

Are Innovative Exchange Traded Funds Threatening the Turf of Traditional Mutual Funds?

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Abstract

The ETF market has grown at a remarkable pace over the past decade. But has this rate been justified with regards to their performance? And have their growth come at a cost to investments in traditional mutual funds? The purpose of this paper is to answer these questions by examining the return and growth rates of 51 ETFs tracking 32 difference indices, spanning domestic and international equity to fixed income, and compares those rates to the return and growth rates of over 12 000 mutual funds tracking the same indices over an 11 year time period. OLS regressions and summary statistics show that the monthly returns of ETFs have been lower than the average of mutual funds tracking the same index. Despite this ETFs have attracted investor capital at an awe inspiring rate. Event studies on the introduction of 37 ETFs comparing the difference-in-difference during this time period, show that increasing the amount of ETFs usually results in a decreased flow of funds to mutual funds in the following months. This would imply that at least some of this growth, or flow of funds, to ETFs have come at the expense of the mutual funds tracking the same indices. The study shows that this is especially frequent when the ETF introduced is the first to track that particular index.

Keywords: Financial innovations, Exchange traded funds, Mutual funds, Event study

Tutor: Laurent Bach

Date: 23.05.2012.

Discussants:

Acknowledgements: We would like to thank Laurent Bach for his enthusiastic support and mentorship throughout this process. We would also like to thank Paolo Sodini for valuable input and feedback. Finally we want to thank Johan Möller for technical support.

1. Introduction

Since the introduction of Standard & Poor's Depository Receipts (SPDR) in 1993, demand for Exchange-traded-funds (ETFs) has grown sharply as both institutional and retail investors have seen the value of adding these investment options to their portfolios. Following this demand, the ETF vendors have increased their product offering, bringing the total number at year-end of 2011 to 1134 separate ETF products, with a total asset value of \$1048 trillion. These ETFs compete directly with traditional Open-ended index mutual funds (MFs), who were introduced on the American market in the early 20th century. There were at the year-end of 2011 8684 MFs in the US alone with a total asset value of \$11.6 trillion (Investment Company Institute, 2012).

1.1 Difference between ETF and MFs

MFs and ETFs are very different investment products by operational and structural construction, however, they share the characteristic that both attempt to deliver returns to its investor through replicating the index they are mandated to track. MFs are publicly offered and its shares can be purchased and redeemed at the Net-asset-value (NAV) of the assets owned by the fund. Investors must announce their decision to buy or redeem their shares before the NAV is calculated, which is carried out on a daily basis. Dividends and capital gains are usually reinvested automatically, which makes the investor liable for qualified dividend and long-term capital gains tax (Solnik and McLeavey, 2009). Investing in MFs is also subject to both operating costs, including fund administration, shareholder accounting, index membership and transaction costs which is incurred when the funds buy and sell securities in their portfolio. These transaction costs comprise of broker commissions and bid-ask spreads, which subsequently reduces the MFs NAV. A detailed overview of MF costs can be seen in exhibit XX. Given that US MFs on average turn over approximately 95% of its inventory of shares every year, these costs can be quite substantial and subsequently affect investor returns (Richards, 2007). ETFs on the other hand, trade on stock market as normal shares of individual companies. They can be traded as long as the markets are open and can be sold short and traded on margin. The operating costs associated with investing in ETFs are marginal compared to those of MFs, only minor administration fees are charged on an annual basis (Solnik and McLeavey, 2009). What makes ETFs so innovative is its redemption in-kind process. Creation and redemption units are created in large multiples of individual ETF shares, usually in blocks of 50.000 shares. If the decision by an investor is made to redeem ETF shares, it will do so by exchanging the redemption unit for a portfolio of stocks held by the fund and used to track the index. As opposed to traditional MFs, the in-kind redemption process means that no capital gain will be realized, as the transaction is a pure asset swap with no cash involved, and investors will therefore be able to defer any capital gains tax.

ETFs also have a cost advantage over MFs because it changes weights in stocks more infrequently and it does not incur broker commission and spread as assets are swapped between the vendors, meaning that they overall have significantly lower turnover, operating and transaction costs. An additional benefit of ETFs is also its ability to be traded with a stop-loss or limit orders, which enables the investor to keep tighter control on risk (Dajczman, 2008). Demand for MFs have traditionally been driven by its ability to assist the investor in achieving their investment objective, that being retirement planning or wealth management. On the other hand, demand for ETFs, since its first inception, have mainly been driven by institutional investors or experienced retail investors need for hedging or broadening the exposure of their portfolios. For the last five years competition among ETF vendors have increased and the competitive landscape is approaching that of the MF industry, where perfect competition have existed for decades (McKinsey, 2011).

1.2 Problematization and hypothesis

According to calculations by the Investment Company Institute (2012), there are clear indications that demand for MFs have weakened and that there have been net withdrawal of funds from MFs for the last four consecutive years. During 2011 net withdrawals reportedly amounted to a total of \$100 billion. Exhibit 1 shows the development of assets under management between MFs and ETFs from 2001 and 2011. Since 2001 funds flowing into MFs have increased by 66,6% , i.e. an annual average of increase 5,2%, while the amount of funds flowing into ETFs have increased by 1256,6%, yielding an annual average increase of 28,8 %. On the basis of these numbers, the outlook for the ETF market is looking very strong with total net assets expected to rival or surpass those of MFs. Despite the increased appetite for ETFs, previous research and empirical evidence, which we will present in the next section, shows that MFs in fact delivers better pre-tax returns on average than ETFs. It is this "contradiction" we would like to examine with our paper. Even though ETFs appears to be the superior product of the two, it still delivers lower average returns than MFs. Beyond that, we would also like to examine how the net flow of funds to- and from MFs are affected by the introduction of ETFs, through an event-study. This brings us to our hypothesis:

- 1) Do ETFs deliver the same market returns as MFs and are there any significant discrepancies?
- 2) What happens to traditional MFs when ETFs are introduced on the same market?
- 3) What investment vehicle is most ideal from an American investor's point-of-view?

We examine this topic because it highlights what happens when new products are introduced on the financial market. How the market reacts to this and whether it creates a structural change in the investment industry, leaving existing market participants with the need to rethink their old business

ideas. It is also interesting from the investor viewpoint as most investors are embedded in the old mind-set of only investing in MFs. In addition, and following the financial crisis, investors, regulators and stakeholders are demanding higher transparency and pressure is mounting on financial sponsors to move their products onto exchanges. Coupled with the general arbitrary view of which investment vehicle that is most optimal, we intend to provide a non-subjective view.

1.3 Scope of research

To limit the scope of this paper we have decided to only present research concerning the actual implications of investing in MFs and ETFs, how the introduction of an ETF affects MFs tracking the same index, as well as only analysing the findings from an American investors viewpoint, although we will consider both an institutional and retail investor perspective. It is important to point out that this paper does not examine topics related to the technical aspects of the buying and selling of MFs and ETFs, trading strategies, arbitrage or other implications of international investments. Leverage and inverted ETFs are not a part of our data

1.4 Results

Results from our research seem to bear out both our hypothesis and what previous research has found. We find that all of the ETFs tracking indices studied perform worse than their Mutual Fund counterparts during the same time period (In some cases spectacularly) We also see that, counter intuitively; they attract more investor funds during the same time period than the equivalent Mutual funds do. This remarkable investor attraction towards ETFs seems to come at a cost for mutual funds. Our event study and difference-in-difference estimation on the net flows to mutual funds show that in 75% of the cases where a new ETF has been introduced, the flow to mutual funds tracking the same index as the newly created ETF are lower in the following 12 month period than the average of mutual funds tracking similar, but unaffected, indices. The effect is more pronounced if the ETF introduced is the first one to track that specific index.

1.5 Outline of study

The remainder of this paper proceeds as follows:

Section 2 summarizes previous literature and research in this field.

Section 3 goes through the theoretical framework needed to perform this study.

Section 4 describes how we obtained our data

Section 5 runs through the methodology used to obtain our results

Section 6 presents our findings from the analysis

Section 7 describes the implication our findings have for investors

Section 8 and 9 concludes our paper and suggests areas for further research

2. Literature review

There is an extensive range of research in the field of investment performance, covering both MF and ETF performance, structural and institutional factors, as well as the co-existence of the two investment vehicles.

The majority of the research related to this field has been published between 2002 and 2010.

However, none of the authors have reviewed or examined any data after 2007, and thereby not capturing the impact of the financial crisis.

The first pieces of research in this field was presented by Elton et al (2002) and Poterba and Shoven (2002), who both analyse the characteristics and performance of the Standard & Poor's Depository Receipts (SPDR) with the underlying index, the S&P 500, as well as with MFs who track the same index. Results from their research show that the SPDR is suffering from a significant tracking error, as it does not re-invest cash-dividends received from the underlying shares. In addition, the authors find that the market price of the SPDR is kept close to its NAV due to the in-kind creation and redemption process.

Authors such as Gastineau (2002 and 2004) and Kostovetsky (2003) focus on the more technical aspects of differences between ETFs and MFs. Gastineau (2002) examines differences in performance and transaction costs between small and large cap indices. He finds that MFs tend to perform better on small and medium cap indices, as they often take on the role of market-making in illiquid markets. In addition, the author present evidence that indices belonging to the Russell family are more MF friendly, due mainly to the greater ease of predicting shifts in the index weights. This leads MFs to rebalance their portfolios at other times than when the index changes their weights. The result of

this is that MF returns are at a slight advantage compared to ETFs when comparing them. Building on his previous work, Gastineau (2004) show through his research that the best way to benchmark ETFs and MFs is to compare performance before taxes. This is also the basis for our data analysis, but we will also consider the tax implications when analysing through the eyes of an American investor. The author also uncovers that the redemption and creation process associated with ETFs leads to corrective trading for ETFs. Hence, ETF returns are affected negatively. Kostovetsky (2003) on the other hand focuses on liquidity, transaction, inefficiency and structural costs as the source of tracking error for MFs and ETFs. In particular, three reasons for non-tracking errors are identified: management fees, shareholder transaction costs and taxation costs. These effects are modelled into a multi-period formula for the final value of the investment along with an extension of the model, which determines how investors should act. The model quantifies whether the investor will choose an index fund over an ETF if the Final Value (index fund) - Final Value (ETF) > 0.

Another area of research within this field deals specifically with liquidity and is examined by Guedj and Huang (2008). Their research concludes that investor with high liquidity needs chooses MFs because of its liquidity guarantee, however, the authors show in their equilibrium model that investors are indifferent between ETFs and MFs if liquidity needs are identical. We question the former result to some extent, as it seems as if the authors have ignored an important structural argument for ETFs, the fact that ETFs actually trade on exchanges, which is by far more liquid. Furthermore, the authors predict that ETFs are a more suitable investment vehicle when investors have correlated liquidity shocks or when the underlying indices are narrower or less liquid. As with Gastineau (2004) and Kostovetsky (2003), the authors have examined transaction costs associated with ETFs and MFs. They conclude that overall the transaction costs are the same, but the allocation of cost between MFs and ETFs are different. Again we find that the authors have ignored a structural factor of ETFs. The cost advantage that comes with ETFs cannot be outweighed by its lower returns.

Another author that has written about several topics concerning ETFs and MFs is Rompotis (2008, 2009 and 2011). In his first paper, the author examines the difference between funds that are part of the same family, i.e. issued by the same vendor. Findings suggest that there are no significant differences in risk and only a slightly inferior effect on returns compared to the benchmark. It is however worth mentioning that he finds a positive relationship between return and risk as well as expenses and tracking errors. Secondly he analyses differences, in particularly bid-ask spreads, between passively and actively managed ETFs. His findings suggest that passive ETFs have greater spreads than actively managed ETFs and that there is a positive correlation between higher trading volume and larger spreads bid-ask spreads. Lastly, Rompotis investigates whether ETFs on average

trade at their NAV. Surprisingly, results show that they trade at a premium with retail investors (which is due to its high redemption size), but this is exploited by institutional investors as arbitrage. In addition Rompotis authored a paper with Milonas (2010) concerning identical ETFs traded on different stock-exchanges. Not surprisingly there are discrepancies due to institutional factors, but evidence is presented which shows that tracking errors are smaller for ETFs that follow a domestic underlying index relative to those that follow non-domestic indices. For our paper we in particular find the last finding notable as it is very much along the lines of our results.

Our paper is first and foremost related to the work of Svetina (2010) and Agapova (2009) who both focus their research on competition and flow of funds between MFs and ETFs. Svetina (2010) studies the heterogeneity of the ETF universe and finds that gross-returns on ETFs compared to MFs are almost statistically indistinguishable, but when correcting for transaction costs (net of transaction costs) ETFs outperform matching MFs by 0,31% per year. In terms of flow of funds, the introduction of ETFs on an index is associated with a net outflow of funds from MFs (the impact on outflow is dependent on whether there are existing ETFs). She also finds that the introduction of competing ETFs permanently reduces the demand for incumbent ETFs in the same asset class and the investment style category. Around the new ETF introduction, competing ETFs (which she finds to be closer substitutes than other MFs) experience larger decline in market share than comparable index funds. Agapova (2009) also compares the aggregate flow of funds between ETFs and MFs. She finds that the two investment vehicles are complements rather than substitutes and that their coexistence can to some extent be explained by a clientele effect. The clientele effect can be explained as investors preference based on desired outcomes.

We add to this literature in three ways. Firstly, we use a much wider and comprehensive range of data than before. In particular our research include data from 2007 to December 2011 (the financial crisis), which has not been analysed previously. Secondly, we analyse and compare returns and implications on fund flows both through regression and as an event study, and we use a wider range of indices and asset classes when we do so. Lastly, we provide an analysis of what implications our results have for different types of investors and which investment vehicle is most suitable from an investors point-of-view.

3. Theoretical framework

Solnik and Mcleavey (2009) describes how NAV is calculated.

$$\begin{aligned} \text{Value of securities} + \text{cash} - \text{liabilities} &= \text{Net Asset Value (NAV)} \\ \text{NAV} / \text{Number of fund shares held by investors} &= \text{net price per share} \end{aligned}$$

Kostovetsky (2003) presents in his research a general table which shows the different costs associated with the two investment vehicles examined. We have decided to include this table so as to highlight the differences

Types of costs	ETFs	MFs
	Fund costs	Fund costs
Transaction costs incurred by the fund when buying and selling securities	No costs associated, because of the in-kind redemption and creation process	Broker commissions and spreads
The inflow and outflow of cash	Any deviation in the value of creation or redemption are paid in cash	Liquidity guarantee creates cash drag. Funds usually keep approx 2% in cash
Dividend policy	Investors usually receive dividends after a short fund administrative period	Investors usually receive dividends after a short fund administrative period
In-and-out arbitrage trading	Because of the in-kind redemption and creation process, arbitrage is eliminated almost immediately	Although illegal by definition, late trading could take advantage of arbitrage situations
Index fund changes	Rebalancing costs occurs	Rebalancing costs occurs
Corporate activity	Rebalancing costs occurs	Rebalancing costs occurs
Management fees	Shareholders are responsible for doing their own accounting resulting in much lower expense ratios	The fund is responsible for doing accounting for shareholder resulting in high expense ratios
	Shareholder costs	Shareholder costs
Shareholder transaction costs	Broker commission and spread	No transaction costs
Taxation costs	None, as long as gains are not realized	Capital gains are distributed to shareholder, but losses are not.

3.1 Institutional factors affecting investments

When US investors invest money they become liable to two types of taxation, dividend income and capital gains. Capital gains are divided into short-term and long-term, where short-term refers to anything shorter than 1 year. Long-term capital gains have traditionally been taxed at 20% for those individuals, whose tax bracket is 15% or more, and at 10% for individuals in the lowest income brackets. Dividend income on the hand have traditionally been tax at the short-term rate, but was changed to the long-term rate under the Bush administration and extended through 2010 as a result of the Tax increase and Reconciliation Act (Richards, 2007) and (ICI, 2012). Tax liability obviously has great implications for investors, however, in the context of our thesis we calculate post-tax returns with a 20% long-term rate and a 20% dividend rate.

3.2 Tax implications for US investors

Within the scope of this paper we consider two separate institutional factors that in varying degree affect our results, but are difficult to control for. The first factor relates to legislative considerations, where US retirement savings are held in 401(k) accounts or defined contribution plans which are subsequently placed in mutual funds. These accounts represent over 40% of all assets under management in the US and also carry with them a tax-break. This means in essence that the tax advantage previously awarded to ETFs is now leveled out. The second factor relates to demographic trends, where the ageing population is affecting the preference of asset through the investment life-cycle. The implications of this shift means that retail investors are turning towards less risky assets, i.e. fixed income, as they are getting closer to retirement. The former has implications for performance comparisons and the latter affects aggregate flow of funds (Richards, 2007).

3.3 Econometric methods and theoretical assumptions

To examine the relationship between indices, and the mutual funds and ETFs tracking them, and the flow of capital between them, we used ordinary least squares regressions. To use this econometric tool we made the following five assumptions:

That the conditional means of the error terms are zero:

$$E[\varepsilon|X] = 0$$

That there is no linear dependence between the regressors:

$$Pr[\text{rank}(X) = p] = 1$$

That there is homoscedasticity:

$$E[\varepsilon_i^2|X] = \sigma^2$$

Uncorrelated error terms:

$$E[\varepsilon_i \varepsilon_j|X] = 0, \text{ for } i \neq j$$

That the error terms are normally distributed:

$$\varepsilon|X \sim N(0, \sigma^2 I_n)$$

When examining the effect of an historical event where external factors are difficult to account for and endogeneity is a problem, one way to bypass the hidden effects on the error term is to compare the difference, or change, in the observed dependent variable before and after the event, with similar variables in other unaffected states, the control groups, during the same time period. Thus hidden factors that may cause a change in the dependent variable should cause a similar change in the dependent variable of the control group. Taking the difference between these two groups, the affected and unaffected state, should allow these hidden factors to cancel out, eliminating or at least reducing the endogeneity problem. This difference-in-difference is a common method used in financial event studies.

In the case of ETF's assumed effect on the flow of capital to mutual funds, we could assume that many other factors that change over time, such as investor confidence, federal interest rates and tax rates, should affect the flow of capital roughly equally across mutual funds tracking various indices. When compared to mutual funds tracking the same kind of index, ie. a fixed income, domestic or international equity based index, the effect of these hidden factors should be more equal still. Thus when examining the change in the flow of capital to mutual funds following the introduction of an ETF, a comparison should be made to the change over the same time period of the flow of capital to mutual funds tracking unaffected indices and perhaps specifically to those mutual funds tracking indices of the same type as the one affected.

Diff-in-diff might not eliminate all of the endogeneity but it should help reduce it. An easy way to use it would be to gather the change over a multiperiod time frame into two aggregate points. One before and one after and compare them. Doing this with such a small amount of states however (many of our ETF introductions occurred at unique times, though some did appear at the same time as others, see Table 18) is problematic and should be avoided according to Bertrand et al (Bertrand , 2004) since it overestimated the rejection rates. Instead we chose to regress the various periods in the time frame and compare the regression coefficients and the regression R^2 .

4. Data

We selected 32 indices that were tracked by mutual funds and at least one ETF during the time period January 2001 to December 2011. We then gathered data on monthly index returns, Mutual Fund returns and size and ETF prices and share.

4.1 Mutual Fund data

The Mutual Fund raw data is comprised of monthly returns per share, net asset value per share (NAV) and total net asset value (TNA), along with fund identifier and date. The amount of funds tracking each index varied to a great degree, with several thousand tracking the larger indices, such as S&P 500, Barclays Capital TIPS and MSCI EAFE, to only a handful or just one or two tracking the smaller indices, such as S&P 100, Barclays Capital US Intermediate Credit Bond and MSCI Japan. In total we gathered monthly data from 12924 Mutual Funds in the time period of Jan 2001 to Dec 2011 (resulting in a maximum of 132 data points for each variable of each fund). The specific number of mutual funds tracking each index can be seen in Table 1 in the Appendix. The data on Mutual funds;

monthly returns, total net assets (TNA) and net asset value (NAV); were taken from Wharton Research Data Services (WRDS).

4.2 ETF data

The ETF raw data is comprised of the closing price of the ETF for the last trading day of the month and the number of shares outstanding, along with ETF identifier and date. The number of ETFs tracking each index varies from one to 4 though having more than two ETFs tracking the index was very uncommon, with only three of the indices being tracked by more than two ETFs. In total data was taken from 51 ETFs in the time period of Jan 2001 to Dec 2011, with a maximum of 132 data points for each variable of each ETF. The specific number of ETFs tracking each index can be seen in table 1 in the Appendix. The data on ETFs, monthly prices and shares outstanding, were, like the data on mutual funds, taken from WRDS.

4.3 Index data.

The index raw data, i.e the returns of each index, was taken from Thomson Reuters Datastream.. This data represents the monthly value weighted returns of the index and thus contains 132 data points for each index. Of the 32 indices, 20 were of domestic equity, 6 were of international equity and 6 were fixed income. The indices and their asset category can be seen in Table 1 in the Appendix. Further details on market capitalization, market scope and development stage for each index can be seen in Table 2 in the Appendix.

5. Methodology

The average returns of the mutual funds were compared to the average returns of the ETFs for the same time period. The comparison was made by regressing the return of the index on the mutual fund and ETF returns. For the event studies we regressed the flow of mutual funds over a 6 month and a 12 month period before and after the introduction of a new ETF, the event, and compared it to regressions of flow over time for mutual funds tracking the other indices, the control group.

In order to calculate the flow of the funds we used the formula:

$$\text{Net Flow (Sirri and Tufano, 1998): } FLOW_{i,t} = \frac{TNA_{i,t} - TNA_{i,t-1} * (1 + R_{i,t})}{TNA_{i,t-1}}$$

Thus to get the flow of the mutual funds between t-1 and t we divided the TNA at time t by the NTA at time t-1, in order to get the percentage increase of money invested in funds. We then subtracted the fund growth to isolate the increase (or decrease) due to flow of investments.

$$TNA_{i,t} = TNA_{i,t-1} * (1 + R_{i,t} + FLOW_{i,t})$$

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$$\frac{TNA_{i,t}}{TNA_{i,t-1}} - (1 + R_{i,t}) = FLOW_{i,t}$$

Based on the fact that

*Net Asset Value (NAV) per share * shares = Total Net Asset Value (TNA)* and that the NAV should equal the price of the share we changed the above equation when calculating the flow of ETFs, where we only had the variable's price and shares outstanding. Thus we applied those changes resulting in:

$$FLOW_{i,t} = \frac{(Shares_{i,t} - Shares_{i,t-1}) * Price_{i,t}}{Shares_{i,t-1} * Price_{i,t-1}}$$

This gave us the percentage increase or decrease of money in the fund (actively inserted or removed). This was weighted by the size of the TNA compared to aggregated TNA of all funds in order to get the aggregate net flow, in per cent, of all ETFs tracking each specific index. This, together with the aggregate TNA of all mutual funds was used to compare the mutual funds with the ETF tracking the same index.

We took the cumulative changes in both Flow and return of Mutual Funds and ETFs and summarized them in Table 3 and Table 4 in The Appendix. A comparison between the values in these two tables can be seen in Table 5. We also summarized the monthly changes in flow and returns via the sum function in stata, shown in Tables 6, 7, 8 and 9.

The index returns were regressed on the average MF returns and the average ETF returns in their overlapping time periods. Correlations and regressions were made using Stata. To look at the Mutual Fund net flow of funds (in percent) we regressed the Index returns, Mutual fund returns and ETF flow (in percent) on mutual fund flows.

We looked at 37 different ETF introductions, and compared the flow of mutual funds tracking the same index as the ETF introduced for an equal period before and after the introduction with the flow

of mutual funds tracking other indices. Two time periods were chosen, 6 and 12 months, with 37 ETF introductions, events, studied with a 6 month period and 33 events studied with a 12 month period.¹

The cumulative monthly flows were regressed on time for a 12 month and a six month period before and after the ETF introduction. The flow was compared to the flows of mutual funds tracking other indices, the control groups, who hadn't had an ETF introduction during the two periods². Regressions with very low R^2 were discarded.³ The specific events discarded and the R^2 of the regressions can be seen in Table 19. The flow comparisons were then restricted to indices of the same type, ie the same asset class. The events were also compared based on if they introduced the first ETF tracking that particular index or if they were an ETF introduced into a market where ETFs tracking that index already existed.

6. Results

If ETFs and Mutual Funds are essentially the same then we would expect to see similar returns between them over time. In other words, we wouldn't expect to see ETF performance deviate from MF performance more than individual Mutual Funds deviate from each other. When compared side by side for the same time period we see that Mutual Funds have a higher mean return, lower standard deviation and higher high and low points. The average returns of the Mutual Funds are mostly small but positive, roughly at $\frac{1}{2}$ of a percent. The average returns of the ETFs however are almost all negative. The standard deviations of the ETFs are greater than those of the mutual funds which is to be expected since there are a greater number of mutual funds. If each fund have the same expected return then one would expect the average to deviate more if fewer funds are sampled. We see that the ETFs have lower minimum returns, again expected since they have a greater standard deviation and a lower mean than mutual funds. The mutual funds, however, have more frequently a higher maximum return, suggesting that the increased volatility of the ETF averages is skewed downward.

¹ Four ETF introductions were too close to the end points of the data to have a complete 12 month period to examine either before or after the event.

² i.e 12 months after or 24 months before the 12 month event study and 6 months after and 12 months before the 6 month event study.

³ Those with R^2 less than 0.1. Though the effect of their exclusion on the results were minimal, see Table 18 and 21.

6.1 Analysis of correlations and regressions on fund performance

Table 10 shows the correlation between MFs, ETFs and indices. Examining the correlation output we immediately see that some of the results stand out from the rest. The MFs that track Barclays Capital US Aggregate Bond and US 1-3 Year Treasury Bond index only have a correlation coefficient of 0.1697 and 0.1167, while the ETFs that track the same indices have a correlation coefficient of 0.7816 and 0.8249 respectively. This is in sharp contrast with other indices in the Barclays family where correlation ranges from 0.6457 to 0.9914. Looking at the performance regressions in exhibit XX, which explains how well funds track indices, we observe that for Barclays Capital US Aggregate Bond and US 1-3 Year Treasury Bond the R^2 value is close to being insignificant at 0.0554 and 0.0003. These low R^2 values helps to explain why MFs tracking the US 1-3 Year Treasury Bond Index are tracking the index so poorly, although it is unclear which, if any additional explanatory variables should have been included, seeing as MFs tracking other indices in the Barclays family have significantly higher R^2 values in the region of 0.7129 to 0.9879.

Another notable observation from the performance regressions is the ETFs ability to outperform its index, meaning that they deliver higher returns to shareholders than what is expected. For ETFs tracking the S&P500, S&P500 Value, Russell 1000, Russell 1000 Value and Russell 3000 indices regression coefficients exceed 1.0000. These observations are confirmed by significance levels well within conventional levels and the R^2 values averaging 0.9900.

Table 11 show the average correlation and regression coefficients of the various indices grouped together based on a series of attributes. Examining the aggregate findings from grouping the indices by asset class, as seen table 12 and 13, we observe two notable trends in the data. Firstly, MFs tracking international equity indices have a significant higher correlation coefficient than ETFs tracking the same indices. This is also confirmed by the performance regressions, where MFs appears to be tracking the indices far better than ETFs and with much higher statistical significance. The same sort of trend can also be observed for MFs and ETFs tracking domestic equity indices. Taking these findings further we observe the second trend when grouping the indices by market capitalization, i.e. the size of the firms the funds invest in. The interesting finding here is that MFs and ETFs perform almost equally well on indices that track large cap firms, but there are great discrepancies between the two on indices that track medium and small cap firms. We can with high statistical certainty conclude that MFs deliver significantly higher returns compared to that of ETFs. Earlier research has tried to explain this phenomenon by pointing to market making and illiquid markets playing in favour of MFs, but we find it hard to believe that it can make such a difference. It is however worth pointing out that the regressions on how ETFs track medium and small cap indices are subject to a relatively

low average R^2 values of 0.4628 and 0.6194 compared to those of MFs of 0.9895 and 0.9978. Grouping the funds together according to market scope and life-cycle we again observe that MFs have significantly higher correlation and are able to track indices much more accurately than ETFs. Although the coefficients for ETFs are affected by low R^2 values, coefficients still have significant p-values. These observations coupled with previous observations further enhance the overall observed trend between MFs and ETFs.

On the whole we observe that ETFs trail MFs in terms of correlation and tracking of indices. Previous literature provides some explanatory reasons to why MFs outperform ETFs, but not at the magnitude shown in our results. In particular, it is hard to understand why performance regressions on ETFs have such low R^2 values on average. Current research and literature does not describe what additional variables can be controlled for and it seems peculiar that ETFs fail to reach their only objective that is, replicating the index they are set to track.

6.2 Analysis of correlations and regressions on flow of funds

From table 14 which shows the correlation between index returns and net flow of funds from MFs and ETFs, we can identify some key trends. The correlation between the S&P 500 index and aggregate flow of funds to MFs tracking this index are positive at 0.5440 and the correlation between net flow of funds to MFs and ETFs are negative at -0.2230. This implies in essence that net flow of funds to MFs that track the S&P 500 moves in the same direction as the index and partially in opposite direction of net flow of funds to ETFs tracking the same index. These findings are coherent with the findings in the event study presented in section 6.2. The same result can also be seen when grouping indices according to market scope and market capitalization, seen in table 16 and 17, although with weaker correlation coefficients. Examining grouped results beyond this proves difficult because of the wide range of results, which brings the average out of context.

Table 15 show the regression output of regressing net flow of funds to ETFs, Index returns and average MF returns on net flow of funds to MFs. What we were expecting to see from these regressions was further evidence that flow of funds to ETFs adversely affects flow of funds to MFs, in other words, a confirmation that ETFs are full or partial substitutes to MFs. Despite our extensive data amount our regression output suffers from substantial endogeneity problems. The average R^2 value is 0.1184 and the majority of the regression coefficients have significance levels well beyond any conventional level. Due to the endogeneity problems associated with the regression results we cannot accurately determine trends from the data and any findings would be inconclusive or statistically insignificant.

6.3 Analysis of event study

The basic differences between before and after the introductions of ETFs are inconclusive, both when looking at a 6 month and a 12 month period. Roughly half the cases see an increase in the net flow to mutual funds following the event, while the other half see a decrease. This is shown in Table 18. However a multitude of different factors determine what amount an investor will insert or withdraw from a fund at any given month. The change in flows, both 6 month and 12 month, following the events occurring in 2003 are all positive. Perhaps this was due to the passing of the Jobs and Growth Tax Relief Reconciliation Act of 2003, colloquially known as the Bush tax cuts, which cut the tax rates on capital dividends, benefiting mutual funds. Perhaps it was due to the Fed cutting the interest rates in June, hitting the low point of the decade at 1%. Since many of these factors are hidden or endogenous our best proxy is to look at how the change in the net flow of capital to mutual funds tracking our affected index compare to the changes in net flow of capital to mutual funds tracking other indices.

We found that in the short term there is no real discernible effect of ETF introduction on the flow of money to mutual funds. Of the 33 ETF introductions with a R^2 above 0.1, 13 of the indices saw flow to mutual funds worsen compared to the average of the flow to the mutual funds tracking other indices while the 19 had a relatively good flow compared to the average. When mutual funds of the affected index were compared to mutual funds in other indices of the same type only, 17 showed MF flows worse than the index type average compared to 15 who showed a greater than average flow.

When looking at the 12 month period however we found that the events coincided with a decrease in flow to mutual funds in 16 of the 28 events. This would indicate a certain amount of delay in the reaction of investor. This friction in the transition of funds could be due to investors' unwillingness to divest their mutual fund holdings and instead, to a greater extent, direct new investments toward ETFs. When compared to similar types only, 21 of the 28 events showed a decreased flow compared to the average. In both cases, compared to all other indices and compared to only indices of the same type, the effect was enlarged when restricted to the first ETF introductions only. Of the events that coincided with flows to mutual funds that were greater than the average of other indices, several had a flow much greater than the average. This would indicate that perhaps an underlying variable both effected the introduction of the ETF and the relative increase in mutual fund flow. Increased investor enthusiasm over an external factor could lead to both increased demand for a product and an increased supply (in anticipation of the increased demand), thus making the ETF introduction seem to boost mutual fund flow compared to mutual funds tracking other indices.

7. Implications for investors

Results from our analysis show that MFs on average outperform ETFs, that ETFs following large cap indices such as the S&P500 and Nasdaq100 have a higher coefficient than MFs and that an introduction of an ETF on an index has a negative effect on net flow of funds to MFs. The performance results are pre-tax and gross of fees, which means that tax sensitive investors carefully need to evaluate which forms of tax liabilities they want to expose themselves to. Seeing as institutional investors are exempted from paying any taxes this consideration is only directly applicable to retail investors. Although ETFs have been promoted as a tax beneficial option, this attribute is only realised if the investor redeems shares in lots of 50,000, which realistically is unlikely to be the case for most retail investors.

Since performance results are calculated gross of fees investors need to be vigilant when choosing which investment vehicle to invest in and not be blindfolded from the fact that one fund might provide greater returns than others. Knowing that the performance coefficients of ETFs are above 1.0000 have implications for risk management and investors who are sensitive to risk, as it implies a higher volatility associated with investing in certain ETFs than that of average MFs. However, since there are more risk management tools available when trading ETFs, such as stop-loss and limit orders, the effects are in essence marginalized as long as the investor remains actively engaged in their investments.

The adverse effect on net flow of funds to MFs imposed by the introduction of ETFs, have implications for investors as the growth rates of ETF are higher than aggregate amounts of funds being invested. Although a significant part of MF holdings are 401(k) retirement accounts and defined contribution plans, MFs could be forced to sell off a number of assets if investors are shifting preference towards ETFs. Such a sell-off is not ideal to remaining investors as they would be left with the losses from liquidating assets of which they were not intending to liquidate just yet.

8. Conclusion.

Our results suggest that, though seemingly more attractive to investors, ETFs actually deliver inferior returns when compared to the average of mutual funds. However in some markets, most notably those indices with large capitalization, ETFs might deliver superior results given that they correlate better with the market. If the underlying index would deliver a net positive return over the next 5-10 years (unlike what they have done in the previous year examined), our regression shows that they

would be in a position to beat their mutual fund counterparts. Either way, our research indicates that investors will be willing to bet on ETFs in the future. The net percentual yearly flow of funds to ETFs has outclassed that of mutual funds by a substantial margin for almost every index tracked. Our event studies have shown that this spectacular growth isn't solely funded by additional capital supplied by exuberant investors. Indeed they would suggest that whenever an index tracking ETF is introduced, the flow to mutual funds tracking the same index is likely to suffer.

9. Further research.

There are several areas in which to continue this research. One is to discern the effect of institutional factors, such as the Bush tax cuts of 2003 or pension holdings, and how they've changed the investment landscape. It would also be beneficial for further research to calculate performance net of fees as it would provide more insight when analysing fund performance . Another would be to extend the time period to get a broader look on the evolution of ETF and their effect on mutual funds. Or conversely one could look at the shorter movements based on volatility and see whether the illiquid nature of mutual funds compared to ETFs has any adverse effects on daily returns and flow. Another would be to compare how the effects of ETFs on mutual funds are distributed amongst the various funds based on their rating previous performance. Furthermore the effect of ETFs during bull markets compared to bear markets might give insight into how the funds will evolve given that the world market takes a turn for the worse or makes an unexpected recovery.

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Appendix

Table 1: Indices examined⁴

Index nr	Name of Index	Index Family	Asset Class	Mutual Funds	ETFs
1	S&P 500	S&P	Domestic Equity	2957	3
2	S&P 100	S&P	Domestic Equity	1	1
3	S&P 500 Value	S&P	Domestic Equity	27	2
4	S&P Equal Weight	S&P	Domestic Equity	6	1
5	Russell 1000	Russell	Domestic Equity	285	2
6	Russell 1000 Growth	Russell	Domestic Equity	828	2
7	Russell 1000 Value	Russell	Domestic Equity	811	2
8	Russell 2000	Russell	Domestic Equity	483	2
9	Russell 2000 Value	Russell	Domestic Equity	319	2
10	Russell 2000 Growth	Russell	Domestic Equity	368	2
11	Russell 3000	Russell	Domestic Equity	759	2
12	Russell Top 200	Russell	Domestic Equity	10	1
13	Russell Midcap	Russell	Domestic Equity	276	1
14	Russell Midcap Growth	Russell	Domestic Equity	386	1
15	MSCI All Country World	MSCI	International Equity	151	1
16	MSCI Europe	MSCI	International Equity	58	1
17	MSCI All Country Asia ex Japan	MSCI	International Equity	33	1
18	MSCI Emerging Markets	MSCI	International Equity	263	2
19	MSCI EAFE	MSCI	International Equity	1683	2
20	MSCI US Prime Market Value	MSCI	Domestic Equity	4	1
21	MSCI Japan	MSCI	International Equity	2	1
22	MSCI US Mid Cap 450	MSCI	Domestic Equity	4	1
23	MSCI US Prime Market 750	MSCI	Domestic Equity	4	1
24	MSCI US Small Cap Growth	MSCI	Domestic Equity	4	1
25	Baclays Capital TIPS	Baclays Capital	Fixed Income	133	2
26	Baclays Capital US Aggregate Bond	Baclays Capital	Fixed Income	2941	4
27	Barc Cap US 1-3 Year Treasury Bonds	Baclays Capital	Fixed Income	14	2
28	Baclays Capital US MBS	Baclays Capital	Fixed Income	86	3
29	Barc Cap U.S. Intermediate Credit Bond	Baclays Capital	Fixed Income	2	1
30	Barc Cap U.S. 5-10 Year Govt/Credit Bond	Baclays Capital	Fixed Income	4	1
31	Dow Jones U.S. Real Estate	Misc	Domestic Equity	1	1
32	NASDAQ-100 Index	Misc	Domestic Equity	21	1

⁴ A list of the 32 indices examined, what family they belong to, what type of asset class it covers, and how many mutual funds and ETFs track it.

Table 2: Index information⁵

Index nr	Name of Index	Market Capitalization (Dom. Eq.)	Market Scope	Development- cycle (Int. Eq.)			
1	S&P 500	Large Cap	Broad	Developed Emerging Emerging Developed Developed			
2	S&P 100	Large Cap	Narrow				
3	S&P 500 Value	Large Cap	Broad				
4	S&P Equal Weight		Broad				
5	Russell 1000		Broad				
6	Russell 1000 Growth		Broad				
7	Russell 1000 Value		Broad				
8	Russell 2000		Broad				
9	Russell 2000 Value		Broad				
10	Russell 2000 Growth		Broad				
11	Russell 3000		Broad				
12	Russell Top 200		Narrow				
13	Russell Midcap	Mid Cap	Narrow				
14	Russell Midcap Growth	Mid Cap	Narrow				
15	MSCI All Country World	Mid Cap	Broad				
16	MSCI Europe		Broad				
17	MSCI All Country Asia ex Japan		Broad				
18	MSCI Emerging Markets						
19	MSCI EAFE		Broad				
20	MSCI US Prime Market Value		Broad				
21	MSCI Japan		Narrow				
22	MSCI US Mid Cap 450	Mid Cap	Broad				
23	MSCI US Prime Market 750	Large Cap	Broad				
24	MSCI US Small Cap Growth	Small Cap	Narrow				
25	Barclays Capital TIPS	Large Cap					
26	Barclays Capital US Aggregate Bond						
27	Barc Cap US 1-3 Year Treasury Bonds						
28	Barclays Capital US MBS						
29	Barc Cap U.S. Intermediate Credit Bond						
30	Barc Cap U.S. 5-10 Year Govt/Credit Bond						
31	Dow Jones U.S. Real Estate				Narrow		
32	NASDAQ-100 Index	Large Cap	Narrow				

⁵ Further index information and categorization. Details the size of the index's market capitalization, its market scope and whether it tracks developed or emerging markets (for international equity indices).

Table 3: cumulative return comparison⁶

Index	Nr of obs	MF returns		ETF returns	
		monthly	yearly	monthly	yearly
S&P 500	131	0,2%	2,2%	-0,2%	-2,1%
S&P 100	39	0,3%	3,8%	0,0%	0,3%
S&P 500 Value	131	0,1%	1,7%	-0,2%	-2,8%
S&P Equal Weight	104	0,6%	7,9%	-0,8%	-8,7%
Russell 1000	131	0,2%	2,4%	-0,1%	-1,8%
Russell 1000 Growth	131	0,0%	-0,4%	-0,3%	-3,3%
Russell 1000 Value	131	0,2%	2,3%	-0,1%	-0,9%
Russell 2000	131	0,5%	5,6%	-0,7%	-8,6%
Russell 2000 Value	131	0,6%	7,2%	-0,4%	-5,2%
Russell 2000 Growth	131	0,2%	2,6%	-0,1%	-1,0%
Russell 3000	131	0,2%	2,8%	-0,1%	-1,7%
Russell Top 200	27	0,7%	9,3%	0,5%	6,3%
Russell Midcap	125	0,5%	5,8%	-0,5%	-5,5%
Russell Midcap Growth	125	0,3%	3,5%	-0,9%	-10,1%
MSCI All Country World	45	-0,1%	-1,4%	-0,6%	-7,2%
MSCI Europe	81	0,1%	1,5%	-0,4%	-5,2%
MSCI All Country Asia ex Japan	40	0,2%	2,2%	-0,4%	-4,6%
MSCI Emerging Markets	104	1,2%	15,0%	-1,2%	-13,6%
MSCI EAFE	124	0,3%	3,9%	-0,7%	-8,5%
MSCI US Prime Market Value	95	0,3%	3,6%	0,0%	-0,6%
MSCI Japan	131	-0,1%	-0,6%	-0,3%	-3,3%
MSCI US Mid Cap 450	95	0,5%	6,3%	0,2%	2,8%
MSCI US Prime Market 750	95	0,3%	3,9%	0,0%	0,6%
MSCI US Small Cap Growth	95	0,5%	5,7%	0,3%	3,1%
Barclays Capital TIPS	96	0,4%	5,0%	0,1%	1,6%
Barclays Capital US Aggregate Bond	99	0,4%	4,6%	0,1%	0,8%
Barclays Capital US 1-3 Year Treasury Bonds	113	0,2%	2,0%	0,0%	0,4%
Barclays Capital US MBS	57	0,4%	4,8%	0,2%	1,9%
Barclays Capital U.S. Intermediate Credit Bond	59	0,4%	4,9%	0,1%	1,2%
Barclays Capital U.S. 5-10 Year Govt/Credit Bond	56	0,6%	8,0%	0,2%	2,8%
Dow Jones U.S. Real Estate	131	0,9%	11,1%	-0,8%	-9,5%
NASDAQ-100 Index	131	-0,2%	-2,6%	-0,4%	-4,9%

⁶ A comparison of the percentage change in the average returns of ETFs and Mutual Funds tracking the specific index, the geometric mean of the returns. The table contains number of months measured, average monthly percentage pre-tax return of mutual funds over the time period, average yearly percentage return of mutual funds over the time period, and average monthly and yearly percentage pre-tax return of ETFs during the same time period.

Table 4: Cumulative flow comparisons⁷

Index	Nr of obs	MF flow		ETF flow	
		monthly	yearly	monthly	yearly
S&P 500	127	0,2%	2,3%	1,4%	18,3%
S&P 100	39	-0,2%	-3,0%	0,0%	-0,5%
S&P 500 Value	127	0,4%	4,5%	3,7%	54,1%
S&P Equal Weight	104	-0,6%	-7,4%	3,9%	57,4%
Russell 1000	130	0,1%	0,6%	2,4%	33,1%
Russell 1000 Growth	126	-0,5%	-6,0%	5,2%	83,0%
Russell 1000 Value	127	0,0%	0,5%	4,6%	71,0%
Russell 2000	128	0,5%	6,3%	3,4%	48,7%
Russell 2000 Value	127	0,3%	3,7%	4,1%	61,5%
Russell 2000 Growth	130	0,0%	-0,4%	1,5%	19,6%
Russell 3000	127	1,0%	12,4%	4,6%	71,4%
Russell Top 200	27	-2,1%	-22,5%	12,8%	325,4%
Russell Midcap	122	1,7%	23,0%	4,4%	68,5%
Russell Midcap Growth	120	-0,2%	-2,1%	4,6%	71,6%
MSCI All Country World	42	0,6%	7,1%	14,1%	388,3%
MSCI Europe	81	-1,3%	-14,5%	4,9%	77,8%
MSCI All Country Asia ex Japan	24	-0,7%	-8,3%	28,0%	1826,6%
MSCI Emerging Markets	103	1,2%	15,3%	8,0%	153,0%
MSCI EAFE	122	0,7%	9,3%	4,3%	66,6%
MSCI US Prime Market Value	94	0,6%	7,0%	5,0%	79,0%
MSCI Japan	128	0,2%	2,8%	1,9%	25,1%
MSCI US Mid Cap 450	95	0,8%	9,4%	3,7%	54,0%
MSCI US Prime Market 750	90	4,6%	71,1%	3,8%	57,0%
MSCI US Small Cap Growth	88	0,9%	11,4%	4,6%	71,1%
Barclays Capital TIPS	96	1,4%	17,5%	5,2%	83,8%
Barclays Capital US Aggregate Bond	99	0,8%	10,0%	7,1%	127,5%
Barclays Capital US 1-3 Year Treasury Bonds	113	0,4%	4,9%	2,6%	35,5%
Barclays Capital US MBS	55	-0,7%	-7,7%	10,0%	215,2%
Barclays Capital U.S. Intermediate Credit Bond	59	0,5%	6,7%	8,8%	174,1%
Barclays Capital U.S. 5-10 Year Govt/Credit Bond	56	0,3%	3,8%	9,5%	197,6%
Dow Jones U.S. Real Estate	126	0,4%	4,7%	4,2%	63,2%
NASDAQ-100 Index	124	-0,2%	-2,9%	1,5%	20,0%

⁷ A comparison of the percentage change in the aggregate net flow of funds to ETFs and Mutual Funds tracking the specific index, the geometric mean of the flows. The table contains number of months measured, average monthly percentage change for net mutual fund flow over the time period, average yearly percentage change for net mutual fund flow over the time period, and average monthly and yearly percentage change for net ETF flow during the same time period.

Table 5: Difference Between ETFs and Mutual Funds in yearly Net Flow and Returns⁸

percentage point difference ETF on MF		
Index	Net Flow	Returns (pre-tax)
S&P 500	16,0%	-4,4%
S&P 100	2,4%	-3,5%
S&P 500 Value	49,6%	-4,5%
S&P Equal Weight	64,8%	-16,6%
Russell 1000	32,4%	-4,2%
Russell 1000 Growth	88,9%	-2,9%
Russell 1000 Value	70,5%	-3,2%
Russell 2000	42,4%	-14,1%
Russell 2000 Value	57,9%	-12,4%
Russell 2000 Growth	20,0%	-3,6%
Russell 3000	59,0%	-4,4%
Russell Top 200	347,9%	-2,9%
Russell Midcap	45,4%	-11,3%
Russell Midcap Growth	73,7%	-13,6%
MSCI All Country World	381,2%	-5,7%
MSCI Europe	92,3%	-6,7%
MSCI All Country Asia ex Japan	1834,9%	-6,8%
MSCI Emerging Markets	137,7%	-28,6%
MSCI EAFE	57,3%	-12,4%
MSCI US Prime Market Value	72,0%	-4,2%
MSCI Japan	22,3%	-2,7%
MSCI US Mid Cap 450	44,6%	-3,5%
MSCI US Prime Market 750	-14,1%	-3,4%
MSCI US Small Cap Growth	59,7%	-2,5%
Barclays Capital TIPS	66,3%	-3,4%
Barclays Capital US Aggregate Bond	117,5%	-3,7%
Barclays Capital US 1-3 Year Treasury Bonds	30,7%	-1,6%
Barclays Capital US MBS	222,9%	-3,0%
Barclays Capital U.S. Intermediate Credit Bond	167,5%	-3,7%
Barclays Capital U.S. 5-10 Year Govt/Credit Bond	193,7%	-5,2%
Dow Jones U.S. Real Estate	58,5%	-20,6%
NASDAQ-100 Index	23,0%	-2,3%

⁸ The table shows the difference, in percentage points, in the yearly (geometric mean) percentage net flows and pre-tax returns between ETFs and mutual funds. If the value is positive, the ETF percent value was larger than the mutual fund percent value.

Table 6: Descriptive Statistics for Monthly Percentage Change in Average Returns of Mutual Funds⁹

Index	Variable	Funds	Obs	Mean	Std. Dev.	Min	Max
S&P 500	MFavgret_1	2957	131	0,0026	0,0394	-0,1542	0,0894
S&P 100	MFavgret_2	1	39	0,0048	0,0581	-0,1470	0,0995
S&P 500 Value	MFavgret_3	27	131	0,0024	0,0439	-0,1665	0,1083
S&P Equal Weight	MFavgret_4	6	104	0,0078	0,0537	-0,2112	0,1864
Russell 1000	MFavgret_5	285	131	0,0028	0,0395	-0,1613	0,0967
Russell 1000 Growth	MFavgret_6	828	131	0,0009	0,0497	-0,1712	0,1178
Russell 1000 Value	MFavgret_7	811	131	0,0029	0,0447	-0,1680	0,1125
Russell 2000	MFavgret_8	483	131	0,0059	0,0531	-0,1948	0,1468
Russell 2000 Value	MFavgret_9	319	131	0,0073	0,0551	-0,1995	0,1627
Russell 2000 Growth	MFavgret_10	368	131	0,0041	0,0622	-0,2164	0,1495
Russell 3000	MFavgret_11	759	131	0,0030	0,0388	-0,1535	0,0890
Russell Top 200	MFavgret_12	10	27	0,0086	0,0500	-0,0850	0,1097
Russell Midcap	MFavgret_13	276	125	0,0061	0,0520	-0,2082	0,1434
Russell Midcap Growth	MFavgret_14	386	125	0,0045	0,0562	-0,2060	0,1342
MSCI All Country World	MFavgret_15	151	45	0,0007	0,0614	-0,1852	0,1052
MSCI Europe	MFavgret_16	58	81	0,0033	0,0645	-0,2191	0,1356
MSCI All Country Asia ex Japan	MFavgret_17	33	40	0,0054	0,0847	-0,2284	0,1687
MSCI Emerging Markets	MFavgret_18	263	104	0,0142	0,0690	-0,2717	0,1730
MSCI EAFE	MFavgret_19	1683	124	0,0042	0,0438	-0,1776	0,0962
MSCI US Prime Market Value	MFavgret_20	4	95	0,0040	0,0466	-0,1656	0,1036
MSCI Japan	MFavgret_21	2	131	0,0008	0,0522	-0,1617	0,1661
MSCI US Mid Cap 450	MFavgret_22	4	95	0,0067	0,0552	-0,2194	0,1416
MSCI US Prime Market 750	MFavgret_23	4	95	0,0042	0,0453	-0,1711	0,1108
MSCI US Small Cap Growth	MFavgret_24	4	95	0,0065	0,0609	-0,2165	0,1582
Barclays Capital TIPS	MFavgret_25	133	96	0,0043	0,0191	-0,1018	0,0568
Barclays Capital US Aggregate Bond	MFavgret_26	2941	99	0,0041	0,0265	-0,1182	0,0655
Barc Cap US 1-3 Year Treasury Bonds	MFavgret_27	14	113	0,0018	0,0137	-0,0493	0,0649
Barclays Capital US MBS	MFavgret_28	86	57	0,0040	0,0087	-0,0318	0,0183
Barc Cap U.S. Intermediate Credit Bond	MFavgret_29	2	59	0,0042	0,0160	-0,0665	0,0338
Barc Cap U.S. 5-10 Year Govt/Credit Bond	MFavgret_30	4	56	0,0066	0,0179	-0,0430	0,0581
Dow Jones U.S. Real Estate	MFavgret_31	1	131	0,0115	0,0713	-0,3105	0,3161
NASDAQ-100 Index	MFavgret_32	21	131	0,0007	0,0752	-0,2733	0,1900

⁹ The table shows the number of tracking mutual funds, the time period examined (in number of months), and the mean, standard deviation, minimum and maximum average return of mutual funds in the time period for each specific index examined.

Table 7: Descriptive Statistics for Monthly Percentage Change in Average Returns of ETFs¹⁰

Index	Variable	Funds	Obs	Mean	Std. Dev.	Min	Max
S&P 500	ETFavgret_1	3	131	-0,0007	0,0474	-0,1812	0,1023
S&P 100	ETFavgret_2	1	39	0,0019	0,0566	-0,1288	0,0931
S&P 500 Value	ETFavgret_3	2	131	-0,0010	0,0513	-0,1864	0,1127
S&P Equal Weight	ETFavgret_4	1	104	-0,0076	0,1462	-1,3777	0,1714
Russell 1000	ETFavgret_5	2	131	-0,0003	0,0482	-0,1879	0,1044
Russell 1000 Growth	ETFavgret_6	2	131	-0,0014	0,0531	-0,1954	0,1216
Russell 1000 Value	ETFavgret_7	2	131	0,0005	0,0479	-0,1861	0,1076
Russell 2000	ETFavgret_8	2	131	-0,0024	0,0844	-0,6555	0,1431
Russell 2000 Value	ETFavgret_9	2	131	-0,0045	0,1103	-1,0576	0,1429
Russell 2000 Growth	ETFavgret_10	2	131	0,0015	0,0679	-0,2440	0,1472
Russell 3000	ETFavgret_11	2	131	-0,0002	0,0494	-0,2079	0,1068
Russell Top 200	ETFavgret_12	1	27	0,0060	0,0433	-0,0803	0,0895
Russell Midcap	ETFavgret_13	1	125	-0,0047	0,1144	-1,1172	0,1570
Russell Midcap Growth	ETFavgret_14	1	125	-0,0022	0,0894	-0,7338	0,1353
MSCI All Country World	ETFavgret_15	1	45	-0,0035	0,0731	-0,2034	0,1203
MSCI Europe	ETFavgret_16	1	81	-0,0021	0,0669	-0,2463	0,1334
MSCI All Country Asia ex Japan	ETFavgret_17	1	40	0,0003	0,0920	-0,2301	0,1599
MSCI Emerging Markets	ETFavgret_18	2	104	-0,0028	0,1171	-0,6018	0,1562
MSCI EAFE	ETFavgret_19	2	124	-0,0074	0,1129	-1,0844	0,1233
MSCI US Prime Market Value	ETFavgret_20	1	95	0,0007	0,0475	-0,1771	0,1045
MSCI Japan	ETFavgret_21	1	131	-0,0014	0,0525	-0,1693	0,1129
MSCI US Mid Cap 450	ETFavgret_22	1	95	0,0040	0,0562	-0,2483	0,1332
MSCI US Prime Market 750	ETFavgret_23	1	95	0,0016	0,0462	-0,1885	0,1047
MSCI US Small Cap Growth	ETFavgret_24	1	95	0,0047	0,0637	-0,2509	0,1541
Barclays Capital TIPS	ETFavgret_25	2	96	0,0015	0,0200	-0,0923	0,0630
Barc Capital US Aggregate Bond	ETFavgret_26	4	99	0,0008	0,0110	-0,0310	0,0450
Barc Capital US 1-3 Year Treasury Bonds	ETFavgret_27	2	113	0,0004	0,0045	-0,0164	0,0164
Barc Cap US MBS	ETFavgret_28	3	57	0,0016	0,0099	-0,0264	0,0381
Barc Cap U.S. Intermediate Credit Bond	ETFavgret_29	1	59	0,0012	0,0171	-0,0713	0,0455
Barc Cap U.S. 5-10 Year Govt/Credit Bond	ETFavgret_30	1	56	0,0025	0,0195	-0,0439	0,0624
Dow Jones U.S. Real Estate	ETFavgret_31	1	131	-0,0023	0,0926	-0,6592	0,2594
NASDAQ-100 Index	ETFavgret_32	1	131	-0,0011	0,0768	-0,3039	0,1696

¹⁰ The table shows the number of tracking ETFs, the time period examined (in number of months), and the mean, standard deviation, minimum and maximum average return of ETFs in the time period for each specific index examined.

Table 8: Descriptive Statistics for Monthly Percentage Change in the Aggregate Net Flow of Mutual Funds¹¹

Index	Variable	Obs	Mean	Std. Dev.	Min	Max
S&P 500	Flow_1	132	0,0019	0,0072	-0,0188	0,0226
S&P 100	Flow_2	41	-0,0022	0,0167	-0,0772	0,0257
S&P 500 Value	Flow_3	132	0,0056	0,0495	-0,0807	0,5145
S&P Equal Weight	Flow_4	105	-0,0061	0,0164	-0,0764	0,0398
Russell 1000	Flow_5	132	0,0005	0,0165	-0,0441	0,1034
Russell 1000 Growth	Flow_6	132	-0,0051	0,0088	-0,0631	0,0229
Russell 1000 Value	Flow_7	132	0,0007	0,0076	-0,0282	0,0181
Russell 2000	Flow_8	132	0,0055	0,0131	-0,0306	0,0606
Russell 2000 Value	Flow_9	132	0,0034	0,0134	-0,0519	0,0435
Russell 2000 Growth	Flow_10	132	0,0010	0,0535	-0,1561	0,1601
Russell 3000	Flow_11	132	0,0101	0,0156	-0,0440	0,0802
Russell Top 200	Flow_12	29	0,2276	1,4465	-0,9090	7,6688
Russell Midcap	Flow_13	127	0,0229	0,0626	-0,1185	0,2708
Russell Midcap Growth	Flow_14	127	-0,0015	0,0211	-0,0520	0,0482
MSCI All Country World	Flow_15	47	0,0053	0,0136	-0,0252	0,0303
MSCI Europe	Flow_16	83	-0,0101	0,0573	-0,3745	0,0309
MSCI All Country Asia ex Japan	Flow_17	42	0,0028	0,0534	-0,1132	0,1793
MSCI Emerging Markets	Flow_18	106	0,0120	0,0143	-0,0245	0,0549
MSCI EAFE	Flow_19	126	0,0073	0,0111	-0,0322	0,0308
MSCI US Prime Market Value	Flow_20	96	0,0059	0,0115	-0,0410	0,0442
MSCI Japan	Flow_21	132	0,0035	0,0548	-0,0979	0,2664
MSCI US Mid Cap 450	Flow_22	96	0,0080	0,0152	-0,0425	0,0556
MSCI US Prime Market 750	Flow_23	96	0,0623	0,1089	-0,0552	0,7709
MSCI US Small Cap Growth	Flow_24	96	0,0115	0,0325	-0,1534	0,1048
Barclays Capital TIPS	Flow_25	98	0,0142	0,0219	-0,0516	0,0838
Barclays Capital US Aggregate Bond	Flow_26	128	0,0084	0,0067	-0,0129	0,0347
Barclays Capital US 1-3 Year Treasury Bonds	Flow_27	115	0,0091	0,1175	-0,2278	0,8866
Barclays Capital US MBS	Flow_28	111	-0,0039	0,0170	-0,0674	0,1145
Barc Cap U.S. Intermediate Credit Bond	Flow_29	61	0,0081	0,0806	-0,1313	0,5064
Barc Cap U.S. 5-10 Year Govt/Credit Bond	Flow_30	58	0,0032	0,0137	-0,0456	0,0347
Dow Jones U.S. Real Estate	Flow_31	132	0,0060	0,0680	-0,2277	0,3293
NASDAQ-100 Index	Flow_32	132	-0,0022	0,0599	-0,1577	0,3041

¹¹ The table shows the time period examined (in number of months), and the mean, standard deviation, minimum and maximum aggregate percentage change in net flow to mutual funds for each specific index examined.

Table 9: Descriptive Statistics for Monthly Percentage Change in the Aggregate Net Flow of Mutual Funds¹²

Index	Variable	Obs	Mean	Std. Dev.	Min	Max
S&P 500	ETFflowP_1	132	0,0171	0,0895	-0,1982	0,5980
S&P 100	ETFflowP_2	41	0,0006	0,0459	-0,0766	0,1331
S&P 500 Value	ETFflowP_3	132	0,0911	0,8435	-0,0733	9,6973
S&P Equal Weight	ETFflowP_4	105	0,0447	0,1288	-0,2015	0,7910
Russell 1000	ETFflowP_5	132	0,0276	0,0960	-0,2728	0,5496
Russell 1000 Growth	ETFflowP_6	132	0,1465	1,3512	-0,1589	15,5384
Russell 1000 Value	ETFflowP_7	132	0,0855	0,6497	-0,1247	7,4593
Russell 2000	ETFflowP_8	132	0,0532	0,2724	-0,3362	2,5882
Russell 2000 Value	ETFflowP_9	132	0,3127	2,8879	-0,9329	32,4282
Russell 2000 Growth	ETFflowP_10	132	0,6670	7,5154	-0,9923	86,3479
Russell 3000	ETFflowP_11	132	0,4944	5,4374	-0,2551	62,4571
Russell Top 200	ETFflowP_12	29	0,3427	1,3529	-0,6261	6,9021
Russell Midcap	ETFflowP_13	127	0,0476	0,1134	-0,0770	0,8055
Russell Midcap Growth	ETFflowP_14	127	0,0562	0,2348	-0,0660	2,4534
MSCI All Country World	ETFflowP_15	47	0,3975	1,9258	0,0000	12,5896
MSCI Europe	ETFflowP_16	83	0,0519	0,0968	-0,0747	0,4330
MSCI All Country Asia ex Japan	ETFflowP_17	42	5,0031	32,3029	0,0000	209,3642
MSCI Emerging Markets	ETFflowP_18	106	0,0991	0,2992	-0,0770	2,7091
MSCI EAFE	ETFflowP_19	126	0,0588	0,2754	-0,4696	2,8757
MSCI US Prime Market Value	ETFflowP_20	96	0,0565	0,1525	-0,1802	1,1806
MSCI Japan	ETFflowP_21	132	0,0216	0,0885	-0,2271	0,6457
MSCI US Mid Cap 450	ETFflowP_22	96	0,0751	0,3822	-0,7225	3,0930
MSCI US Prime Market 750	ETFflowP_23	96	0,0513	0,1607	-0,7719	0,8391
MSCI US Small Cap Growth	ETFflowP_24	96	0,0501	0,1479	-0,2261	1,0605
Barclays Capital TIPS	ETFflowP_25	98	0,0879	0,5443	-0,0670	5,3837
Barclays Capital US Aggregate Bond	ETFflowP_26	128	0,0718	0,3226	-0,0198	3,6324
Barclays Capital US 1-3 Year Treasury Bonds	ETFflowP_27	115	0,0272	0,0654	-0,2018	0,3853
Barclays Capital US MBS	ETFflowP_28	111	0,0565	0,1501	-0,1853	1,0000
Barc Cap U.S. Intermediate Credit Bond	ETFflowP_29	61	0,0954	0,1660	-0,3378	0,8299
Barc Cap U.S. 5-10 Year Govt/Credit Bond	ETFflowP_30	58	0,1003	0,1582	-0,0470	0,9853
Dow Jones U.S. Real Estate	ETFflowP_31	132	0,0678	0,3119	-0,3877	2,7517
NASDAQ-100 Index	ETFflowP_32	132	0,0304	0,2807	-0,1441	3,0078

¹² The table shows the time period examined (in number of months), and the mean, standard deviation, minimum and maximum aggregate percentage change in net flow to ETFs for each specific index examined.

Table 10: Performance Correlations¹³

Index	MF Index	ETF Index	MF ETF
S&P 500	0,990	0,995	0,988
S&P 100	0,999	0,896	0,896
S&P 500 Value	0,985	0,994	0,984
S&P Equal Weight	0,991	0,313	0,330
Russell 1000	0,990	0,996	0,986
Russell 1000 Growth	0,985	0,990	0,981
Russell 1000 Value	0,993	0,996	0,990
Russell 2000	0,992	0,695	0,698
Russell 2000 Value	0,988	0,492	0,491
Russell 2000 Growth	0,991	0,991	0,990
Russell 3000	0,988	0,995	0,982
Russell Top 200	0,961	0,450	0,430
Russell Midcap	0,988	0,503	0,498
Russell Midcap Growth	0,988	0,651	0,669
MSCI All Country World	0,989	0,770	0,764
MSCI Europe	0,989	0,810	0,826
MSCI All Country Asia ex Japan	0,980	0,673	0,717
MSCI Emerging Markets	0,993	0,620	0,641
MSCI EAFE	0,982	0,466	0,464
MSCI US Prime Market Value	0,986	0,856	0,807
MSCI Japan	0,794	0,829	0,952
MSCI US Mid Cap 450	0,996	0,839	0,851
MSCI US Prime Market 750	0,993	0,991	0,997
MSCI US Small Cap Growth	0,988	0,787	0,839
Barclays Capital TIPS	0,646	0,806	0,734
Barclays Capital US Aggregate Bond	0,170	0,782	0,191
Barclays Capital US 1-3 Year Treasury Bonds	0,117	0,825	0,020
Barclays Capital US MBS	0,789	0,676	0,509
Barclays Capital U.S. Intermediate Credit Bond	0,949	0,722	0,713
Barclays Capital U.S. 5-10 Year Government/Credit Bond	0,991	0,670	0,689
Dow Jones U.S. Real Estate	0,994	0,746	0,738
NASDAQ-100 Index	0,999	0,990	0,990

¹³ The correlations of the average monthly returns between the Mutual funds and ETFs tracking the index and the index returns, and the between the Mutual fund and ETF returns.

Table 11: Performance Regressions¹⁴

Index	Mutual Funds				ETFs		
	Obs	R ²	Coef	Cons	R ²	Coef	Cons
S&P 500	131	0,9801	0,8279	0,0022	0,9895	1,0003	-0,0014
S&P 100	39	0,9998	0,9990	0,0019	0,8018	0,7829	0,0008
S&P 500 Value	131	0,9716	0,8570	0,0022	0,9888	1,0086	-0,0015
S&P Equal Weight	104	0,9994	0,9981	0,0005	0,0979	0,7282	-0,0095
Russell 1000	131	0,9794	0,8188	0,0021	0,9922	1,0044	-0,0013
Russell 1000 Growth	131	0,9749	0,9445	0,0008	0,9808	1,0043	-0,0019
Russell 1000 Value	131	0,9868	0,9378	0,0015	0,9924	1,0073	-0,0011
Russell 2000	131	0,9840	0,8579	0,0018	0,4832	0,9530	-0,0072
Russell 2000 Value	131	0,9767	0,9211	0,0022	0,2421	0,9173	-0,0097
Russell 2000 Growth	131	0,9869	0,9218	0,0006	0,9820	0,9980	-0,0029
Russell 3000	131	0,9753	0,7900	0,0022	0,9891	1,0128	-0,0015
Russell Top 200	27	0,9959	1,0486	0,0013	0,2151	0,1959	0,0013
Russell Midcap	125	0,9864	0,9449	0,0009	0,2531	1,0292	-0,0095
Russell Midcap Growth	124	0,9823	0,9416	-0,0004	0,4311	0,9040	-0,0054
MSCI All Country World	45	0,9825	0,8975	0,0025	0,5935	0,6444	-0,0022
MSCI Europe	81	0,9842	1,0043	0,0024	0,6566	0,7108	-0,0021
MSCI All Country Asia ex Japan	40	0,9684	0,9542	0,0009	0,4522	0,4893	-0,0040
MSCI Emerging Markets	104	0,9868	0,9550	0,0012	0,3839	0,8990	-0,0115
MSCI EAFE	124	0,9659	0,7975	0,0020	0,2168	0,9464	-0,0079
MSCI US Prime Market Value	95	0,9997	0,9986	0,0023	0,7331	0,7494	-0,0005
MSCI Japan	131	0,6306	0,7962	0,0034	0,6868	0,8345	0,0012
MSCI US Mid Cap 450	95	0,9999	1,0010	0,0012	0,7042	0,7211	-0,0007
MSCI US Prime Market 750	95	0,9998	0,9979	0,0017	0,9817	1,0025	-0,0013
MSCI US Small Cap Growth	95	0,9978	0,9639	-0,0001	0,6194	0,6280	-0,0004
Barclays Capital TIPS	96	0,7129	0,7993	0,0039	0,6493	0,6808	0,0002
Barclays Capital US Aggregate Bond	99	0,0554	0,6156	0,0040	0,6107	0,6865	0,0002
Barc Cap US 1-3 Year Treasury Bonds	113	0,0003	0,0551	0,0018	0,6804	0,7268	0,0003
Barclays Capital US MBS	57	0,4901	0,6260	0,0031	0,4327	0,4605	0,0004
Barc Cap U.S. Intermediate Credit Bond	59	0,8843	1,0128	0,0029	0,5208	0,6334	0,0001
Barc Cap U.S. 5-10 Year Govt/Credit Bond	56	0,9879	1,0325	0,0047	0,4487	0,5220	0,0007
Dow Jones U.S. Real Estate	131	0,9885	1,0117	0,0060	0,5565	0,9856	-0,0076
NASDAQ-100 Index	131	0,9976	1,0042	-0,0011	0,9802	1,0085	-0,0038

¹⁴ The table shows regressions of index returns on average mutual fund returns and ETF returns for each specific index with the time period, in months, the R², coefficient and constant of the regression shown.

Table 12: Performance Correlations by Category¹⁵

Category	Type	MF Index	ETF Index	MF ETF
Index family	S&P	0,991	0,799	0,799
	Russell	0,986	0,776	0,771
	MSCI	0,969	0,764	0,786
	Barclays Capital	0,610	0,747	0,476
	Misc	0,997	0,868	0,864
Asset Class	Domestic Equity	0,989	0,808	0,807
	International Equity	0,955	0,695	0,727
	Fixed Income	0,610	0,747	0,476
Market capitalization (Dom Eq)	Large Cap	0,993	0,955	0,941
	Medium Cap	0,991	0,664	0,673
	Small Cap	0,988	0,787	0,839
Market scope (Dom Eq)	Broad	0,989	0,799	0,804
	Narrow	0,989	0,787	0,845
Life-cycle (Int Eq)	Developed	0,986	0,638	0,645
	Emerging	0,987	0,646	0,679
Market scope (Int Eq)	Broad	0,987	0,682	0,685
	Narrow	0,794	0,829	0,952

Table 13: Performance Regressions by Category¹⁶

Category	Type	R ² MF	Coef MF	Cons MF	R ² ETF	Coef ETF	Cons ETF
Index family	S&P	0,988	0,920	0,002	0,720	0,880	-0,003
	Russell	0,983	0,913	0,001	0,656	0,903	-0,004
	MSCI	0,952	0,937	0,002	0,603	0,763	-0,003
	Barclays Capital	0,522	0,690	0,003	0,557	0,618	0,000
	Misc	0,993	1,008	0,002	0,768	0,997	-0,006
Asset Class	Domestic Equity	0,988	0,939	0,001	0,701	0,882	-0,003
	International Equity	0,920	0,901	0,002	0,498	0,754	-0,004
	Fixed Income	0,522	0,690	0,003	0,557	0,618	0,000
Market capitalization (Dom Eq)	Large Cap	0,989	0,906	0,002	0,914	0,926	-0,001
	Medium Cap	0,990	0,963	0,001	0,463	0,885	-0,005
	Small Cap	0,998	0,964	0,000	0,619	0,628	0,000
Market scope (Dom Eq)	Broad	0,980	0,891	0,002	0,670	0,845	-0,003
	Narrow	0,810	0,904	0,005	0,622	0,910	-0,003
Life-cycle (Int Eq)	Developed	0,975	0,901	0,002	0,437	0,829	-0,005
	Emerging	0,978	0,955	0,001	0,418	0,694	-0,008
Market scope (Int Eq)	Broad	0,978	0,900	0,002	0,489	0,767	-0,004
	Narrow	0,631	0,796	0,003	0,687	0,835	0,001

¹⁵ The average correlations between mutual fund monthly returns and the tracked index returns, ETF monthly returns and the tracked index, and between mutual fund monthly returns and ETF monthly returns for each type in various categories.

¹⁶ The averages of the regressions of index monthly returns on mutual fund and ETF monthly average returns for each type in various categories.

Table 14: Flow Correlations¹⁷

Index	MF Index	ETF Index	MF ETF
S&P 500	0,544	-0,010	-0,223
S&P 100	0,117	-0,193	-0,020
S&P 500 Value	0,078	0,013	0,173
S&P Equal Weight	0,137	0,237	0,040
Russell 1000	0,173	-0,062	-0,035
Russell 1000 Growth	0,285	0,015	0,007
Russell 1000 Value	0,330	-0,022	0,000
Russell 2000	0,098	0,085	-0,041
Russell 2000 Value	0,286	0,161	-0,100
Russell 2000 Growth	-0,003	-0,049	0,106
Russell 3000	0,379	0,016	-0,161
Russell Top 200	0,106	0,003	0,012
Russell Midcap	-0,716	0,076	-0,151
Russell Midcap Growth	0,101	0,013	0,062
MSCI All Country World	0,226	-0,120	0,030
MSCI Europe	0,145	0,202	0,148
MSCI All Country Asia ex Japan	0,186	-0,085	-0,061
MSCI Emerging Markets	0,169	0,135	0,068
MSCI EAFE	0,571	0,091	0,036
MSCI US Prime Market Value	0,192	-0,049	0,062
MSCI Japan	0,275	0,101	0,452
MSCI US Mid Cap 450	0,105	-0,051	0,174
MSCI US Prime Market 750	-0,129	-0,101	0,053
MSCI US Small Cap Growth	0,097	-0,005	-0,015
Barclays Capital TIPS	0,236	0,098	-0,048
Barclays Capital US Aggregate Bond	0,146	0,121	0,020
Barclays Capital US 1-3 Year Treasury Bonds	0,298	0,000	0,044
Barclays Capital US MBS	0,072	0,119	0,055
Barclays Capital U.S. Intermediate Credit Bond	0,025	0,206	0,219
Barclays Capital U.S. 5-10 Year Government/Credit Bond	0,200	0,138	-0,009
Dow Jones U.S. Real Estate	0,110	-0,006	-0,055
NASDAQ-100 Index	0,521	0,037	0,042

¹⁷ The correlations of the monthly net flow between the Mutual funds and ETFs tracking the index and the index returns, and the between the net flow of Mutual funds and the net flow of ETFs.

Table 15: Flow Regressions¹⁸

Index	Obs	R ²	Coef ETFflow	Coef Indexret	Coef Mfavgret	Cons
S&P 500	131	0,322	-0,009	-0,024	0,129	0,002
S&P 100	41	0,086	-0,010	4,582	-4,631	0,007
S&P 500 Value	131	0,109	0,002	-1,735	2,116	0,001
S&P Equal Weight	105	0,064	0,015	1,272	-1,254	-0,007
Russell 1000	131	0,056	-0,013	0,405	-0,422	0,002
Russell 1000 Growth	131	0,095	0,000	0,154	-0,113	-0,005
Russell 1000 Value	131	0,117	0,001	-0,028	0,087	0,000
Russell 2000	131	0,115	0,004	-0,490	0,595	0,004
Russell 2000 Value	131	0,124	0,001	-0,165	0,249	0,002
Russell 2000 Growth	131	0,010	0,000	-0,682	0,738	0,001
Russell 3000	131	0,159	0,000	-0,129	0,317	0,009
Russell Top 200	29	0,098	-0,090	143,636	-135,096	0,417
Russell Midcap	127	0,547	0,047	-0,016	-0,885	0,026
Russell Midcap Growth	127	0,062	0,021	-0,063	0,094	-0,003
MSCI All Country World	47	0,216	0,000	0,265	-0,389	0,006
MSCI Europe	83	0,092	0,112	1,561	-1,477	-0,012
MSCI All Country Asia ex Japan	42	0,053	0,000	0,307	-0,177	0,002
MSCI Emerging Markets	106	0,067	0,005	-0,190	0,239	0,011
MSCI EAFE	96	0,341	0,001	0,220	-0,127	0,007
MSCI US Prime Market Value	131	0,059	0,008	-0,930	0,985	0,003
MSCI Japan	131	0,171	0,161	0,069	0,217	0,000
MSCI US Mid Cap 450	96	0,057	0,008	1,667	-1,636	0,009
MSCI US Prime Market 750	94	0,021	0,002	11,001	-11,333	0,082
MSCI US Small Cap Growth	96	0,040	-0,004	1,618	-1,603	0,011
Barclays Capital TIPS	98	0,050	-0,001	0,014	0,247	0,013
Barclays Capital US Aggregate Bond	127	0,129	0,002	0,122	-0,091	0,009
Barc Cap US 1-3 Year Treasury Bonds	115	0,105	-0,011	8,158	0,409	0,009
Barclays Capital US MBS	110	0,022	-0,012	0,221	-0,241	-0,001
Barc Cap U.S. Intermediate Credit Bond	61	0,016	0,059	-0,032	0,173	0,002
Barc Cap U.S. 5-10 Year Govt/Credit Bond	58	0,075	0,019	-0,520	0,633	-0,002
Dow Jones U.S. Real Estate	129	0,021	-0,018	0,402	-0,294	0,008
NASDAQ-100 Index	131	0,290	0,020	-1,432	1,856	-0,001

¹⁸ The table shows regressions of monthly ETF flow, monthly index returns and monthly average mutual fund returns on monthly mutual fund flow for each specific index with the time period, in months, the R², coefficient and constant of the regression shown.

Table 16: Flow Correlations by Category¹⁹

Category	Type	MF Index	ETF Index	MF ETF
Asset Class	Domestic Equity	0,141	0,005	-0,003
	International Equity	0,262	0,054	0,112
	Fixed Income	0,163	0,114	0,047
Market capitalization (Dom Eq)	Large Cap	0,309	-0,043	-0,056
	Medium Cap	-0,170	0,013	0,029
	Small Cap	0,097	-0,005	-0,015
Market scope (Dom Eq)	Broad	0,198	0,010	-0,027
	Narrow	0,055	0,048	0,199

Table 17: Flow Regressions by Category²⁰

Category	Type	R ² Flow	Coef ETF	Coef Indexret	Coef Mfavgret	Cons
Asset Class	Domestic Equity	0,123	-0,001	7,952	-7,505	0,028
	International Equity	0,157	0,046	0,372	-0,286	0,002
	Fixed Income	0,066	0,009	1,327	0,188	0,005
Market capitalization (Dom Eq)	Large Cap	0,162	-0,001	0,412	-0,294	0,004
	Medium Cap	0,222	0,025	0,529	-0,809	0,011
	Small Cap	0,040	-0,004	1,618	-1,603	0,011
Market scope (Dom Eq)	Broad	0,165	0,014	1,589	-1,558	0,012
	Narrow	0,096	0,071	0,236	-0,038	0,004

¹⁹ The average correlations between mutual fund monthly net flow and the tracked index returns, ETF monthly net flow and the tracked index, and between mutual fund monthly net flow and ETF monthly net flow for each type in various categories, all flows in per cent.

²⁰ The averages of the regressions of monthly ETF flow, index monthly returns and mutual fund monthly average returns on mutual fund monthly net flow for each type in various categories, all flows and returns in per cent.

Table 18: Difference in Monthly Flow to Mutual Funds²¹

Event Nr	Initial Introduction	Event Date	Change in flow	
			6 month	12 month
1	Yes	31-jul-01	0.0151	-
2	Yes	31-aug-01	0.0089	-
3	Yes	31-aug-01	-0.0035	-
4	Yes	31-jul-02	0.0169	-0.0228
5	Yes	30-apr-03	0.0000	0.0028
6	Yes	30-apr-03	0.0038	0.0064
7	Yes	30-sep-03	0.0050	0.0022
8	Yes	31-dec-03	0.0355	0.0055
9	Yes	30-jan-04	-0.0045	0.0068
10	Yes	30-jan-04	-0.0041	-0.0009
11	Yes	30-jan-04	-0.0299	-0.0081
12	No	31-mar-05	-0.0136	-0.0063
13	No	31-mar-05	-0.0073	0.0101
14	Yes	31-jan-07	0.0385	0.0158
15	Yes	30-mar-07	-0.0153	-0.0164
16	Yes	30-apr-07	-0.0034	-0.0011
17	No	30-apr-07	0.0070	0.0136
18	No	31-maj-07	-0.0053	-0.0018
19	No	31-jul-07	-0.0127	-0.0119
20	Yes	31-mar-08	-0.0123	-0.0117
21	Yes	29-aug-08	-0.0401	0.0078
22	Yes	30-sep-08	-0.0031	-0.0299
23	No	30-jan-09	0.0054	0.0010
24	Yes	30-sep-09	0.1466	0.0396
25	No	30-nov-09	0.0115	0.0075
26	No	31-aug-10	-0.0004	-0.0105
27	No	31-aug-10	-0.0220	-0.0106
28	No	30-sep-10	0.0053	-0.0014
29	No	30-sep-10	0.0106	-0.0012
30	No	30-sep-10	0.0031	0.0043
31	No	30-sep-10	0.0024	0.0113
32	No	30-sep-10	-0.0015	-0.0050
33	No	30-sep-10	0.0061	0.0003
34	No	30-sep-10	0.0049	-0.0037
35	No	30-sep-10	0.0076	0.0042
36	No	30-sep-10	0.0075	-0.0083
37	No	29-jul-11	-0.0005	-

²¹ The table shows the ETF introduction date, whether it is the first ETF introduced that tracks that particular index and the change in monthly percentual mutual fund net flow in the 6 month and 12 month period following the event when compare to a time period of equal length before the event. Outlined changes were discarded due to low R^2 .

Table 19: Descriptive Statistics of the Event Studies²²

Event nr	Event Date	Index	6 month		12 month	
			Period 1	Period 2	Period 1	Period 2
			R ²	R ²	R ²	R ²
1	31-jul-01	13	0,909	0,831	-	-
2	31-aug-01	14	0,143	0,252	-	-
3	31-aug-01	19	0,932	0,478	-	-
4	31-jul-02	27	0,758	0,913	0,632	0,134
5	30-apr-03	4	0,336	0,064	0,586	0,792
6	30-apr-03	19	0,963	0,967	0,960	0,969
7	30-sep-03	26	0,937	0,979	0,980	0,988
8	31-dec-03	25	0,883	0,925	0,894	0,873
9	30-jan-04	20	0,879	0,857	0,027	0,904
10	30-jan-04	22	0,983	0,992	0,975	0,990
11	30-jan-04	24	0,990	0,961	0,539	0,887
12	31-mar-05	16	0,996	0,376	0,914	0,846
13	31-mar-05	18	0,986	0,807	0,908	0,959
14	31-jan-07	29	0,889	0,090	0,847	0,495
15	30-mar-07	28	0,167	0,576	0,343	0,929
16	30-apr-07	26	0,991	0,986	0,987	0,964
17	30-apr-07	30	0,788	0,991	0,928	0,916
18	31-maj-07	26	0,998	0,982	0,989	0,963
19	31-jul-07	19	0,998	0,380	0,987	0,718
20	31-mar-08	15	0,969	0,088	0,967	0,641
21	29-aug-08	17	0,404	0,910	0,000	0,043
22	30-sep-08	2	0,676	0,645	0,789	0,368
23	30-jan-09	28	0,982	0,824	0,988	0,936
24	30-sep-09	12	0,355	0,589	0,144	0,208
25	30-nov-09	28	0,964	0,214	0,958	0,680
26	31-aug-10	25	0,426	0,674	0,876	0,913
27	31-aug-10	27	0,127	0,966	0,710	0,821
28	30-sep-10	1	0,903	0,834	0,005	0,317
29	30-sep-10	3	0,918	0,925	0,833	0,632
30	30-sep-10	5	0,969	0,699	0,456	0,182
31	30-sep-10	6	0,981	0,559	0,876	0,000
32	30-sep-10	7	0,875	0,890	0,377	0,947
33	30-sep-10	8	0,708	0,533	0,258	0,218
34	30-sep-10	9	0,067	0,818	0,545	0,061
35	30-sep-10	10	0,882	0,471	0,804	0,141
36	30-sep-10	11	0,193	0,977	0,738	0,690
37	29-jul-11	26	0,930	0,646	-	-

²² The table shows the date, index tracked, and R² for the regression of mutual fund net flow on each time period; 6 and 12 months, before and after; of the ETF introduced. Outlined boxes are those R² values less than 0.1 that were excluded from the event study due to their low significance.

Table 20: Comparison of Diff-in-Diff Results for Mutual Fund Flow²³

	6 month Diff-in-Diff				12 month Diff-in-Diff			
	all indices		same index type		all indices		same index type	
	mean	median	mean	median	mean	median	mean	median
Nr of MF flow decreases	13	14	18	17	16	17	21	21
% of flow decreases	0,39	0,42	0,55	0,52	0,57	0,61	0,75	0,75
1st introduction	0,53	0,47	0,60	0,53	0,69	0,69	0,77	0,77
2nd introduction	0,28	0,39	0,50	0,50	0,47	0,53	0,73	0,73

²³ Comparison of the change in flow for the 6 and 12 month period before and after the introduction of an ETF. The change in flow between the two time periods for each event is compared to the change in the flow of all other indices and to the change in flow of only indices of the same type of asset class as the index that the introduced ETF tracks between the same two time periods. The change in flow between the two time period is compared to the mean and median change in the flow of the compared indices (the control group). Number of Mutual Fund flow decreases, show the number of events (out of 33 and 28 significant events for 6 and 12 month respectively) that resulted in a relative decrease in the net flow to mutual funds tracking the same index as the ETF introduced. The % of flow decreases show the % of events the resulted in a relative decrease. The 1st and 2nd introduction show the % of events that resulted in a relative decrease of initial ETF introductions and subsequent ETF introductions, respectively.

Table 21: Diff-in-Diff Values for Percentage Change in Mutual Fund Flow after ETF introduction²⁴

Event	Date	Index	6 month		Diff-in-Diff		12 month		Diff-in-Diff	
			all indices	same index type	all indices	same index type	all indices	same index type	all indices	same index type
			mean	median	mean	median	mean	median	mean	median
1	31-jul-01	13	0,013	0,014	0,016	0,018	-	-	-	-
2	31-aug-01	14	0,007	0,008	0,007	0,009	-	-	-	-
3	31-aug-01	19	-0,005	-0,004	0,009	0,009	-	-	-	-
4	31-jul-02	27	0,028	0,024	0,027	0,024	-0,014	-0,015	-0,012	-0,015
5	30-apr-03	4	-0,008	-0,009	-0,008	-0,009	-0,008	-0,011	-0,009	-0,011
6	30-apr-03	19	-0,004	-0,005	-0,017	-0,019	-0,004	-0,007	-0,025	-0,017
7	30-sep-03	26	0,003	0,006	-0,001	0,009	0,000	-0,003	-0,002	-0,008
8	31-dec-03	25	0,032	0,031	0,029	0,029	0,012	0,008	-0,001	-0,004
9	30-jan-04	20	-0,007	-0,007	-0,007	-0,007	0,010	0,006	0,009	0,011
10	30-jan-04	22	-0,007	-0,006	-0,007	-0,006	0,002	-0,001	0,001	0,003
11	30-jan-04	24	-0,033	-0,032	-0,033	-0,032	-0,005	-0,009	-0,006	-0,004
12	31-mar-05	16	-0,014	-0,011	-0,012	-0,014	-0,005	-0,005	-0,037	-0,031
13	31-mar-05	18	-0,008	-0,005	-0,006	-0,008	0,012	0,011	-0,020	-0,015
14	31-jan-07	29	0,039	0,036	0,017	0,017	0,016	0,018	-0,028	-0,028
15	30-mar-07	28	-0,012	-0,014	-0,039	-0,039	-0,024	-0,012	-0,101	-0,101
16	30-apr-07	26	0,001	0,000	-0,019	-0,019	-0,003	0,005	-0,027	-0,027
17	30-apr-07	30	0,011	0,011	-0,009	-0,009	0,012	0,019	-0,012	-0,012
18	31-maj-07	26	-0,002	0,000	-0,015	-0,015	-0,013	0,002	-0,109	-0,109
19	31-jul-07	19	-0,015	-0,005	-0,004	-0,007	-0,026	-0,006	-0,010	-0,012
20	31-mar-08	15	0,011	-0,013	-0,018	-0,012	-0,010	-0,012	0,010	0,010
21	29-aug-08	17	-0,048	-0,035	-0,024	-0,026	0,022	0,009	0,065	0,065
22	30-sep-08	2	-0,007	0,001	-0,028	-0,003	-0,010	-0,028	-0,020	-0,030
23	30-jan-09	28	0,030	0,000	-0,012	0,008	0,010	-0,004	0,045	0,045
24	30-sep-09	12	0,150	0,151	0,146	0,152	0,043	0,039	0,044	0,041
25	30-nov-09	28	0,012	0,013	0,013	0,013	0,013	0,011	0,038	0,008
26	31-aug-10	25	0,015	0,004	0,009	0,011	-0,009	-0,009	0,008	0,008
27	31-aug-10	27	-0,006	-0,018	-0,012	-0,010	-0,009	-0,009	0,008	0,008
28	30-sep-10	1	0,014	0,002	0,006	0,003	0,002	0,000	-0,006	-0,008
29	30-sep-10	3	0,020	0,007	0,012	0,008	0,002	0,000	-0,006	-0,008
30	30-sep-10	5	0,012	0,000	0,004	0,001	0,007	0,005	-0,001	-0,003
31	30-sep-10	6	0,011	-0,001	0,003	0,000	0,014	0,012	0,006	0,004
32	30-sep-10	7	0,007	-0,005	-0,001	-0,004	-0,002	-0,004	-0,010	-0,012
33	30-sep-10	8	0,015	0,003	0,007	0,004	0,003	0,001	-0,005	-0,007
34	30-sep-10	9	0,014	0,002	0,006	0,002	-0,001	-0,003	-0,009	-0,011
35	30-sep-10	10	0,017	0,004	0,009	0,005	0,007	0,005	-0,001	-0,003
36	30-sep-10	11	0,017	0,004	0,009	0,005	-0,005	-0,007	-0,013	-0,015
37	29-jul-11	26	0,003	0,001	-0,013	-0,008	-	-	-	-

²⁴ The table shows the date, index tracked and diff-in-diff values of the mutual fund net flow for each new ETF introduction studied. The diff-in-diff values show the change in mutual fund net per cent flow, in the 6 and 12 months before and after the ETF introduction, of the mutual funds tracking the same index as the ETF introduced compared to the mean and median of the change in the flow of mutual funds tracking other all other indices, and those tracking indices of the same type of asset class. Outlined Event numbers indicate a subsequent ETF introduction, i.e. the introduction of an ETF tracking an index that is already tracked by ETFs.

