managed equity funds.

Gruber (1996) conducts a study which examines the behaviour of individual investors in the U.S. investing in mutual funds. He raises the question whether individual investors can successfully forecast mutual fund performance. He addresses this issue by examining risk adjusted returns of new money that was flowing into mutual funds. His findings show that the return on new cash flows is higher than the average return of all the investors in these funds. From thereon the term ‘smart money’ has been associated with investors’ ability to identify superior mutual funds in advance.

Chevalier and Ellison (1997) find a positive relation between U.S. mutual funds inflows and risk-adjusted returns, indicating that investors chase past winners.

Sirri and Tufano (1998) study the flows in and out of individual U.S. equity mutual funds from 1971 to 1990. They find that investors disproportionately flock to funds with high performance but on the other side do not flee from poor performing funds at the same rate. They also find that funds that charge high fees and which probably spend much more on marketing than their competition show a much stronger performance-flow relationship.

Zheng (1999) re-examines the ‘smart money’ effect in the U.S. and also tries to find out, whether information on investors’ money flows can be utilized in trading strategies to capture abnormal returns. The findings confirm the ‘smart money’ effect, but no

statistically significant evidence is found that investors can beat the market by investing in funds that have received positive new money inflows.

When comparing institutional versus retail flows, Del-Guercio and Tkac (2002) find that U.S. pension plan sponsors punish poor performing fund managers by withdrawing assets as opposed to retail investors. They also note that pension fund sponsors do not flock disproportionately to the top performers of the last year.

Sapp and Tiwari (2004) find that the 'smart money' effect in the U.S. can be explained by stock return momentum. After adding a momentum factor to their Fama/French 3-factor benchmark model the 'smart money' effect disappears. Furthermore they demonstrate that investors are not actively identifying momentum-style funds but rather naively chasing past winners.

Keswani and Stolin (2005) find evidence on the 'smart money' effect being present in the United Kingdom. According to their findings, the performance difference between high and low net flow funds averages up to 0.10% per month and is highly statistically significant. Further they find that the effect is mainly driven by fund purchases of both, individual and institutional investors alike.

Research in the U.S. by Frazzini and Lamont (2006) contradicts the 'smart money' effect that some fund managers have skill and some individual investors can detect those superior fund managers. They find that the 'smart money' effect is limited to short time horizons of about one quarter, but over longer time periods the 'dumb money' effect dominates. Mutual fund investors are 'dumb' in the sense that they reallocate their money to mutual funds which invest in stocks that have low future returns. They even argue that by doing the opposite of individual investors, it is possible to construct a portfolio with high returns.

They also find that the 'dumb money' effect is related to the 'value effect' and that this relation reflects return-chasing flows. It was mentioned earlier that a strong positive relationship was detected between past performance and fund inflows. Frazzini and Lamont find that money flows into mutual funds that own growth stocks and is withdrawn from mutual funds that own value stocks. However, the 'value effect' explains not all of the 'dumb money' effect.

Their results show that the total net benefit of mutual funds versus the CRSP value-weighted market return is -1.4% per annum. About 70% of this underperformance can be attributed to the 'dumb money' effect. Accordingly, investors are more hurt by their

reallocation across funds than by the fees and expenses that actively managed funds charge. Within their mutual fund holdings, investors tend to overweight industries that subsequently perform poorly and overweight growth stocks always. They conclude that a naive passive strategy would dominate the actual strategy of the aggregate mutual fund investors.

3.7 Dollar-weighted return studies

"*Mutual fund investors can enhance their returns by selecting superior funds, advantageously timing their cash flows to the fund, or both.*" (Friesen and Sapp, 2006, p.1) The previous chapter on Fund Flow Studies reports mixed evidence on the ability of individual investors to select superior funds. This chapter will analyse the research that has been done on determining whether fund investors make good investment decisions regarding the timing of their cash flows.

While time-weighted returns are an appropriate measure of fund manager performance, the example in Chapter 1.1 has shown that time-weighted returns are not an accurate measure of fund investors' returns. To account for the month-to-month variation in assets under management, a dollar-weighted average return has to be calculated, which weights the returns by the level of fund assets at each monthly observation point. Previous research has examined dollar-weighted returns by using different approaches and different levels of data aggregation.

Nesbitt (1995) attempts to measure the cost of market timing by examining the difference between time-weighted and dollar-weighted returns at the aggregate fund level. For the 1984-1994 period, all 17 U.S. equity and bond fund categories show lower dollar-weighted returns than time-weighted returns, averaging a difference of 1.08% per annum. He attributes the shortcomings of investors to trend following behaviour.

Dalbar (2004) calculates dollar weighted returns for the period 1984 to 2003. The calculations are based on the assumption that aggregate U.S. equity fund cash flows of active investors are invested in the passive Standard and Poor's 500 index. The study reports that while the S&P 500 earned an annualized return of 12.98% (buy and hold strategy) over the twenty year period, the average equity fund investor would have generated a return of 3.51% by investing in the S&P 500 index during the same time period. Dalbar's core message states that "*Investment return is far more dependent on*

investor behaviour than on fund performance. Mutual fund investors who hold their investments are more successful than those that time the market." (Dalbar, 2004, p.2)

In his speech to the United States Senate in 2003, Vanguard founder, John C. Bogle (2003) argues that the Dalbar study ignores the selection penalty of active investors. Instead of investing in the passively managed S&P 500 index, investors select an average fund that lags the S&P 500 index by 2.9 %[15] per year. He further argues that fund investors did even worse, because in the time of the 'new economy', they did not chose the average fund, but instead invested in sector funds to make bets on the computer, telecommunications or technology sector. With hindsight we know now, that those were the sectors which suffered the biggest losses when the 'new economy' bubble burst.

Dichev (2007) looks at dollar-weighted returns at the aggregate stock market level for various international markets. He argues that at the aggregate level it is possible to conduct a comprehensive examination of dollar-weighted effects around the world. On the other side he admits, that the aggregation of data can offset and smooth the variation in firm- or industry-level capital flows. Therefore, there can be stronger dollar-weighted effects at lower levels of aggregation (e.g.: at the individual fund level), while through the aggregation of data these effects can cancel each other out. He notes that the aggregate results of his study should be considered as the lower limit on the possible dollar-weighted effects in the universe of stock investing. Dichev finds that dollar-weighted returns are systematically lower than buy-and-hold returns around the world. The difference (or performance gap) for NYSE/AMEX stocks is 1.3 % per year (from 1926 to 2002) and 5.3 % for NASDAQ stocks (from 1973 to 2002). Remarkable is the huge performance gap for the more volatile NASDAQ stocks. The performance gap averages 1.5 % for 19 major international stock markets and 1.3 % for the UK stock market (from 1973-2002). Dichev concludes that both, the historical equity market premium and the firms' cost of equity capital may be lower than existing estimates. He also provides evidence that aggregate stock returns tend to be lower after capital inflows and lower after capital outflows. This explanation is consistent with investor 'return-chasing behaviour'.

Braverman, Kandel et al. (2005) examine fund flows and dollar-weighted returns for a data set of aggregate U.S. mutual funds from 1983-2003. They find a negative relationship between investors' aggregate net flows into and out of funds and the returns of the funds in

[15] Adjusted for an estimated survivorship bias of 0,5 %

the consecutive time periods. This negative relationship causes that mutual fund investors in aggregate achieve lower long term accumulated returns than a buy and hold position in these funds would achieve. Specifically, they observe a performance gap of 1.2% per year for the 1984-1990 period and a performance gap of 2.67% for the period from 1991-2003. They suggest that this gap can be explained either by rational market or behavioural explanations.

Friesen and Sapp (2006) examine the timing ability of fund investors, using cash flow data at the individual fund level for 7,125 U.S. equity mutual funds from 1991-2004. They argue that aggregation of data can potentially bias the results and smooth out the performance gap. Also, by using fund level data, they are able to measure the timing performance of investors who choose strong performing funds and investors who choose poor performing funds. They find that the average dollar-weighted return is 1.56% lower than the average time-weighted return per annum. Their analysis of index funds yields a smaller but still significant performance gap of 0.60% per annum, indicating that some index fund investors try to time their investments through these low-cost products. Further they find, after calculating the risk-adjusted performance (alpha) of each fund, that the potential alpha-gains are largely erased by poor timing decisions and that those who are lucky enough to be in the best performing funds also have the worst timing performance of all. Interestingly, Friesen and Sapp find the biggest performance gap of 3.04% per annum for the sector ‘Aggressive Growth’, which are also the funds with the biggest standard deviation of fund returns. This finding is consistent with Dichev (2007) who finds the biggest performance gap for the more volatile NASDAQ stocks. Friesen and Sapp conclude that the timing underperformance is consistent with investor return-chasing behaviour.

4 DATA DESCRIPTION

The example in Chapter 1.1 has shown that in order to calculate dollar-weighted returns it is necessary to use cash flow data. Often, cash flow data is not readily available, and therefore cash flows have to be estimated as in equation (3)[16].

(3)

$$NCF_{j,t} = TNA_{j,t\text{-}1}\,(1 + r_{j,t}) - TNA_{j,t}$$

The net cash flow ($NCF_{j,t}$) for fund j in time period t is calculated as the difference between the performance-based growth in assets over the month [$TNA_{j,t\text{-}1}(1 + r_{j,t})$] and the fund's actual assets at the end of the month ($TNA_{j,t}$).

In the existing literature, Nesbitt (1995) has used direct cash flow data, but other researchers have used the calculation from equation (3) to obtain cash flows (Friesen and Sapp (2006), Morningstar (2006), Dichev (2007)). As fund level cash flow data is not readily available for UK equity funds, equation (3) is being used to calculate cash flows from TNAs (Total Net Assets) and return data.

4.1 TNA data

Total net assets, indicates the total amount of assets a fund holds as of a certain point in time (Indexfunds, 2002). The TNA data set being used originates from Lipper and is from Keswani and Stolin (2005). It includes monthly TNA observations for 1,008 UK equity funds for the period from 1992-2003.

4.2 Return data

The term 'return', indicates the total percentage gain of a fund over the respective time period (Indexfunds, 2002). The original source of the return data is Standard and Poor's Micropal. The data set includes a monthly time series of returns for 935 UK equity funds for the time period 1973-2003. The return data set was obtained from Dimensional Fund Advisors Ltd. and includes the return data from Quigley and Sinquefields' 1973-1997 dataset on UK equity funds. Their data set was extended to cover the period from 1998-2003. The return data being used is net of the Advance Corporation Tax (ACT). This suits

[16] formula from Friesen and Sapp (2006), p.9. Note that the formula was arranged in a different order to conform to the investment project explanation of the IRR calculation.

the purpose of the analysis because not the fund manager performance should be evaluated but the individual investor return.

4.3 Data set construction

This section will explain the construction of the data set and the compromises that had to be made. As the two data sets (TNAs and returns) cover time periods of different lengths, the data set had to be reduced to a common denominator which is the time period 1992-2003. Generally speaking, returns data is more readily available from data providers than TNA data. Therefore, the construction of the data set begins with analysing the TNA data set and then matching TNA data series with return data series.

The TNA data set includes UK equity funds in the IMA categories UK All Companies, UK Equity Income, UK Smaller Companies and UK Growth.

Table 3: UK equity funds

	Live and Dead Funds	Dead Funds or merged	Live Funds, end 2003
UK All Companies	595	264	331
UK Equity Income	194	108	86
UK Smaller Comp	139	65	74
UK Growth	80	80	0
All Funds	1,008	517	491

Source: Compiled by the author, based on the data set being used

As Table 3 shows, of the 1,008 UK equity funds within the TNA data set, only 491 were still in existence at the end of 2003. The category UK Growth was completely abolished. Funds in this category were re-categorized and are now listed in other sectors.

For the scope of this thesis it was decided to deal with surviving funds only. Although this restriction is not ideal, it is defensible on the grounds that not the performance of fund managers is evaluated where survivorship bias can have severe effects (see Chapter 3.3). Rather the performance of individual fund investors' is evaluated and a priori there is no strong reason to expect survivorship bias to have a significantly different impact on dollar weighted returns as compared to time-weighted returns. On the other hand, there is reason to believe that cash flows are related to performance, as is survival. To perform meaningful dollar weighted return calculations, it is also necessary to exclude funds with a data history shorter than 3 years. After the exclusion of non surviving funds and funds that were launched after December 2000, 335 funds remain within the TNA data set.

When matching the TNA data set with the returns data set, another 61 funds were lost. For 26 funds the fund codes of the TNA and returns data set were not matching. 24 funds had no returns data at all and 11 funds had a data history that was shorter than 3 years. After matching TNAs and returns data, 274 funds remained within the data set.

4.3.1 Coverage in terms of total assets under management

At the end of 2003 there existed 491 UK equity funds with total assets under management of £ 101.3 billion. This study includes 274 UK equity funds with total assets under management of £ 68.9 billion as of December 2003, which equates to coverage of 68%. At the beginning of the observation period £ 10 billion of total assets were covered in this study versus an industry total of £ 27.6 billion which corresponds to a smaller coverage of 36.2%. On average 53.1% of UK equity funds total assets were covered between 1992 and 2003. The lower than 100% coverage can be explained by the restriction of including surviving funds only and requiring a fund history of at least 3 years.

4.3.2 Treatment of funds with stale TNA values

Of the remaining 274 funds, 131 funds (or 48%) had at least one 'stale' TNA value. A TNA value is defined as stale, if the value from the previous month is being repeated. Some of the funds had very big numbers of stale TNAs which made it necessary to correct those data series. To overcome this problem a consistent methodology had to be developed for removing stale TNAs.

Two rules, which are independent of each other, seemed to correct the stale TNAs in the most sensible way, without losing too many data points.

Rule 1: If more than 10% of total monthly TNAs are stale, the whole data series should be removed.

Rule 2: If there are more than three stale monthly TNAs in a row, the data series should be deleted until the point where the TNAs are no longer repeating.

In total, 17 funds had to be treated according to the above outlined methodology. Two funds were treated according to Rule 1 and for the remaining 15 funds Rule 2 was applied. As a result of Rule 1, two funds with a total of 288 fund months had to be removed. The

application of Rule 2 resulted in six data series being completely removed, as the series of stale TNAs happened to appear in the last three years. Another nine data series were partly removed. The application of Rule 2 resulted in a total loss of 1,092 fund months.

After correcting the above mentioned 17 funds for stale TNA values, there remain four cases with three stale TNAs in a row and 34 cases with two stale TNAs in a row, representing 33 funds. These 33 funds remain within the data sample, because firstly, correction action for these funds would result into a too big loss of fund months, and secondly, two or three stale TNAs do not obstruct the data set in a way that longer series of stale TNAs would have done.

After excluding dead funds, funds with no longer than three years of data history and funds that were biased by a bigger number of stale TNAs, the final data set consists of 266 funds, representing 28,801 fund months.

Table 4: Final data set

	Number of Funds
UK All Companies	167
UK Equity Income	50
UK Smaller Companies	49
All funds	266

Source: Compiled by the author, based on the data set being used

4.3.3 Data errors

When screening the data set for inconsistencies, nine data errors were detected. All of the data errors concern wrong TNAs. Wrong TNAs can occur if either the fund manager makes a mistake when submitting the data or the data is processed wrongly in the research database. This can be as simple as omitting one digit and obtaining a TNA series of 100 million, 10 million and 102 million for example. The TNA value of 10 million in this case is obviously wrong because of an omitted digit. For the ease of calculation it was decided to treat the data errors similar to fund mergers (see Chapter 6.2.1) by just setting the ‘suspicious’ cash flows to zero. The more accurate method would be to estimate the wrong/missing TNAs with an estimation procedure. However, the slightly different outcome would have no effect on the data set whatsoever, as just nine data points are concerned.

4.3.4 Fund mergers

In the mutual fund industry, a merger is referred to when a fund is ceasing business and transfers its remaining assets into another fund. Often, this happens to unsuccessful funds which are merged into more successful funds within the same fund family. In the relevant literature fund mergers are treated in different ways.

To answer the research question, “Are UK fund investors achieving fund rates of return?” it is necessary to include fund mergers in the cash flow calculations. Why? Because from the day of the merger onwards, investors from the ‘old’ fund that was merged into the ‘new’ fund, are earning now the returns of the ‘new’ fund. Therefore, to accurately reflect the real investor experience, it is necessary not to correct for mergers. Hence, for the dollar-weighted return calculation in Analysis Part 1, mergers are treated as a really big cash flow.

On the other side, in ‘fund flow’ studies, it is common practice to subtract the increase in TNAs which is due to fund mergers when calculating cash flows (e.g. Zheng (1999), Sapp and Tiwari (2004), Frazzini and Lamont (2006)). This makes sense, as the fund flow literature wants to examine investor behaviour only, whereas fund mergers are driven by fund managers, not by investors. Consequently, for Analysis Part 2, the data set will be corrected for fund mergers, to answer the question, whether investors are ‘smart’ in their cash flow timing decisions.

5 RETURN CALCULATIONS

In principle, there are three common ways to calculate investment returns over multiple time periods.

- Arithmetic average rate of return
- Geometric average rate of return (time-weighted average return)
- Dollar-weighted average return (internal rate of return)

The following section[17] will outline the calculation techniques, as well as some relevant characteristics of the respective return calculation modes.

5.1 Arithmetic average return

The arithmetic average return "*… equals the sum of a fund's reported returns, divided by the fund's number of reported returns.*" (Friesen and Sapp, 2006, p.27) The arithmetic return always exceeds the geometric return with the biggest difference for return series that exhibit a large standard deviation. The difference between the two returns series only falls to zero if there is no variation in returns at all. When evaluating past performance, the geometric return is a preferred measure to the arithmetic return, since the arithmetic return ignores compounding. However, for estimating future performance, it is important to use the arithmetic average, because it is an unbiased estimate of the portfolio's expected return under the assumption that the expected return does not change over time. (Bodie, Kane et al., 2005)

5.2 Geometric average return

The geometric average return is also called a time-weighted average return because it ignores the variation of funds under management over time.[18] The geometric average represents the constant rate of return that is needed each month to match the actual performance over some past investment period. The geometric average is calculated by "*… compounding the actual period-by-period returns and then finding the equivalent single*

[17] The Formulas which are used in Chapter 5 are from Friesen and Sapp (2006), p. 8 et seq. Note that the formula for calculating cash flows was arranged in a different order to conform to the investment project explanation of the IRR calculation.

[18] This chapter draws heavily on Bodie, Kane et al. (2003)

per-period return."(Bodie, Kane et al., 2003, p.133) The return for fund j in month *t* is r_{jt}. The geometric average monthly return for fund j is calculated as follows:

(4)

$$\bar{r}_j^g = \left(\prod_{t=1}^{T} \left(1 + r_{jt}\right) \right)^{1/T} - 1$$

The time-weighted return is an appropriate measure to evaluate fund manager performance. Since the fund manager does not have full control over the amount of assets invested in his fund, returns should not be weighted more heavily in one period than in another, when evaluating past performance.

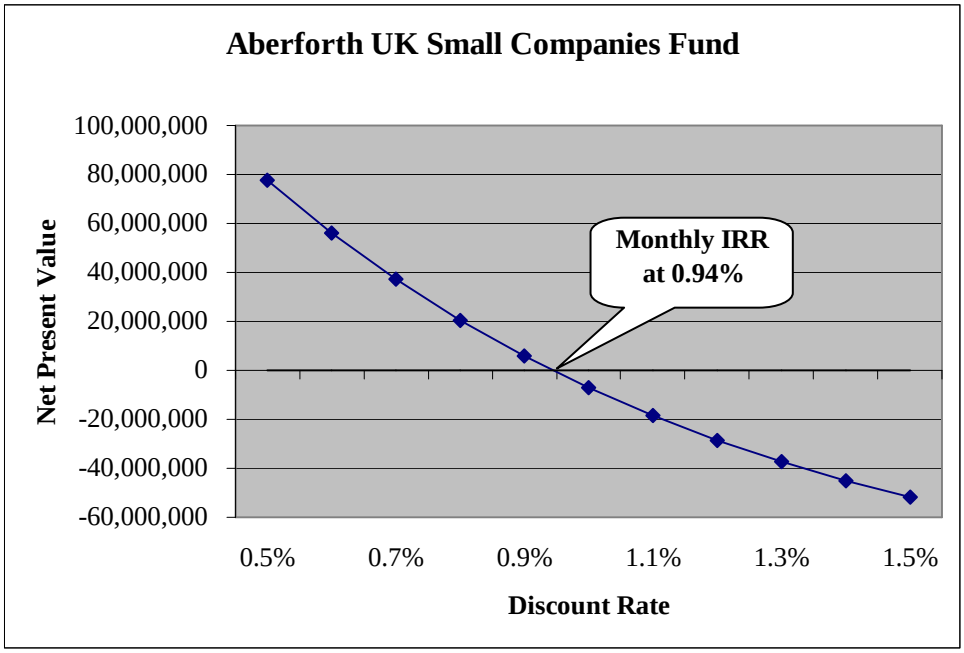
5.3 Dollar-weighted return

As opposed to geometric returns, dollar weighted returns account for the variation in assets under management over time.

In the literature, the dollar-weighted return calculation is often explained with the concept of an investment project in corporate finance. Hence, the investment project consists of an initial investment, subsequent cash flows and a final liquidation value[19] at the end of the time period. The dollar-weighted average return is the internal rate of return (IRR) of the investment project. The IRR calculation assumes intermediate cash flows are reinvested at the IRR. The logic behind the dollar-weighted return calculation can be explained by further investigating the concept of the Net Present Value (NPV) and the IRR. Both are used in corporate finance to evaluate investment projects. The NPV is inversely related to the discount rate. The NPV is calculated by discounting all future cash flows by a specified discount rate. The IRR is the discount rate which yields a NPV of zero. (Bodie, Kane et al., 2003)

[19] The final liquidation value in the case of a fund investment is equal to the Net Asset Value (NAV) at the end of the time period. An actual liquidation of fund assets does not typically take place.

Figure 9: Net Present Value vs discount rate



Source: Compiled by the author.

The example from Figure 9 highlights the relationship between NPV and discount rate. In order to evaluate the performance of fund investors in the Aberforth UK Small Companies Fund, various discount rates are used to determine a net present value. The internal rate of return is found where the net present value equals zero. For the example from above, this is at a monthly IRR of 0.94%. Computationally, the IRR is calculated through an iterative search process that starts with an estimate for IRR and then repeatedly alters that value until a correct IRR is obtained (Microsoft, 2007).

When calculating investment fund performance, the dollar-weighted return measures the return, weighted by the assets invested in the fund at each observation point. Therefore it captures the average return earned by fund investors.

The dollar-weighted average monthly return for fund j is defined as the rate of return at which the accumulated value of the beginning TNA (TNA_0), plus the accumulated value of net cash flows (NCF_t), equals the current TNA (TNA_T) at the end of the observation period (Friesen and Sapp, 2006):

(5)

$$\bar{r}_j^{dw} : TNA_0\left(1+\bar{r}_j^{dw}\right)^T + \sum_{t=1}^{T} NCF_t\left(1+\bar{r}_j^{dw}\right)^{(T-t)} = TNA_T$$

(6)

$$NCF_{j,t} = TNA_{j,t\text{-}1}\,(1 + r_{j,t}) - TNA_{j,t}$$

Equation 6 explains the calculation of net cash flows. NCF_{jt} represents the monthly net cash flow to fund *j* in month *t* and $TNA_{j,t}$ is the total net assets for fund *j* at the end of month *t*.

The concept of dollar-weighting returns exhibits some other interesting characteristics. Dollar-weighting of returns is a logical extension to the concept of value-weighting in the cross section of returns. Value-weighting in the cross-section makes sense, because it reflects the situation that stocks with a higher market capitalization play a more important role to investors. But value-weighting does not account for the fact that the market value of different cross sections varies over time. "*Dollar-weighting of returns addresses this shortcoming by value-weighting both the cross section and the time series of returns.*" (Dichev, 2007, p. 388) Value-weighting in the time series makes it necessary to scale by beginning market value adjusted for the compounding of returns. This can be achieved by using the IRR calculation. (Dichev, 2007)

Dollar-weighted returns are a more relevant measure of individual investor performance than existing alternatives. In general, past performance is measured by a geometric average of buy-and-hold returns. But compounding and using a geometric average assumes equal weighting of time series. This may not be accurate, if investors are timing the market and changing their net investment exposure over time. However, changing capital exposure over time is not sufficient to create a difference between buy-and-hold and dollar-weighted returns. If fund investments and disinvestments are 'random', and earn the same average rate of returns as the fund, there will be no difference between buy-and-hold and dollar-weighted returns. However, there will be a difference to the extent that there are positive or

negative correlations between (a) the timing of fund investments and disinvestments and (b) past and future fund returns. (Dichev, 2007)

5.4 The concept of the performance gap

The concept of the performance gap is mentioned in Friesen and Sapp (2006) and simply refers to the difference between the time-weighted return and the dollar-weighted return.

Performance gap = Time-weighted return – Dollar-weighted return

If the performance gap is positive (higher time-weighted than dollar-weighted return), investors are participating on average more strongly in the 'below-average' returns of the funds they are invested in. This may be due to lack of skill or unlucky cash flow timing decisions. On the other side, if the performance gap is negative (higher dollar-weighted than time-weighted return), investors are participating on average more strongly in the 'above-average' returns of the funds and it can be reasoned that they are skilful (or lucky) in their cash flow timing decisions.

5.5 Significance testing

The significance of the performance gap is tested by using a simple Student's t-test to assess whether the performance gap is considerably different from zero.[20]

7)

$$t = \frac{\overline{x} - \mu_0}{\frac{s}{\sqrt{n}}}$$

The population mean (μ_0) is assumed to be zero. Therefore, the t-statistic is calculated by dividing the sample mean ($\bar{x}$) by the standard deviation from the mean (s) over the square root of the sample size (n).

Null hypothesis: There is no significant difference between the sample mean and zero.

Alternative Hypothesis: There is a significant difference between the sample mean and zero.

[20] This chapter draws heavily on Gerstman (2003)

6 ANALYSIS

The analysis chapter is split in two parts in order to answer two different questions.[21] On the one side, it is interesting to find out what rates of return UK equity fund investors have actually achieved over the 12 year period from 1992 to 2003 (Part 1). On the other side, the purpose of Part 2 is to shed some light on the cash flow timing ability of fund investors, while controlling for fund mergers and the influence of initial TNAs.

6.1 Part 1: What rates of return do UK equity fund investors achieve?

In the following section the results of dollar-weighted average return calculations will be examined under various sets of specifications.

The arithmetic, geometric and dollar-weighted average monthly returns are calculated as outlined in Chapter 5. The performance gap is calculated by subtracting the dollar-weighted return from the geometric return. For the return calculations and the performance gap calculation, mean, median and the standard deviation of the respective return/performance gap are reported. All return figures are reported as per cent per month. The t-statistics are calculated for the mean performance gap and are reported in parentheses.

The results will be compared to the U.S. study, “Mutual fund flows and investor returns: An empirical examination of fund investor timing ability” by Friesen and Sapp (2006), where applicable.

[21] The tables in Chapter 6 are based on the data set being used and were compiled by the author. The analysis section of Friesen and Sapp (2006) was used as a guideline for the results presentation.

6.1.1 General Results

For the 266 UK equity funds within the sample, arithmetic, geometric and dollar-weighted returns are calculated over the time period 1992-2003.

Table 5: Results for all funds

	Mean	Median	Standard Deviation
All Funds (N=266)			
Arithmetic Monthly Return	0.56	0.66	0.47
Geometric Monthly Return	0.44	0.56	0.49
Dollar-Weighted Monthly Return	0.28	0.37	0.58
Performance Gap	0.16	0.10	0.39
(t-stat)	(6.52)		

Table 5 shows a geometric average monthly return of 0.44% versus a dollar-weighted average monthly return of 0.28% for all funds. Hence, investors under-perform the fund they are invested in, by about 0.16% per month. The performance gap is highly statistically significant with a t-statistic of 6.52. For the median fund, the monthly performance gap is 0.10%. On an annualized basis the average geometric return is 5.41% versus an average dollar-weighted return of 3.41%, which results in an annual performance gap for UK equity fund investors of about 2%.

For U.S. investors, Friesen and Sapp (2006) report a somewhat smaller annual performance gap of 1.56% which is also highly significant (t-stat of 20.70).

A potential concern is that the results may be driven by funds which have been launched late in the 1990s and hence, were exposed to a larger number of negative market performance months than the other funds in the data set. Therefore results are also reported separately for funds which were in existence throughout the whole observation period, i.e. funds with a data history of 12 years.

Table 6: Results for funds existing throughout the period

	Mean	Median	Standard Deviation
Funds existing throughout period (N=113)			
Arithmetic Monthly Return	0.82	0.79	0.20
Geometric Monthly Return	0.71	0.69	0.19
Dollar-Weighted Monthly Return	0.54	0.62	0.36
Performance Gap	0.17	0.07	0.36
(t-stat)	(5.11)		

Unsurprisingly, Table 6 shows stronger geometric monthly returns of 0.71% as well as stronger dollar-weighted monthly returns of 0.54%, which translates into an annual

performance of 8.86% for fund managers (buy-and-hold return) versus 6.68% for fund investors. As the performance gap stays pretty much constant at 0.17% per month or around 2% annually the conclusion remains the same, namely that on average, investors are falling short of buy-and-hold returns.

Another potential concern is that the performance gap does not reflect what happened to aggregate investors' money, because average returns are reported and the fund size of the individual funds is not taken into account. To accurately reflect what happened to all fund investors' pounds, the results need to be value weighted. To do this, the average TNA over the respective time period is calculated for each fund and the value-weighting multipliers are obtained by dividing the average TNA of each fund by the sum of the average TNAs of all funds.

Table 7: Results for all funds (value weighted)

	Mean	Mean (value-weighted)
All Funds (N=266)		
Arithmetic Monthly Return	0.56	0.66
Geometric Monthly Return	0.44	0.56
Dollar-Weighted Monthly Return	0.28	0.40
Performance Gap	0.16	0.16

The results in Table 7 indicate that the value-weighted returns are higher for both, geometric returns (6.93% annually) and dollar-weighted returns (4.91% annually) than the not value-weighted returns. Basically, the funds with higher TNAs had higher returns and this is been taken in consideration by value-weighting the returns. From this result it can be reasoned, that aggregate fund investors returns are not as low as the reported average of 3.41% would suggest. After weighting the returns by average TNA size, the return of fund investors increases to 4.91% per annum.

The approach of giving more weight to funds with higher average TNAs seems to describe more accurately what happened to investors' money than taking straight averages, and is therefore covered more extensively in the next chapter.

6.1.2 Results by fund size

To further explore what happened to investors' money, the funds are sorted in 5 quintiles according to fund size i.e. average TNAs.

Table 8: Results by fund size

	(small) Quintile 1	Quintile 2	Quintile 3	Quintile 4	(large) Quintile 5
Average TNA	£16,198,681	£44,452,849	£95,044,378	£189,462,360	£611,215,717
Average years in existence	7.5	8.3	9.4	9.6	10.3
Arithmetic Return	0.40	0.59	0.53	0.63	0.67
Geometric Return	0.27	0.46	0.40	0.51	0.57
Dollar-Weighted Return	0.18	0.26	0.21	0.34	0.43
Performance Gap	0.09	0.20	0.19	0.17	0.14
(t-stat)	(1.55)	(3.25)	(3.10)	(3.49)	(3.59)

The first row of Table 8 shows the average TNA values for 5 quintiles, ranging from the smallest funds with average TNAs of about 16 million pounds to the largest funds which have about 611 million pounds of assets under management. When having a closer look at Table 8 some interesting patterns can be detected. Both, geometric returns and dollar-weighted returns tend to increase with increasing fund size. The geometric and dollar-weighted returns are highest for the biggest funds with the most assets under management. How can this pattern be explained? Naturally, TNAs increase when returns are good. Also money flows into funds when returns are good, which increases TNAs even more. So there should be a mutually reinforcing relationship between performance and fund size.

The second row of Table 8 displays the average number of years that the funds of the respective quintile were in existence during the observation period. Here, a monotonic relationship can be found, showing that the funds with the smallest average TNAs having only been in existence for about 7.5 years on average, versus the funds with the highest average TNAs have been in existence for about 10.3 years. Hence, another explanation for the higher returns for funds with more assets is the longer time period, being in existence. This proved especially beneficial, as those funds in aggregate, caught a bigger amount of the strong returns during the 1990s.

A third possible explanation for the monotonic return pattern is cost. Small funds have higher total expense ratios than large funds as they cannot utilize economies of scale as

efficiently as their bigger counterparts. Therefore returns of the smallest funds within the sample can be dragged done because of higher proportional expense ratios.

The performance gap displays a somewhat different pattern to the pattern that was previously discussed for the return series. The gap monotonically increases from 0.14% for Quintile 5 to 0.20% for Quintile 2, but is relatively small for Quintile 1 with 0.09%. It can be concluded, that a significant performance gap persists for all five categories of TNA sizes. However, the size of the performance gap is more important for larger funds (Quintile 5 and 4) because more investor money is affected.

Friesen and Sapp (2006) find a similar monotonic relationship between the performance gap and fund size categories, where the performance gap is greatest for the largest quintile of funds. For the largest quintile of U.S. mutual funds they report an average monthly performance gap of 0.19% which is higher than the performance gap for the largest quintile of UK equity funds (0.14% per month).

The similarity between the outcomes from the value-weighting exercise in the previous chapter and the results for quintiles 5 and 4, demonstrates the strong influence of funds with the biggest TNAs on actual fund investors' returns.

6.1.3 Results for index funds

Results for index funds are reported separately, as the investors in index funds are assumed to exhibit different investment behaviour than investors in actively managed funds. In the first instance, they have chosen to give up chasing 'hot' fund managers and to accept the market rate of return minus cost. In order to achieve the market rate of return, investors have to be invested at all times and shouldn't attempt to time the markets.

Table 9: Results for index funds

	Mean	Median	Standard Deviation
Index Funds (N=23)			
Arithmetic Monthly Return	0.18	0.24	0.45
Geometric Monthly Return	0.08	0.13	0.46
Dollar-Weighted Monthly Return	-0.07	0.00	0.35
Performance Gap	0.15	0.12	0.24
(t-stat)	(2.94)		

As can be seen from Table 9, the results speak a different language. Firstly, the geometric return for index funds is extremely low over the observation period with 0.84% per annum,

compared to the result of 5.40% annually for all funds within the sample.[22] The difference in geometric returns can be explained by the variation in 'years in existence'. The sample of index funds was on average 7.1 years in existence. When looking at the total data set, funds were on average for 9.02 years in existence. Additionally, 13 of the 23 index funds were launched within the last 6 years of the observation period, thus the good returns throughout the 1990s were not captured but the bad returns between 2000 and 2002 were. The average index fund investor actually earned negative returns of 0.81% per year between 1992 and 2003. Overall, the worse returns for index funds do not support the conclusion that actively managed funds are the 'better alternative'. Rather it needs to be highlighted that the results for index funds for this specific sample and over this specific time period look rather dim.[23] Surprisingly, the performance gap of 0.15% monthly (or 1.81% annually) is very similar to the performance gap for the whole sample (0.16% monthly; 1.98% annually). This finding indicates, that although index fund investors have given up too chase active funds, they are still trying to time their investments.

Also Friesen and Sapp (2006) find for their U.S. sample, that index fund investors try to time their investments although the magnitude of their performance gap is smaller with 0.60% per annum compared to 1.56% per annum for active investors.

[22] 'All funds' include index funds as well.
[23] Fund manager performance studies (see Chapter 3.4) have extensively documented the underperformance of actively managed mutual funds when compared to benchmark indices

6.1.4 Results by fund sectors

To understand the behaviour and the characteristics of the performance gap in greater depth, the following analysis will look at different fund sectors.[24]

Table 10: Results by fund sectors[25]

	Mean Values			Median Values				
	Geometric Monthly Return	Dollar-Weighted Monthly Return	Performance Gap	Geometric Monthly Return	Dollar-Weighted Monthly Return	Performance Gap	Std Dev of Avg Fund Return	Std Dev of Performance Gap
UK All Companies [Growth] N=167	0.35	0.18	0.17 (5.66)	0.48	0.22	0.11	0.45	0.38
UK Equity Income [Value] N=50	0.64	0.56	0.08 (1.72)	0.68	0.61	0.03	0.32	0.31
UK Small Companies [Small] N=49	0.55	0.35	0.20 (2.90)	0.71	0.55	0.15	0.63	0.49

The examination of the performance gap for different IMA fund sectors produces some other interesting insights. First of all, the three fund sectors can also be roughly described as 'Growth' (UK All Companies), 'Value' (UK Equity Income) and 'Small' (UK Small Companies). This terminology more accurately describes the characteristics of the underlying stocks, which the respective fund categories own.

When comparing geometric returns, UK Equity Income exhibits the strongest performance with an annualized return of 7.96%, followed by UK Small Companies with 6.80% and UK All Companies with 4.28%. The performance gap is lowest for UK Equity Income with 0.08% monthly or 1.10% per annum. UK Small Companies have the highest performance gap with 0.20% monthly or 2.43% per annum, which is more than twice the performance gap for UK Equity Income. The sector UK Smaller Companies also exhibits the largest cross-sectional variability in fund performance with a standard deviation of average geometric monthly returns of 0.63%[26]. The findings suggest that investors might be better in capturing market returns in less aggressive sectors like UK Equity Income.

[24] See Chapter 4.3 for the description of the different IMA sectors.
[25] Standard deviations are reported for the average geometric return and the performance gap
[26] The standard deviation for the average geometric return explains the variation of average returns within the respective category

Friesen and Sapp (2006) also report results for different fund sectors. They find a positive and significant performance gap for all 6 of their objective categories.[27] Similar to the findings for the UK, they state that in general, growth-oriented categories have the largest performance gaps whereas income-oriented funds have the smallest.

6.1.5 Results by volatility

While the previous Chapter has shown that the performance gap is higher in sectors with a large cross-sectional variability of returns, this chapter will more carefully examine the effects of fund return volatility as measured by the standard deviation from the mean. For each fund the standard deviation is calculated using the time-series of monthly returns. The funds are then sorted in five quintiles according to the magnitude of their monthly standard deviation.

A potential concern is that funds which have only existed during the second part of the period would have higher standard deviations, just because more of their lifespan coincided with the more volatile market of the late 1990s. Because of this, ranking on volatility can then be like ranking on fund birth date. This problem can be circumvented by using just funds which have existed throughout the entire observation period for this part of the analysis.[28]

Table 11: Results by volatility

	(low volatility) Quintile 1	Quintile 2	Quintile 3	Quintile 4	(high volatility) Quintile 5
Average monthly standard deviation	4.02	4.23	4.35	4.64	5.65
Arithmetic Return	0.76	0.83	0.72	0.86	0.92
Geometric Return	0.68	0.74	0.63	0.75	0.76
Dollar-Weighted Return	0.53	0.61	0.51	0.54	0.50
Performance Gap	0.15	0.13	0.12	0.21	0.26
(t-stat)	(2.48)	(2.19)	(1.83)	(2.55)	(2.52)

The first row of Table 11 shows the average monthly standard deviation of returns for each quintile ranging from low volatility funds with a standard deviation of 4.02% to high volatility funds with a standard deviation of 5.65% per month. Quintile 5 shows the highest

[27] Their U.S. fund sectors include Aggressive Growth, Small-Cap Growth, Mid-Cap Growth, Growth, Growth & Income and Income-Growth.

[28] The suggestions by David Stolin are gratefully acknowledged.

geometric return of 0.76% per month, but also the lowest dollar-weighted return of 0.50% per month. This translates into a performance gap of 0.26% per month or 3.17% per year. The quintiles with higher return volatility display slightly higher geometric returns along with lower dollar-weighted returns. The results show that the performance gap tends to be larger for high volatility funds. So even if high volatility funds display greater returns (as in quintile 5), investors apparently are not able to capture these greater returns as the significantly lower dollar-weighted return shows.

Dichev (2007) finds similar results in terms of volatility for the U.S. He reports results for the aggregate U.S. stock market on the individual security level. He finds a performance gap of 1.3% per annum for NYSE/AMEX stocks and a performance gap of 5.3% per annum for the more volatile NASDAQ stocks.

6.1.6 Results by fund families

This part of the analysis will look at the time- and dollar-weighted returns of some of the bigger fund families. The seven fund families with the largest number of funds were chosen.

Table 12: Results by fund families

	Mean Values			Median Values					
	Geometric Monthly Return	Dollar-Weighted Monthly Return	Performance Gap	Geometric Monthly Return	Dollar-Weighted Monthly Return	Performance Gap	Std Dev of Avg Fund Return	Std Dev of Performance Gap	Average Years in existence
Fidelity N=9	0.59	0.29	0.30 (6.84)	0.64	0.39	0.35	0.48	0.13	9.9
HSBC N=8	0.25	0.10	0.16 (2.06)	0.44	0.27	0.17	0.52	0.21	7.4
Jupiter N=8	0.47	0.00	0.47 (3.91)	0.52	-0.03	0.47	0.46	0.34	6.6
L&G N=7	0.26	0.18	0.09 (1.12)	0.58	0.36	0.06	0.60	0.20	9.3
M&G Group N=12	0.30	0.25	0.05 (0.49)	0.59	0.66	-0.09	0.95	0.32	10.8
Schroder N=8	0.79	0.78	0.01 (0.18)	0.81	0.88	0.04	0.28	0.20	10.3
Scottish Amicable N=8	0.27	0.30	-0.03 (-0.61)	0.40	0.44	-0.04	0.43	0.15	8.4

The results for the largest fund families reveal some interesting facts. For example, investors in Fidelity funds have produced a large performance gap of 0.30% per month which is highly statistically significant. Even more extreme, Jupiter funds display a

performance gap of 0.47% per month which equals 5.80% per year. In fact, investors with Jupiter funds have received returns of 0.00% over the total observation period. How can these disappointing returns be explained? The table shows that Jupiter funds on average have been in existence for the shortest period of time with 6.6 years on average. Also, 4 of the 8 Jupiter funds have been launched after the beginning of the year 1999. Fund investors with Schroders and Scottish Amicable have done comparatively well. Investors with Schroders have achieved dollar-weighted returns of 0.78% per month, closely matching the respective geometric returns. Investors with Scottish Amicable have not achieved the same returns as investors with Schroders in absolute terms however they were the only investors to achieve a negative performance gap. A negative performance gap indicates that the investors in the funds have achieved a superior performance to the funds itself. This can occur by skilled or lucky timing of cash flows.

6.1.7 Summary

In the period from 1992 to 2003 the average UK equity fund investor has earned a rate of return that was about 2% lower than the fund he was invested in. Weighting funds according to their respective fund size shows what happened to the average pound invested.

Table 13: Comparison versus benchmark (1992-2003) [29]

	Annualized Return
FTSE All-Share	**9%**
Average Fund	**7%**
Average Fund Investor	**5%**

Through the observed time period, fund investors achieved a return of 4.91% versus a fund return of 6.93% per annum. In other words, fund investors captured just 71%[30] of the possible fund returns. Table 13 shows that the average fund underperformed the FTSE All-Share (8.99% per annum) by another 2% per year. This indicates that fund investors are underperforming the broad market by 4%.

The analysis also showed that the funds with the most volatile returns, exhibited the largest performance gap (3.17%).

[29] Comparison of annualized geometric returns. Returns are illustrated in whole-numbers to demonstrate a strong case. Return figures for Average Fund and Average Fund Investor are value-weighted returns. Return figures for FTSE All Share were sourced from Dimensional Fund Advisors.

[30] The 71% figure was calculated by dividing the dollar-weighted return by the time-weighted return (4,91/6,93=0,7085). Don Phillips (2006) from Morningstar refers to this ratio as success ratio.

6.2 Part 2: Examination of investors timing ability

Analysis Part 1 showed that from 1992-2003 UK equity fund investors were not able to thoroughly capture fund returns.

The second part of the analysis goes one step further. In this section, the question as to whether investors are 'smart' in their cash flow timing decisions will be addressed. To address this issue, it is necessary to control for factors that influence dollar-weighted returns, but are not within the scope of fund investor decision making.

One of these factors is a fund merger. In the case of a fund merger, fund managers decide to merge an unsuccessful fund into another fund of the same fund family for example. A fund merger goes into the dollar-weighted return calculation of Analysis Part 1 as a large cash inflow. However, as the fund merger did not happen because of fund investor decision making it should be excluded from the dollar-weighted return calculation when exclusively examining cash flow timing ability (Frazzini and Lamont, 2006).

The second important factor is initial Total Net Assets. Why? As the initial TNAs represent the starting value of the observation period, the dollar-weighted return of the initial TNAs equals the buy-and-hold or geometric return. Hence, if you have two funds, with the exact same cash flow pattern, the fund with the higher initial TNAs will have dollar-weighted returns closer to the geometric return. So, all the initial TNA does, is to drag the dollar-weighted return towards the geometric return. But the initial TNA does not tell us anything about investor cash flow timing ability.

Therefore, cash flows have to be controlled for both, fund mergers and initial TNAs, to adequately reflect investor timing decisions.[31]

6.2.1 Mergers

As discussed previously, mergers do not happen because of fund investor decision making and therefore it would not be correct to attribute the positive/negative performance effect of fund mergers to 'smart'/'dumb' investor decision making.

Unlike for U.S. mutual fund databases, there is not sufficient merger data on funds readily available in the UK, to correct each individual fund's cash flows for merger effects.

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[31] The suggestions by David Stolin are gratefully acknowledged.

Therefore a second best approach has to be used by applying a filter. It was decided to use a filter which looks at the cash flows as a percentage of the previous months TNA. Normal cash flows are in the range of 0-10% of the previous month's TNA. A cash flow above 50% of the previous month's TNA seems to be abnormal and very likely to have happened due to a fund merger. The purpose of the filter is to detect the suspicious cash flows and set them accordingly to zero. When setting up the cash flow filter, various different filter percentages were tried out. When using 100% of previous month's TNAs hardly any mergers were corrected. When using 10% of previous month's TNAs nearly every data series was corrected multiple times. The results seemed to make the most sense for a cash flow filter in the range between 40% and 60% of previous month's TNA. Within this range the end results did not vary very much, so it was decided to use a cash flow filter of 50% of the previous month's TNAs.

Table 14: Merger example

Time Period	**07/2002**	**08/2002**	**09/2002**	**10/2002**
Halifax Investment UK Growth Fund				
Returns	-9.20%	2.34%	-10.33%	6.28%
TNAs	£747,655,013	£776,739,766	£1,694,194,856	£1,800,111,316
Cash flows	-£4,750,475	-£11,589,626	-£997,692,308	£478,977
Corrected cash flows	-£4,750,475	-£11,589,626	£0	£478,977
Reconstructed TNAs	£747,655,013	£776,739,766	£696,502,548	£739,763,931

In the case of the Halifax Investment UK Growth Fund, the cash inflow in September 2002 of -£997,692,308 is 128% of previous month's TNA (£776,739,766). The filter detects the suspicious cash flow and sets it to zero as can be seen in row 'Corrected cash flows'. All the other cash flows within the data series remain the same. However, because of the correction of the huge cash inflow (due to a merger), the TNA value at the end of the observation period also has to change. This can be achieved, by reconstructing TNAs with corrected cash flows and original returns.

Also Nesbitt (1995) determines the ending TNA values mathematically to ensure that only the pattern of cash flows, and not possible data errors, affect the dollar-weighted return calculation.

Due to the correction filter, also some small funds in their beginning stage could be affected inadvertently by excluding their smaller absolute cash flows (although bigger than 50% of the previous month's TNAs). To overcome this problem, small funds are treated

differently. If the respective cash flows are more than 50% of the previous month's TNAs, but below 5 million pounds in absolute terms, those cash flows were manually restored. This happened in the case of 22 funds, with a total of 32 individual cash flows being restored.

After applying the filter to the entire data set following outcomes were obtained:

- 165 funds – no merger correction necessary
- 96 mergers corrected for 84 funds
- 22 'negative'[32] mergers corrected for 22 funds

The correction of mergers has the effect that in a few instances final TNA values end up being negative. In reality this will never happen, as the funds will close down as soon as the value will drop to zero. However, even if the ending TNA value is negative, the dollar-weighted return calculation will still give a mathematically correct answer.

However, four data series did not yield a mathematical solution and two data series displayed multiple IRRs. Hence, these 6 funds were excluded from the following analysis. The problem of multiple IRRs will be explained in the following chapters in greater detail.

The comparison of figures from Analysis Part 1 with the figures after correcting for mergers yields the following results.

Table 15: Comparison of data after merger correction

	Mean (original)	Mean (corrected for mergers)
All Funds (N=260)		
Geometric Return	0.44	0.44
Dollar-Weighted Monthly Return	0.28	0.29
Performance Gap	0.16	0.15
(t-stat)	(6.52)	(5.96)
Geometric Return (value-weighted)	0.56	0.57
Dollar-Weighted Monthly Return (value-weighted)	0.40	0.42
Performance Gap (value-weighted)	0.16	0.14

Table 15 shows that the correction of mergers had only a small effect on straight average dollar-weighted returns. When comparing the value-weighted figures, the dollar-weighted return is slightly higher after correcting for mergers and the performance gap is slightly

[32] 'Negative' merger in this case means that a large cash outflow has occurred. This can happen for example when mutual funds transfer bigger block accounts to other funds within the same fund family.

lower. All in all, this leads to the conclusion that fund mergers had no severe impact on investor returns.

6.2.2 Initial TNAs

Initial TNAs tend to drag the dollar-weighted return towards the geometric return. For the examination of investors' cash flow timing ability, it is therefore necessary to exclude the initial TNAs from the dollar-weighted return calculations. This can best be demonstrated by means of an example.

Table 16: Initial TNA example

Time scale	**0**	**1**	**2**	**3**
Fund-level calculations				
	Returns			
Fund 1		30.00%	-10.00%	10.00%
Fund 2		30.00%	-10.00%	10.00%
	Cash flows			
Fund 1		£50.00	£100.00	0
Fund 2		£50.00	£100.00	0
	TNAs			
Fund 1	£1,000.00	£1,350.00	£1,315.00	£1,446.50
Fund 2	£100.00	£180.00	£262.00	£288.20
	DWR calculations			
Fund 1	-£1,000.00	-£50.00	-£100.00	£1,446.50
Fund 2	-£100.00	-£50.00	-£100.00	£288.20

	Fund-level geometric and dollar-weighted returns		
	Geom	DWR	Gap=DWR-Geom
Fund 1	8.77%	8.55%	0.22%
Fund 2	8.77%	7.26%	1.51%

The hypothetical example shows two funds with exactly the same return and cash flow pattern over a three month time period. The only difference between the two funds is their initial TNA value of £1,000 for Fund 1 and £100 for Fund 2. Although the cash flow timing of the investors in these two funds is identical, the difference in initial TNA values causes the respective dollar-weighted return and the performance gap to be considerably different. This shouldn't be the case if the objective is to examine investor cash flow timing ability only.

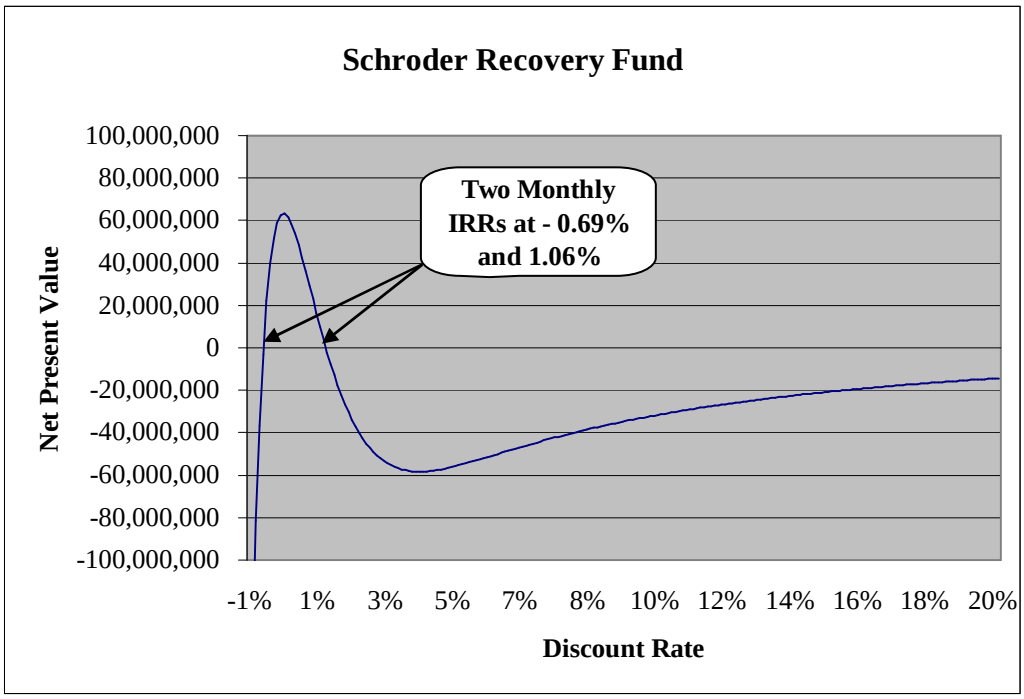
To circumvent this problem, initial TNAs are set to zero for all of the 266 funds for this part of the analysis. When removing initial TNAs, subsequent cash flows are not affected.

However, the final TNA value has to be adjusted. In Chapter 6.2.1 it is explained, how 'reconstructed TNAs' are calculated with merger-adjusted cash flow data. The same methodology is used here. 'Reconstructed TNAs' are calculated which take the removal of the initial TNA value into account and also use the merger-adjusted cash flow data. Hence, one obtains a cash flow series which is controlled for both, fund mergers and initial TNAs, to adequately reflect investor cash flow timing decisions.

6.2.3 Multiple IRRs

The removal of the initial TNA value markedly changes the characteristics of the 'investment project'. When trying to solve for the internal rate of return, not all of the cash flow series produce straightforward IRR results. Figure 2 shows the relationship of discount rate and net present value for a fund that yields two IRR solutions.

Figure 10: Multiple IRRs



Source: Compiled by the author.

The graph shows that both, an IRR of -0,69% and an IRR of 1,06%, give a net present value of zero for the Schroder Recovery Fund.

The problem of multiple solutions for IRR calculations is well recognized in the literature (Friesen and Sapp (2006), Dichev (2007)). IRR computations yield multiple solutions,

especially if the sign changes frequently and the magnitude of the cash flows varies a lot (Dichev, 2007).

When solving for the internal rate of return, the following outcomes were obtained:

- One IRR solution in the case of 225 funds
- Two IRR solutions in the case of 29 funds
- No mathematical solution in the case of 12 funds

For funds, which have two different IRR solutions, a subjective judgement of which IRR to include, would be necessary. It is difficult to say which IRR makes more economic sense, and it seems that the IRRs in these cases are quite unstable and therefore especially sensitive to small changes in cash flows. In many cases, both of the two IRRs are very large numbers and one of them is positive and one is negative. As the average IRR for the whole data set is small, the results can be severely affected, if outliers from the 'two IRR cases' are included in the calculations. Therefore it appears to be more sensible to exclude the 29 funds which display two IRR solutions as well as the 12 funds which have no mathematical solution at all.

6.2.4 Results

The results are obtained for cash flow series which are adjusted for both, initial TNAs and fund mergers. This makes it possible to examine investor timing performance only.

The arithmetic, geometric and dollar-weighted average monthly returns are calculated as outlined in Chapter 5. The performance gap is calculated by subtracting the dollar-weighted return from the geometric return. For the return calculations and the performance gap calculation, mean, median, standard deviation and the value-weighted mean[33] of the respective return/performance gap are reported. All return figures are reported as per cent per month. The t-statistics are calculated for the mean performance gap and are reported in parentheses.

[33] Value-weighted results are calculated as in Chapter 6.1.1 with the difference that 'Reconstructed TNAs' (ex initial TNAs) are used instead of the 'original' TNAs.

Table 17 reports statistics for 225 UK Equity funds which display one stable internal rate of return. Funds with unstable IRRs or no mathematical solution are excluded.

Table 17: Investor timing performance

	Mean	Median	Standard Deviation	Mean (value-weighted)
All Funds with one IRR (N=225)				
Arithmetic Monthly Return	0.56	0.67	0.47	0.73
Geometric Monthly Return	0.45	0.58	0.49	0.63
Dollar-Weighted Monthly Return	0.25	0.23	0.76	0.31
Performance Gap	0.20	0.30	0.72	0.32
(t-stat)	(4.22)			

As one would expect from the previous explanations, the removal of initial TNAs, results in lower dollar-weighted returns and a larger performance gap. The comparison with the results from the previous analysis (Chapter 6.1.1) shows that the average performance gap has increased from 0.16% per month to 0.20% per month.

A remarkable difference can be found when comparing the more important value-weighted results, which take the average size of each individual fund into account. The value-weighted performance gap has increased from 0.16% per month (Chapter 6.1.1) to 0.32% per month which corresponds to 3.91% per year. The evidence from the examination of investor timing performance indicates that investors hurt themselves through their timing decisions considerably more than previous results might have suggested.

To eliminate the concern that the results are driven by funds which have been launched late in the observation period, results are also reported for funds which were in existence throughout the whole observation period.

Table 18: Investor timing performance for funds existing throughout the period

	Mean	Median	Standard Deviation	Mean (value-weighted)
Funds existing throughout period (N=97)				
Arithmetic Monthly Return	0.82	0.79	0.19	1.00
Geometric Monthly Return	0.72	0.69	0.19	0.91
Dollar-Weighted Monthly Return	0.33	0.37	0.52	0.67
Performance Gap	0.39	0.34	0.48	0.24
(t-stat)	(7.98)			

Table 18 shows a highly significant average performance gap of 0.39% and a value-weighted performance gap of 0.24% per month. Although the value-weighted performance gap is not as high as the performance gap in the previous analysis (0.32% per month) it is

still considerably higher than the performance gap in the analysis in Chapter 6.1.1 which includes initial TNAs (performance gap of 0.16% per month). It can be concluded that a higher performance gap also persists for a sample of funds that has been in existence throughout the whole observation period.

6.2.5 Summary

Analysis Part 1 has shown that the average individual investor has achieved a return of about 5% per year while underperforming the funds he was invested in by about 2%.

However, after controlling for fund mergers and initial TNAs, to allow for examination of investor cash flow timing ability, the investor return becomes a mere 3.8% per year. As counterpart to the lower investor return the performance gap has grown substantially. In fact, through harmful cash flow timing decisions, investors lose about 4% per year, which roughly equals the remaining amount that they achieve in total per year (3.8%). Thus, investors can double their rate of return, simply by avoiding harmful cash flow timing decisions and by maintaining a rigorous buy-and-hold strategy.

6.3 Results at the aggregate fund level

As mentioned previously, IRRs can become quite unstable if the sign of the relevant cash flows changes frequently, the magnitude of the cash flows varies a lot and especially if the characteristics of the 'investment project' are changed by for example removing initial TNAs.

To test whether the results from the individual fund level (Chapter 6.1) are robust, returns are also calculated at the aggregate fund level:[34]

- The dollar-weighted return at the aggregate fund level is calculated by simply adding up all cash flows of each month and calculating the internal rate of return from the time series of cash flows.
- The value-weighted geometric return at the aggregate fund level is obtained by taking the sum of each monthly return multiplied with the corresponding TNA value and dividing it by the sum of all TNA values. The geometric return can then be calculated from the corresponding time series of value-weighted returns.

[34] Also Dichev (2007) states that frequent and large changes in the sign and magnitude of the cash flows are less pronounced at the aggregate level and therefore you will get more reliable IRR solutions.

When calculating returns at the individual fund level, value-weighting of returns addresses the problem that funds have different TNAs. However, one major shortcoming is that the different lifespan of individual funds is not incorporated at the fund level.

When calculating returns at the aggregate fund level, returns are value-weighted as well as time-weighted. Through only considering the funds which are in existence in each particular month and weighting each return with the respective TNA value, aggregate results seem to produce more reliable return results. This logic applies for both, geometric and dollar-weighted returns. However, at lower levels of aggregation valuable insights can be gained for various specifications as demonstrated previously (see Chapter 6.1).

Table 19: Fund level results versus aggregate level results[35]

	Including Initial TNAs		Excluding Initial TNAs	
	Actual Investor Experience		**Investor Timing Performance**	
	Fund Level	Aggregate Level	Fund Level	Aggregate Level
Value-weighted Results				
Geometric Monthly Return	0.56	0.68	0.63	0.70
Dollar-Weighted Monthly Return	0.40	0.51	0.31	0.32
Performance Gap	0.16	0.17	0.32	0.38

Table 19 presents the main results, including the two main parts of the analysis ('Including Initial TNAs' and 'Excluding Initial TNAs') showing results on the fund level and on the aggregate level.

It can be seen that the returns on the aggregate level are significantly higher for both, geometric and dollar-weighted returns which is a result of the previously explained different consideration of individual fund lifespan. However, the performance gap is fairly constant between 0.16% and 0.17% per month.

When examining the results from Analysis Part 2 ('Excluding Initial TNAs') it can be seen that the dollar-weighted monthly returns are matching each other quite closely at 0.31% and 0.32% respectively. The performance gap is significantly higher as in Analysis Part 1 (about 0.16% per month) with results ranging from 0.32% per month on the fund level to 0.38% per month on the aggregate level.

[35] The sample size is 266 funds except for the column 'Ex Initial TNAs', where the sample size is 225 funds at the fund level.

7 EXPLANATIONS OF THE PERFORMANCE GAP

Analysis Part 1 and 2 have shown that investors under perform the funds they are invested in by a substantial amount. What are the specific reasons for this performance gap, i.e. why do investors make suboptimal cash flow timing decisions? In the literature there are a couple of different explanations which will be discussed in the following chapters.

7.1 Behavioural explanations

Why do investors jeopardise themselves and behave in the stock market as they do? The collaboration between finance and psychology, which has become known as behavioural finance, offers explanations. According to behavioural finance, psychological biases are responsible for irrational behaviour of participants in the stock market. In the next section some of these biases will be explored.

7.1.1 Overconfidence

One of the most often mentioned biases is overconfidence. People show a tendency to overestimate the precision of their knowledge. Odean (1998) provides a good summary of the literature about overconfidence and mentions that overconfidence has been observed in many professional fields from physicians and nurses to engineers, lawyers and managers.

People also have unrealistic self-evaluations. The majority of people see themselves better as the average person and most people perceive themselves better than they are perceived by others. People evaluate their abilities and their chances more favourably than those of their peers. (Odean, 1998b) People tend to attribute successes to their own ability and failure to bad luck or other factors. This bias is also called self attribution bias. (Daniel, Hirshleifer et al., 2001)

On the other side, Taylor and Brown (1988, p.204) argue that "*unrealistic optimism can be associated with higher motivation, greater persistence, more effective performance, and ultimately, greater success.*" This may be true in a corporate environment, where people with greater optimism and self-confidence are more likely to succeed. However, studies in financial markets about the trading behaviour of individual investors show that overconfidence leads to harmful outcomes (Odean (1998), Barber and Odean (2000)).

Friesen and Sapp (2006) consider behavioural biases, such as overconfidence, as a possible explanation for the performance gap between fund returns and fund investors' returns.

7.1.2 Limited attention and processing power

The fact that investors' attention is limited is an inevitable consequence of the tremendous information available in the marketplace as well as a consequence of humans' limited information processing power (Hirshleifer and Teoh, 2003). When making decisions, people have the tendency to overweight salient information (i.e. attention grabbing information) (Kahneman and Tversky, 1973). Investors also give too much weight to how extreme information is and neglect quality and reliability of the information (Griffin and Tversky, 1992).

7.1.3 Summary of systematic cognitive errors that are made by investors

- Investors focus on what is salient which may cause them to invest just in those stocks or funds that catch their apparently limited attention. Many investors also neglect entire asset classes and omit many individual securities within sectors, which makes them under diversified. (Daniel, Hirshleifer et al., 2001)
- Investors are strongly biased towards allocating disproportionately more money in their home country and employees tend to invest disproportionately more in their company's stock (Hubermann, 2001).
- Investors are loss averse, indicating that they are more willing to realize gains than losses (Odean, 1998a).
- Investors base their investment decision on past performance of stocks and mutual funds and naively extrapolate past price trends (Sirri and Tufano, 1998).
- Investors trade too aggressively (Odean (1998), Barber and Odean (2000)).

7.2 Investor irrationality and ‘smart’ corporations

A series of papers has documented a strong positive relation between the past performance of mutual funds and subsequent fund inflows (Ippolito (1992), Chevalier and Ellison (1997), Sirri and Tufano (1998)). Ippolito finds that investors not only move their money towards good performing funds but also move their money away from poor performers.

Friesen and Sapp (2006) state that the empirical finding of a performance gap is consistent with a behavioural explanation where fund investors ‘chase’ high past returns and ‘flee’ from low past returns. The authors presume that if fund returns are not serially correlated and inflows occur after returns far above the mean while outflows occur following returns far below the mean, investors will on average lose due to the tendency of asset class returns to cluster around the mean.

Moreover, Dichev (2007) finds material correlations between capital flows and returns for the aggregate U.S. stock market. His results imply that investors moved money into the stock market after good past returns and before subsequent poor returns; the converse applies for withdrawals of assets. He relates the existence of a performance gap between stock returns and stock investors’ returns to the debate about the magnitude of the equity premium. More precisely, he explains the performance gap “*... as a point estimate of the reduction in the firms’ cost of equity capital due to the successful timing of the firms’ equity issues and redemptions*.” (Dichev, 2007, p.399) Hence, he concludes, that both the historical equity premium and the firms’ cost of capital may be lower than existing estimates.

Frazzini and Lamont (2006) find that investors in mutual funds are hurt by their trading decisions. So, if individual investors are losing money through their mutual fund trades, who is making money? Possible candidates for ‘exploiting’ individual investors are corporations, hedge funds, pension funds, other institutions or individuals trading individual stocks. Chapter 3.5 (Individual investor performance studies) showed that individuals using discount brokers to purchase stocks consistently fail to outperform. When considering institutional investors (fund managers) a problem emerges. Since individual investors eventually control fund managers (or more precisely, impact the cash flows), it is difficult to disentangle the skill of the two groups. The performance and the holdings of mutual funds are driven by both, stock picking of managers and manager picking of individual investors.

Similarly to Dichev, Frazzini and Lamont also suspect corporations profit from ‘dumb’ investor reallocation decisions. First of all they find that demand by individuals and supply from firms is correlated. When individual investors indirectly buy more stock of a specific company through mutual fund inflows, companies increase the number of shares outstanding (for example, through seasoned equity offerings or stock-financed mergers). In this sense, trading by individuals reflects uninformed and possibly also irrational demand as opposed to the actions of firms which represent informed and presumably more rational supply. Financial institutions (fund managers) seem to behave more like passive intermediaries who facilitate trade between the ‘dumb’ money (individual investors) and the ‘smart’ money (corporations). They conclude that “… *individual investor sentiment causes some stocks to be misvalued relative to other stocks, and that firms exploit this mispricing*.” (Frazzini and Lamont, 2006, p.34)

Braverman, Kandel et al. (2005, p.20) suggest that the performance gap suffered by mutual fund investors can be explained “*by either ‘rational market explanations’ that are based on rational time-varying risk premiums or ‘behavioral explanations’ such as investor sentiment.*” Under the assumption that investors are rational and markets are efficient, their results can be explained by equilibrium models with heterogeneous agents having heterogeneous constraints, income or preferences.

Also Daniel, Hirshleifer et al. (2001) discuss the hypothesis that firms repurchase or issue shares to profit from market misvaluation. They go one step further and ask if firms deliberately try to mislead investors by choosing income-increasing accounting methods or report high accounting adjustments (accruals) to improve investor perception artificially. They argue that investors and analysts are on average too credulous, for example, when examining an information event, they do not discount appropriately for the incentives of others to manipulate the signal. They also state that as a result of mispricing there is substantial misallocation of resources in the economy. As a solution, they recommend measures like regulation of disclosure by firms and by information intermediaries and financial reporting regulations.

7.3 Who can be blamed for the existence of the performance gap?

So far, two possible explanations for the performance gap have been considered: the irrational return chasing behaviour of individual investors and the counterpart of corporations that make smart decisions when to issue and repurchase stocks.

Another possible explanation considers liquidity needs. Investors may simply be taking money out of funds when they need it and putting money in when they have spare cash. For example city workers get large bonuses, put the money into equity funds and this is followed by lower than average performance (maybe even for a connected reason). In this sense it cannot be said that investors are ‘dumb’ in their cash flow timing decisions, if the money they lose by missing out on high fund returns is more than offset by their decision to use this money elsewhere.[36]

The ‘liquidity needs’ explanation may explain a part of the performance gap, however the ‘investor irrationality’ explanation is the explanation most commonly discussed in the literature and will subsequently be further examined.

It has to be acknowledged that first of all investors have to blame themselves for irrational or ‘dumb’ cash flow timing decisions and hence, the existence of a performance gap. However, in general investors are not making their decisions without being influenced by someone. Many different parties exert influence on investors when it comes down to investment decisions:

- The media
- Investment Advisors
- Banks
- Fund managers
- Fund databases
- Investment Analysts

[36] The suggestions by David Stolin are gratefully acknowledged.

The question is whether these various parties act in the best interest of the individual investor. This is questionable, as for example investment advisors, banks and fund managers, have often direct incentives in the form of commissions to encourage the movement of assets. It would go beyond the scope of this thesis to analyze the actions and interests of each individual party separately. However, this would be an interesting subject for further research. As this thesis is focussed on examining the UK fund industry, the actions and interests of fund managers will be examined briefly.

Investment funds advertise performance based upon a reporting period chosen ex post to maximize its return. Often they also chose very short time horizons and misleading benchmarks for comparison. This selective reporting is potentially misleading to investors with limited attention. (Daniel, Hirshleifer et al., 2001)

Fund managers launch and promote 'trendy' funds. Especially in the 'new economy' period a lot of sector funds were launched aiming at the internet, telecommunications and technology sector. With hindsight we know that investors in these funds exhibited large losses. (Bogle, 2003)

With their advertising efforts and their policy of launching 'trendy' funds, fund managers encourage investors to chase past returns and to time the market. It can be reckoned that a majority of fund managers care more about increasing assets under management and accordingly their fee income than they care about the wellbeing of the investors in their funds.

The following measures can help investors to reduce the magnitude of the performance gap and hence to achieve a more desirable investment experience:

- Investment education
- Standardization of fund manager advertising[37]
- Publishing of dollar-weighted returns[38]

[37] The first and second bullet point are mentioned in Daniel, Hirshleifer et al. (2001)
[38] Bogle (2003) has talked already in 1996 about the need for mutual funds to report dollar-weighted returns

8 CONCLUSION

The purpose of this thesis is to answer the research question: “Are UK fund investors achieving fund rates of return?” The answer is a resounding ‘No’.

Analysis Part 1 has demonstrated that the average fund investor in the UK for the period from 1992-2003 has achieved a performance of 5% versus an average fund performance of 7% per year. This translates to a performance gap of 2%. Herein it is even not recognized that the average fund fails to match the performance of the FTSE All-Share Index.

Analysis Part 2 adjusts the data for factors that are not within the scope of fund investor decision making (e.g. fund mergers and initial TNAs). This makes it possible to exclusively examine investor cash flow timing ability. The results show that the performance gap increases to about 4% per annum between the fund return and the fund investors’ return. This indicates that the actual actions of investors are hurting them even more than Analysis Part 1 might have suggested.

The results from the two analysis parts document the existence of a performance gap quite clearly. Less clear are the reasons for the existence of a performance gap.

A quite plausible explanation is that investors are chasing past winners and are therefore ending up buying high and selling low. Another explanation suggests that corporations are smart in their timing decisions when to issue and repurchase equity and as a result exploit dumb individual investors. These two explanations can coexist because when individual investors purchase past winning funds they end up buying overvalued stocks (through their fund investment) which the corporate sector is happy to sell.

When asking whom to blame for the existence of the performance gap it is easy to blame individual investors for their ‘irrational behaviour’. However, individual investors are rarely making their decisions entirely on their own, but are influenced by a vast number of external parties (media, advisors, fund managers, etc.). If fund managers are taken as an example, it can be said that the majority of fund managers tries to influence investors with their ‘fee-driven’ marketing agenda.

Investors can be helped through investment education, the standardization of fund manager advertising and the publishing of dollar-weighted returns.

It is important to make the individual investors and the investment industry aware of the importance of dollar weighted returns, because ultimately, investors are not achieving fund rates of return but fund investors' rates of return.

The findings of this thesis as well as the bulk of the existing finance literature suggest that individual investors would be better off with a passive buy-and-hold strategy.

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