



Passive mutual funds and ETFs: Performance and comparison

Edwin J. Elton^a, Martin J. Gruber^{a,*}, Andre de Souza^b

^a Stern School of Business, New York University, 44 West 4th Street, New York, NY 10012, USA

^b Peter J. Tobin College of Business, St. John's University, United States

ARTICLE INFO

Article history:

Received 27 December 2018

Accepted 5 July 2019

Available online 6 July 2019

Keywords:

Index funds

Exchange traded funds

Comparative performance

ABSTRACT

Over 26% of investment company assets are held in passively managed vehicles. Thus, it is important to understand what affects the performance of passive vehicles and how to choose among the multiple passive options following any index. This paper examines the factors that are important in explaining differences across funds following the same index and demonstrates how to select a passive vehicle that has a high probability of having the best performance in the following years.

© 2019 Elsevier B.V. All rights reserved.

1. Introduction

Passive investing in the form of both open-end index funds and exchange traded funds has become an important part of the investment landscape. At the end of 2016, passive exchange traded funds accounted for 2.4 trillion dollars and index funds accounted for 2.6 trillion dollars of the 19.2 trillion held in investment company assets.¹ Together they represented over 26% of the assets under management by investment companies. The growth of passive investing can be seen by the fact that ten years ago passive index funds and ETFs represented 10.5% of the assets of investment companies, while five years ago they represented 16.4%. Given the size of passive investing and its rapid growth, it is important to understand the factors that determine the performance of alternative passive investments so that investors can make rational choices among the options they are offered.²

The first open-end index mutual fund was offered by Vanguard in 1976.³ Index mutual funds are constructed in different ways. For indexes with few constituents where the constituents are ac-

tively traded, they are usually constructed by holding all securities in the portfolio in the same proportions as the index. When the index contains a large number of securities and/or when some constituents are not actively traded, portfolio managers normally construct a portfolio with many fewer securities than the index while attempting to match the performance of the index. The following factors can affect the performance of an index fund:

- (1) Matching procedure;
- (2) Procedure used for handling index changes, share buybacks, cash position, and inflows and outflows to the fund;
- (3) Income earned from security lending, if any;
- (4) Transaction costs;
- (5) Expense charges;
- (6) Capital gains taxes on sales of securities.

Exchange Traded Funds (ETFs) have existed for a shorter period of time than index funds. The first ETF (spider) was introduced in January, 1993. ETFs have steadily increased in number with the major growth in recent years. There are three principal organizational forms for ETFs: trusts, mutual funds, and holders. The original ETF (spider) was organized as a trust. As discussed in [Elton et al. \(2002\)](#), this organizational form has many disadvantages and currently there are only eight ETFs organized as trusts.⁴ The most popular form of organization for ETFs is as a mutual fund, and the vast majority of ETFs are organized this way.⁵ Holders, a form of ETFs, are different from other types of ETFs in that

* Corresponding author.

E-mail addresses: eelton@stern.nyu.edu (E.J. Elton), mgruber@stern.nyu.edu (M.J. Gruber), desouzab@stjohns.edu (A. de Souza).

¹ There are \$29 billion invested in actively managed ETFs that are not included in our analysis.

² [Guedy and Huang \(2009\)](#) present a theoretical model of why an investor would prefer an ETF or index fund. They argue investors with liquidity needs should prefer an index fund since any costs imposed on the fund to meet their liquidity needs is borne by all investors in the fund. [Agapova \(2011\)](#) argues that both ETFs and index funds should exist because of clientele effects. In addition, [Cremers \(2010\)](#) shows that the existence of passive investments leads to better performance in active funds.

³ The first index passive account was offered by Wells Fargo in 1969. This was not offered in the form of an open-end mutual fund.

⁴ Trusts have two major disadvantages compared to mutual fund structures. They cannot engage in security lending and they are restricted on the use of dividends received on the underlying stock. [Poterba and Shoven \(2002\)](#) performed an analysis of one ETF organized as a trust versus an index fund following the same index.

⁵ As explained shortly, there are important differences in organizational structure between mutual funds and ETFs.

owning a holder gives an investor a direct ownership of the securities held by the holder and the investor retains all rights such as voting rights. Because of these differences, we will not examine holders in this article.

The ETF marketplace is dominated by three organizations that trade under the names SPDR, Vanguard, and iShares. Vanguard is unique in how it has developed its ETFs. Vanguard ETFs are a share class of its index fund. For all other ETFs organized as a mutual fund, each ETF is a stand-alone fund.

ETFs differ from index funds in how inflows into and outflows from the fund occur. For ETFs, inflows and outflows occur in kind. Investors can turn over securities that match the fund's portfolio and in return receive shares in the ETF worth an equivalent amount of money.⁶ Alternatively, they can turn in shares of the ETF and receive an equivalent amount of the underlying portfolio.⁷ The ETF can select securities with a low cost to deliver when shares of the ETF are turned in and, of most importance, the exchange is not a taxable transaction. This means that the cost base of the holdings of the ETFs is generally close to the market price. Thus, ETFs rarely have capital gains.

The factors that can affect passive ETFs are similar to those affecting passive index funds, but there are some differences. First, organizational form can affect performance. Also, ETFs do not incur transaction costs when investors buy and sell shares. Any increase or decrease in shares outstanding is done with in kind transactions. Finally, cash position is less important for ETFs since they do not have to hold cash as protection against redemption.

A major consideration in choosing a particular index fund or ETF is the difference in their value from that of the index. An index fund trades at the end of day value of the securities in its portfolio. This can differ from the index value because the index and the index fund do not have the same composition or because the index and index fund have different ways of valuing either thinly traded securities or securities in foreign markets. ETFs have an additional source of difference. ETFs trade as a stock and an ETF can trade at prices different from the value of the securities held by the ETF. While they can differ, the arbitrage caused by the creation and deletion process keeps values close.⁸

In this study, we analyze the factors that impact investor return. The paper is divided into seven sections. In the first section, we will discuss our sample. This is followed by a section examining performance before fees charged by the index fund or the ETF. This will give us insight into management performance. In the third section, we will examine the importance of factors that affect the return investors receive. In the fourth section, we will examine the importance of capital gains. In the fifth section, we will discuss how to select among first index funds and then ETFs that follow the same index. In the sixth section, we will examine differences between the best of the index funds and the best of the ETFs. The final section is the conclusion.

2. Sample

Our initial sample consisted of all funds labeled either as a passive ETF (excluding ETF notes and holders) or as an index fund by Morningstar. This sample was increased by any fund so listed by CRSP and not listed as such in Morningstar. We first eliminated

all funds that were enhanced return funds or had an investment strategy other than matching an index. We then excluded all commodity funds. We then eliminated all index funds and ETFs where there was not at least one index fund and one ETF following the same index at the same time. Finally, we dropped one international bond mutual fund and three international real estate index funds and their matching ETFs since there are so few passive portfolios following these indexes. This resulted in a sample of 174 ETFs and 396 index funds. Note there are 2.3 times as many index funds as ETFs in our sample. All of the results presented in this paper are for the common period where at least one index fund and one ETF existed. Our data on mutual fund and ETF characteristics primarily comes from Morningstar; however, gaps in the data are filled in using annual reports. Our sample included all ETFs and index funds that had at least 12 months of data during the period January 1994 through November 2016.⁹

Index funds have multiple share classes. When examining returns pre-expenses, we use pre-expense returns on the share class with the longest overlap with the ETF following the same index.¹⁰ When examining returns to shareholders (return after expenses), for index funds we use the share class that is available to the investor with the lowest expense ratio. We have two different samples: institutional and individual. For the institutional sample, we use the share class with the lowest expense ratio since institutions should be able to purchase any share class and purchase enough to have any loads waived. For the individual sample, we use the share class with the lowest expense ratio available to individuals. Since passive investing has grown over time, our sample has more observations on more recent data.

There are large differences in performance compared to the index they follow across funds holding different types of securities. This is primarily due to ease of replication, liquidity, and differences in market closing times. Thus, it is informative to present results on individual categories. We use six categories: U.S. large stock, U.S. sector, U.S. midsize and small stock funds, emerging market equity, foreign stock, and U.S. bond. By far, the largest number of passive products are offered to match U.S. stock indexes. Because of potential difference in liquidity and ease of replication, we used Morningstar classifications to divide U.S. stock funds between those holding larger stocks and those holding smaller stocks. Bond passive products are separated out because they trade in a different market, because of the changing composition of the bond indexes, and because the presence of illiquid bonds makes bond indexes more difficult to replicate. Foreign stock funds and emerging market stock funds present both problems in liquidity and pricing because securities are traded over time periods where the U.S. markets are closed. Finally, U.S. sector funds hold securities with very different characteristics than the other two U.S. stock groups.¹¹

3. The performance of ETFs and index funds pre-expenses

In this section, we discuss the performance of ETFs and index funds gross of fees. This measures the performance of the manager for the two types of passive funds. We will measure investor performance in the next section of this paper.

⁶ Investors can buy and sell shares of any ETF on the exchange where it is listed. This does not affect cash flow to the ETF.

⁷ For some funds, cash can be used instead of securities. There are special intermediaries called authorized participants (AP) that perform the function of creation and deletion. If cash is used, the (AP) and ultimately the client pay the transaction costs of purchasing securities in the fund.

⁸ See Madhavan (2016).

⁹ When looking at performance, three years after selection, we use return data through 2018.

¹⁰ Theoretically, the pre-expense returns on all share classes should be the same. We did not find this to be exactly true. Rather, we find small differences across share classes. This is probably due to small differences in the timing of expenses.

¹¹ A number of funds switch indexes over time. When a fund switches indexes, we treat the time period where they follow each index as a separate fund.

Table 1
Characteristics of differential return and regression results pre-expenses.

Category	Type of fund	Number	Mean	Stdev	Alpha	Beta	R ²
EMERG MKT EQ	ETF	7	−0.0021	0.711	0.0024	0.987	0.975
EMERG MKT EQ	INDEX FUND	11	−0.0168	0.674	−0.0135	0.987	0.979
FOREIGN STOCK	ETF	17	−0.0111	0.377	−0.0098	0.993	0.991
FOREIGN STOCK	INDEX FUND	42	−0.0370	0.577	−0.0349	0.985	0.984
US BOND	ETF	25	0.0035	0.114	−0.0023	1.015	0.994
US BOND	INDEX FUND	46	−0.0012	0.126	−0.0051	1.012	0.986
US LARGE STOCK	ETF	48	0.0019	0.030	0.0028	0.999	1
US LARGE STOCK	INDEX FUND	162	0.0014	0.070	0.0016	0.999	1
US SECTOR	ETF	33	0.0077	0.127	0.0062	0.999	0.996
US SECTOR	INDEX FUND	34	0.0142	0.129	0.0144	1	0.996
US SMALL MID	ETF	44	0.0066	0.033	0.0073	0.999	1
US SMALL MID	INDEX FUND	101	0.0021	0.084	0.0035	0.998	1
ALL	ETF	174	0.0030	0.122	0.0026	1	0.996
ALL	INDEX FUND	396	−0.0022	0.156	−0.0019	0.998	0.996

This table contains the performance characteristics of our sample of both index funds and passive ETFs. The first column identifies the funds in our sample by their categories. The third column identifies the number of observations for index funds and ETFs. The fourth and fifth columns present the pre-expense monthly average difference and the standard deviation of the monthly difference between each index fund or ETF and the index it follows (expressed in percent per month). The next three columns present for each category and overall the statistics of the time series regression of the pre-expense return for each fund or ETF against the index it follows.

In Table 1, we present performance statistics for ETFs and index funds both overall and separately for the six categories discussed earlier. In computing performance of ETFs and index funds, we use return on NAV before expenses since NAV represents the value of the assets in a portfolio.

We employ two types of performance measures. The first uses the differential monthly return (fund return minus index return in percentage) and examines its mean and standard deviation. The second measure of performance employs three characteristics of a regression of the return (pre-expenses) against the index that the fund follows. The three statistics are the intercept, the beta, and the coefficient of determination (R^2). Overall averages are computed using all funds.¹²

Column 3 of Table 1 shows the number of funds in each category. Overall, ETFs have higher differential returns than index funds, although differential return in both cases is close to zero (3.6 basis points per year for ETFs and minus 2.64 basis points per year for index funds). The fact that the differential return is so close to zero means that, on average, management is able to earn enough on activities such as security lending, tender offers, and possibly strategies in handling index changes to overcome losses due to the transaction costs incurred in matching the index. While the mean is close to zero, there is a wide range of differential returns for both index funds and ETFs. For index funds, the 90% range goes from −5.5 to 31 basis points per year. For ETFs, the 90% range is −3.7–25 basis points per year. ETFs have a smaller range which is probably due to a smaller range of transaction costs because they don't incur transaction costs when their shares are bought and sold.

Overall, the standard deviation of the differential returns of ETFs is smaller than the standard deviation of index funds. This is true in five categories, with emerging market as the exception.

We now examine the second set of performance metrics based on a regression of each fund against the index it follows. The average beta for the entire sample is slightly below 1 for index funds and exactly 1 for ETFs. Funds maintain a beta close to 1 in each category and do an excellent job of tracking their declared index with an average R^2 above 0.996. The only category that has R^2 be-

low 0.98 is emerging market equity where indexes are harder to track.¹³

In summary, we find that both index funds and passive ETFs do, on average, an excellent job of tracking the indexes they follow. On average, ETFs have slightly higher pre-expense differential returns, alphas, and betas than index funds. They also have a smaller standard deviation of differential return.

4. Explaining mean differential return and standard deviation of pre-expense differential return

In the prior section, we examined the size of mean differential return and the standard deviation of differential return. In this section we will examine which variables explain differences in these measures across funds for both index funds and ETFs. We will first discuss how the explanatory variables are measured and then present our results.

4.1. The variables for index funds

What can affect an index fund's differential return pre-expenses? First, note that index funds incur transaction costs in buying and selling securities. We use average turnover over the life of the fund as a proxy for transaction costs. We would expect a negative sign when regressing differential return on turnover. We have no hypothesis about the relationship between turnover and standard deviation of differential return. Many index funds engage in security lending. Security lending produces revenue for the fund. Thus, we would expect a positive sign when regressing differential return on the return from security lending. Once again, we have no hypothesis on the relationship between security lending and the standard deviation of differential return. We measure this variable as the dollars earned on security lending divided by total assets.¹⁴

Note that index funds differ in how they handle inflows and outflows, index composition changes, and tender offers. We do not have data to measure these variables directly. However, we do have four measures to proxy for sophisticated management who are

¹² A number of funds show large deviations from the index they follow. This is especially true in emerging markets and foreign stock. Most large deviations reverse in the next month. We checked all large differences and CRSP and Morningstar agree. Many of the large differences are likely due to a fund's fair value pricing, while indexes do not use fair value pricing.

¹³ The data in Table 1 was recomputed leaving out all Vanguard ETFs and index funds that followed the same index since they are share classes of the same fund. The results showed only small differences and therefore are not reported.

¹⁴ While security lending is a direct measure of income, it is also a measure of management sophistication. Total assets includes all classes of securities that receive income from security lending.

likely to develop methods for earning more on these profit opportunities or methods to mitigate costs when indexes change composition. Our first proxy is simply how many different index funds a family offers. We would expect a family that manages lots of index funds to expend the resources to develop techniques to exploit profit opportunities or mitigate costs. We use the log of the number of index funds managed by the family to measure this. Our second proxy for the likelihood of developing sophisticated management is fund size. We measure this as the fund size divided by the average fund size in the category since fund size differs substantially across categories. This is averaged across years. Our third proxy of sophistication is number of holdings in the fund divided by the number of holdings in the index. This is averaged over time. This variable indicates how closely the fund matches the index and indirectly the fund size. Given that it indirectly measures fund size, it may mitigate the importance of the variable size. Our final measure of sophistication is expenses. We would expect lower expense funds are better managed because they are trying to attract customers by their performance and, therefore, pay more attention to management of the fund. Because low expenses are associated with greater sophistication, expenses will have the opposite sign of other measures of sophistication. We would expect an increase in sophistication as proxied by the other three measures to be positively related to differential return and negatively related to standard deviations of differential return.

The last variable we examined is cash. We measure this variable as the fraction cash represents of total assets averaged over the life of the fund. Having a higher percent of assets in cash should lower return since cash has a lower return than stocks or long-term bonds. On the other hand, a large cash position may be associated with the use of futures and thus be a sign of sophisticated management, leading to a positive or neutral effect of cash on return. The fraction cash represents of total assets is highly correlated (0.72) with the variation in cash. Thus, funds that hold a lot of cash on average vary the amount in cash over time which should lead to a positive sign for the standard deviation of differential return. The return associated with the variables just discussed above all measure the input of management. Later we refer to the return of these variables as the contribution of management to return.

Examining Table 1, we see large differences in matching the index for sectors where exact replication was more difficult and where fair value pricing is used. Thus, over any sample period, differences can exist simply because there are differences in return between the included and excluded securities or where fair value pricing causes difference in price between the fund and the index. To eliminate this effect, we added dummies for sectors. We have no priors for these dummies on differential return. However, we would expect that sectors where replication is more difficult would have a higher standard deviation of differential return so that coefficient would be positive and highest in those sectors where replication is most difficult.

4.2. The results for index funds pre-expenses

In this section, we measure the impact of each of the variables discussed above both on differential return and standard deviation of differential return. The actual effects (and their signs) are estimated by performing a cross-sectional regression of the form:

$$X_i = a_{i+} \sum B_{ij} I_j + e_i$$

Where:

X_i is either the average differential return or the average standard deviation of differential return for each passive fund i . I_j is the

j th variable in the set of 12 variables discussed above. The results are shown in Table 2.¹⁵

The first thing to note from Table 2 is that the set of 12 variables account for a high and statistically significant portion of both the cross-section of differential returns and the cross-section of the standard deviation of differential returns. The model explains 35% of the differential returns and 66% of the difference in the standard deviation of differential returns. The second thing to note is that the signs are generally consistent with those hypothesized in the section above and that all of the coefficients which are statistically different from zero have the hypothesized signs.

The impact of sector dummies on differential return depends on the historical return in the period studied. On the other hand, the sectors that affect standard deviation are logical with foreign stock and emerging market stocks showing the largest positive impact on standard deviation. These are the sectors where partial replication is likely and which are least liquid so that closing prices can differ between the index being matched and the matching index fund.

By far, the most significant impact on differential return of the remaining variables is turnover. This makes sense since every dollar of trading expense subtracts a dollar from the gross income of a fund. Not only is the t value associated with turnover large ($t = -5.95$), but the impact on differential return is large. The impact on differential return from being at the lowest 5% rather than the highest 5% is 24 basis points per year.¹⁶ Turnover has a small and not significant relationship with standard deviation.

The next most significant variable, log of number of index funds in the family, signifies sophistication and expertise on the part of management. The impact on differential return is positive and significant ($t = 2.75$). The final significant variable is security lending. The impact is positive and significant ($t = 2.41$). An increase of 1% in the income from securities lending adds 58 basis points per year to differential return.

Next consider expenses. The signs are as hypothesized and the coefficient on standard deviation of differential returns is significant. The impact of expenses on pre-expense return is negative. While not statistically significant, this indicates that high expense funds do worse than low expense funds in terms of their management of assets. None of the other variables, cash, fund size to sector size, and ratio of holdings, are significant. Only the ratio of holdings is close to significant.

4.3. The variables for ETFs

Several variables that should affect differential return and standard deviation of return are different for ETFs and index funds. We dropped two variables for ETFs because ETFs grow or shrink through exchanges in kind. Thus, creation or deletion of shares does not involve transaction costs on the part of the fund. Turnover caused by index changes or changes in replication is likely to be small and unimportant, so we exclude this variable.¹⁷ Likewise, cash is not necessary for transactions and thus its impact on differential return should be very small or non-existent.

4.4. The results for ETFs

In Table 3, we present the results of the cross-sectional regression of differential return before expenses and the standard deviation of differential return against the set of variables discussed

¹⁵ Each fund is one observation. Each variable is averaged over the life of each fund.

¹⁶ The co-efficient reported in Table 2 for turnover is based on turnover being measured annually in decimal form.

¹⁷ Turnover was important in index funds because it was dominated by transactions due to cash inflows or outflows to the fund.

Table 2

Cross-sectional regression of variables on mean differential return and standard deviation of differential return for index funds pre-expenses.

Variable	Mean Return Coefficient	tValue	Standard deviation coefficient	tValue
Intercept	-0.0116	-1.70	0.0506	1.50
EMERG MKT EQ	-0.0278	-3.35	0.6116	14.88
FOREIGN STOCK	-0.0435	-9.22	0.5091	21.82
US BOND	0.0018	0.31	0.0605	2.18
US SECTOR	0.0024	0.44	0.0651	2.44
US SMALL MID	-0.0015	-0.42	0.0063	0.35
Log Number of Funds	0.0036	2.75	0.0005	0.07
Cash	0.0001	0.31	0.0024	1.53
Turnover	-0.0001	-5.95	0.0000	-0.38
Fund Size to Sector Size	-0.0001	-0.38	-0.0013	-0.77
Ratio of Holdings	0.0108	1.75	-0.0107	-0.35
Expenses	-0.0034	-0.58	0.0632	2.19
Security lending	0.0481	2.41	0.0503	0.51
R ²	0.35		0.66	

This table reports regression coefficients and t values from a cross-sectional regression across all index funds. The dependent variable is mean differential return and standard deviation of differential return for each fund (expressed as percent per month). The first five variables are dummies which take on a value of one if an index fund fits the category. The variable log number of funds is the log of the number of index funds in the family to which the fund belongs. The variable expense is the expense ratio for each fund (expressed as percent per year). Cash is measured as the dollars in cash divided by total assets (expressed as percent per year). Turnover is the average turnover (percent per year). Fund size to sector size is the total assets in the fund divided by average total assets of all funds in the same category. Ratio of holdings is the variable number of securities held by the fund over the number of securities in the index it follows at a point in time. Security lending is the income earned by the fund through security lending divided by the average assets of the fund, expressed as percent per year. All variables except security lending are computed by averaging across the years the fund is in our sample.

Table 3

Cross sectional regression of variables on mean differential return and standard deviation of differential return for ETFs.

Variable	Mean return coefficient	tValue	Standard deviation coefficient	Tvalue
Intercept	-0.0065	-0.59	-0.0559	-0.46
EMERG MKT EQ	-0.0073	-1.05	0.6028	7.77
FOREIGN STOCK	-0.0180	-3.47	0.2717	4.71
US BOND	-0.0016	-0.37	0.0985	2.11
US SECTOR	0.0073	1.99	0.0773	1.87
US SMALL MID	0.0008	0.20	-0.0500	-1.19
Log Number of Funds	0.0063	3.82	0.0062	0.32
Fund Size to Sector Size	-0.0004	-0.52	-0.0052	-0.59
Security Lending	0.0769	2.88	0.8665	2.93
Ratio of Holdings	-0.0115	-1.28	0.0464	0.47
Expense Ratio	-0.0227	-1.52	-0.0649	-0.39
Not latest index			0.1362	3.70
R ²	0.26			0.51

This table reports regression coefficients and t values from a cross-sectional regression over all ETFs. The dependent variable is mean differential return and standard deviation of differential return (expressed as percent per month). For each fund, the first five variables are dummies which take on a value of one if the fund fits that category. Log number of funds is the log of the number of funds managed by a family. Fund size to sector size is total assets in the fund over the average of this variable for all funds in the category at a point in time. Expense ratio is expressed as a percent per year. Security lending is the income earned by the fund through security lending divided by the average assets of the fund, expressed as percent per year. Ratio of holdings is the average over the life of the fund of the variable number of securities held by the fund over the number of securities in the index at a point in time. Not latest index is a dummy that is one if the fund changed indexes it followed and the index is the earlier index. Fund size to sector size, log number of funds, ratio of holdings, and expense ratio are all yearly averages over the period where we have an index fund and ETF following the same index.

above. Note that the models explain a great deal of the cross-section: $R^2 = 0.26$ for differential return and 0.51 for the standard deviation of differential return.

The results for categories are similar to the results for index funds. We have no hypothesis with respect to return, but once again, the impact of foreign stock and emerging market stocks have a strong positive effect on standard deviation with t values of 4.71 and 7.77, respectively.

The most significant variable affecting differential return is the log of the number of funds offered in the family ($t = 3.82$). Recall that this is a measure associated with the expertise and sophistication of the fund management. While this has a major impact on differential return, it has almost no impact on the standard deviation of differential return. If we use the 90% range for log of

number of funds, the implied difference in differential return for the lower value and the higher value is 8 basis points per year.

The next largest impact on differential return is the amount of securities lending a firm engages in ($t = 2.88$). A positive sign is logical since revenue from every dollar from securities lending flows directly to revenue and hence to differential return. Using the 90% range for this variable, the implied difference in differential return for the lower value and the higher value is 24 basis points per year. An increase of 1% in the return from security lending increases return on an ETF by 92 basis points. Securities lending also has a major and statistically significant impact on the standard deviation of differential return ($t = 2.93$). This is logical since the income from security lending varies over time and this increases the standard deviation of differential return. Similar to the results for

index funds, neither fund size to sector size nor ratio of holding is significant.

We have added a variable to capture the increased standard deviation that is associated with a fund changing the index it follows. The impact on standard deviation is positive and statistically significant. Changes in an index are likely to occur when an ETF has difficulty tracking the index it follows.

Finally, we should note that while not statistically significant, expenses have much more of an impact in explaining the differential performance of ETFs than they have in explaining the differential performance of index funds. The effect of a 1% increase in expense ratios decreases gross performance by 4 basis points for index funds and 27 basis points for ETFs per year.

5. Performance of index funds and ETFs after expenses

In this section, we re-examine the analysis of Section II based on the return shareholders receive. Again, we will first examine performance and then the factors that explain performance.

5.1. Performance

Why can investors' return differ from pre-expense return? There are four reasons: expenses, the difference between the net asset value per share and price for ETFs, taxes, and the transaction cost of buying or selling ETFs. Of these four factors, two are taken into consideration when we examine post expense return (expenses and pricing differences); two (taxes and transaction costs) will be discussed later in this paper.¹⁸

When we compare pre- and post-expense return, the post-expense differential return is 42.2 basis points per year lower for index funds and 18.0 basis points lower for exchange traded funds. Thus, examining post expense returns results in a much bigger decrease in differential return for index funds. Over our entire sample, ETFs have an average differential return of minus 14.4 basis points per year while index funds have an average differential return of minus 39.6 basis points after expenses compared to the index they track.¹⁹ In addition, the standard deviation of differential return is higher for index funds than for ETFs.

When we examine our six categories discussed earlier, the results after expenses are the same as pre-expenses with respect to direction, but the outperformance of ETFs over index funds increased.

5.2. Explaining differences across funds in after expense differential return and after expense standard deviation of differential return

Differences in after expense differential return and standard deviation of differential return come about because of differences in pre-expense return and differences in expenses. In Tables 2 and 3, we examined what variables explain differences in differential return and standard deviation of differential return for ETFs and index funds pre-expenses. We used the variables that were significant in explaining differences for either variable pre-expenses to explain cross-sectional differences across funds post expense. We also retained the ratio of holdings because it was close to significant.

¹⁸ Taxes aren't important if we are considering this analysis from the viewpoint of a tax-free institution (e.g., pension fund).

¹⁹ We also examined what differential expense ratios were between the lowest expense index fund and the lowest expense ETF following the same index over the common period. For institutional investors, ETFs had lower expenses by 4.9 basis points per month and for retail investors 16.1 basis points per month. If we examine the latest expense ratio rather than the average over the common period, the differences become 7.7 basis points lower expenses for ETFs for institutional investors and 25.7 basis points for retail investors.

Table 4 shows the performance of index funds after expenses. The first thing to note is that the size and significance of all the coefficients in Table 4 are virtually the same as those in Table 2. The big difference is that the R^2 for the mean return difference goes from 0.35 to 0.73. In addition, the size and t value for the coefficient on expenses is much larger in absolute magnitude (t value of -15.01). The regression used monthly post-expense differential return and annual expenses. The results imply that a 1% increase in annual expenses reduces monthly post expense return by 8.65 basis points or 1.04% annually. If we wish to explain returns with one variable, it is clearly expense ratios. However, turnover, security lending, and the number of funds in the family add significant information.

The results for ETFs are shown in Table 5 after expenses and Table 3 pre-expenses. Examining differential return and standard deviation of differential return, all variables except expenses have close to the same magnitude and significance in Tables 3 and 5. As expected, the coefficient on expenses has a much greater impact on post-expense differential return than pre-expense differential return. The coefficient of -0.1048 on yearly expense ratio means that a 1% increase in the yearly expense ratio decreases monthly return by 10.48 basis points per month or 1.26% per year. This is much larger than the 1.04% impact on index funds. The change in the R^2 with respect to differential return does not increase nearly as much as it did for index funds. We see that the expense ratio has the largest impact on the differential return of ETFs, but both security lending and the number of funds contain additional information.

6. Capital gain differences

Table 6 shows the amount of capital gains paid and the frequency with which they are paid for both ETFs and index funds. As discussed earlier, ETFs, because they handle purchases and sales in kind and since these transactions are nontaxable, are able to have the cost basis of securities they own close to or even above market value. This means that ETFs are much less likely to pay capital gains. Table 6 confirms this intuition. Table 6 shows overall results and results for each category. Thirty percent of ETFs paid capital gains sometime in their history, while 71% of index funds paid capital gains sometime in their history. Given that they paid capital gains at any time, ETFs only paid capital gains in 13% of the years they existed while index funds paid capital gains in 44% of the years they existed. Thus, across all fund years, ETFs paid capital gains 4% of the years while index funds paid capital gains 31% of the years.²⁰

When we examine the categories, we see large differences in the fraction of funds that paid capital gains. Bond funds, whether index funds or ETFs, frequently pay capital gains. For index funds, 89% of the bond funds paid capital gains sometime in their life, while for ETFs the percentage is 68%. Bond funds have high turnover because of changes in the maturity of the bonds they hold and this accounts for more frequent payment of capital gains. The next highest category is small and mid-cap stocks with 77% of index funds and 41% of ETFs paying a capital gain sometime over their life.

Not only do ETFs pay capital gains less frequently, when they do pay it is a smaller amount relative to net assets. Examining the last column of Table 6 shows that the average capital gain paid over all years of the existence of the fund is 2.5% for index funds and 0.2% for ETFs.

²⁰ In 2008 and the next few years, almost none of the funds or ETFs paid capital gains.

Table 4

Cross-sectional regression of variables on mean differential return and standard deviation of differential return for index funds post-expenses.

Variable	Mean return coefficient	tValue	Standard deviation coefficient	tValue
Intercept	-0.0114	-1.66	0.0422	2.02
EMERG MKT EQ	-0.0280	-3.31	0.6122	14.95
FOREIGN STOCK	-0.0441	-9.18	0.5115	22.37
US BOND	0.0024	0.41	0.0675	2.90
US SECTOR	0.0029	0.53	0.0671	2.53
US SMALL MID	-0.0017	-0.45	0.0072	0.40
Log number of funds	0.0034	2.59	-0.0013	-0.21
Turnover	-0.0001	-6.01	0.0023	1.51
Ratio of holdings	0.0109	1.74	0.0000	-0.40
Expenses	-0.0865	-15.01	0.0659	2.30
Security lending	0.0498	2.44	0.0489	0.50
R ²	0.73		0.66	

This table reports regression coefficients and t values from a cross-sectional regression across all index funds. The dependent variable is mean differential return and standard deviation of differential return for each fund. The first five variables are dummies which take on a value of one if an index fund fits the category. The variable log number of funds is the log of the number of index funds in the family to which the fund belongs. The variable expense is the expense ratio for each fund expressed as percent per year. Cash is measured as the dollars in cash divided by total assets expressed as percent per year. Turnover is the average turnover expressed as percent per year. Fund size to sector size is the total assets in the fund divided by average total assets of all funds in the same category. Ratio of holdings is the variable number of securities held by the fund over the number of securities in the index it follows. Security lending is the income earned by the fund through security lending divided by the average assets of the fund, expressed as percent per year. All variables except security lending are computed by averaging across the years the fund is in our sample.

Table 5

Cross-sectional regression of variables on mean differential return and standard deviation of differential return for ETFs post-expenses.

Variable	Mean return coefficient	tValue	Standard deviation coefficient	tValue
Intercept	-0.0173	-2.34	0.0047	0.13
EMERG MKT EQ	-0.0077	-1.11	0.6025	7.90
FOREIGN STOCK	-0.0177	-3.42	0.2696	4.76
US BOND	0.0003	0.08	0.0928	2.13
US SECTOR	0.0068	1.86	0.0780	1.92
US SMALL MID	0.0000	0.01	-0.0472	-1.14
Log number of funds	0.0061	3.68		
Security lending	0.0815	3.06	0.8626	2.96
Expense ratio	-0.1048	-7.07	-0.0700	-0.47
Not latest index			0.1428	4.26
R ²	0.49		0.51	

This table reports regression coefficients and t values from a cross-sectional regression over all ETFs. The dependent variable is mean differential return and standard deviation of differential return. For each fund, the first five variables are dummies which take on a value of one if the fund fits that category. Log number of funds is the log of the number of funds managed by a family. Fund size to sector size is variable total assets in the fund over the average of this variable for all funds in the category. Expense ratio is expressed as percent per year. Security lending is the income earned by the fund through security lending divided by the average assets of the fund, expressed as percent per year. Ratio of holdings is the average over the life of the fund of the variable number of securities held by the fund over the number of securities in the index. Not latest index is a dummy that is one if the fund changed indexes it followed and the index is the earlier index. Fund size to sector size, log number of funds, ratio of holdings, and expense ratio are all yearly averages over the period where we have an index fund and ETF following the same index.

This shows the tax advantage for ETFs with respect to capital gains can be important in determining whether to choose an ETF or index fund for any investor subject to capital gains taxes.

7. Selecting the best index fund and the best ETF following each index

The purpose of this section is to see if we can use available information about the index funds or ETFs following each index to select a very good or the very best index fund or ETF from the investor's perspective (after expenses). This analysis involves formulating a criteria for selecting a fund and formulating the criteria over which a forecast will be evaluated. We assume a fund is selected based on one year of data and the choice is evaluated over both the following year and the following three years. Below we list the basis for selecting a fund and the metric used to evaluate the selection.

Selection basis	Evaluation criteria
1. Expense ratio	Differential return
2. Expense ratio adjusted for management skill	Information ratio ^a

^a This is identical to the generalized Sharpe ratio as defined in Sharpe (1994).

While several of these metrics have been discussed elsewhere in this paper, we have not yet described the information ratio and adjusted expenses. The information ratio is defined each year as the average differential return divided by the standard deviation of the differential return based on monthly data for each year. It represents the extra return per unit of extra risk taken by not holding the index.

We used expense ratio to select funds because expense ratios were determined to be by far the most significant variable in explaining differential return. Simply using expense ratios ignores the

Table 6
Index funds.

Category	Number	Percent of funds paid (%)	Percent of years paid (%)	Average capital gain per year (%)
EMERG MKT EQ	11	36.36	9.84	0.16
FOREIGN STOCK	42	61.90	29.46	5.45
US BOND	46	89.13	59.83	0.47
US LARGE STOCK	162	74.69	39.67	1.56
US SECTOR	34	38.24	22.77	1.58
US SMALL MID	101	77.23	59.38	4.10
Average	396	71.46	43.68	2.46
ETFs				
Category	Number	Percent of funds paid (%)	Percent of years paid (%)	Average capital gain per year (%)
EMERG MKT EQ	7	0.00	0.00	0.00
FOREIGN STOCK	17	5.88	1.98	0.18
US BOND	25	68.00	51.18	0.43
US LARGE STOCK	48	20.83	3.23	0.01
US SECTOR	33	18.18	8.74	0.12
US SMALL MID	44	40.91	10.62	0.26
Average	174	29.89	12.78	0.17

This table shows the capital gains paid. Column 1 shows the categories for which we report results. Column 2 is the number of funds in each category. Column 3 is the percentage of funds in a category that paid a capital gain sometime over the life of the fund. Column 4 is the average percentage of years that any fund in that category paid a capital gain divided by the number of years conditional on paying a capital gain in some year. Column 5 is the total capital gains paid over the life of the fund expressed as a percentage of total assets divided by the number of years a fund existed.

information we discovered about what determines pre-expense returns in our cross-sectional analysis.

To incorporate what we know about management ability in Tables 2 and 3, we see if expenses plus the predictable part of management ability leads to better prediction of future returns. To estimate the predictable part of management ability, we use the results from Tables 2 and 3 to determine which variables are significant in any year. We regress cross-sectionally pre-expense differential return against the significant variables from Tables 2 and 3 excluding category dummies. For each fund, we substitute its value of the variables on the right hand side of the estimated equations and multiply them by the associated regression coefficients. This gives a value for the predictable part of management ability for each fund for each year. Since performance should be expenses minus management ability (the contribution of management to differential pre-expense performance), we have our measure of expenses adjusted for the predictable part of management ability.

In any year, we rank all of the index funds that follow each index in our sample. For example, one of the ranking metrics (expenses) ranks all funds following an index by expense ratios. Select the fund with the lowest expense ratio. Now, in both the next year and over the next three years, we compare this fund's performance with the performance of all other funds following the same index using two evaluation criteria; differential return and the information ratio. There are three measures of how well the fund selected does. The first measures how well the fund does versus random selection from funds that follow the same index. This is simply the differential return (or information ratio) on the fund selected minus the average differential return (or information ratio) on all funds following the same index. A second way to evaluate performance is to determine what fraction of funds do worse than the one selected. The third way we evaluate our selection criteria is how often the fund we selected has the best performance in the evaluation period.

Table 7 shows the results for selecting based on expense ratios.²¹ The results for one year are in Part A and the results for

three years are in Part B.²² Results are presented for ETFs, index funds available for retail purchase, and index funds available to institutional investors. Consider retail index funds. On average, there were 10 funds following each of 24 indexes.²³ Examining the one year results for retail investors, we find that selecting on the basis of the fund with the lowest expense ratio earned an extra 3.2 basis points per month or 38 basis points per year compared to random selection. Eighty-two percent of the funds following the same index did worse and 53% of the time the lowest expense fund had the highest performance in the next period, all highly statistically significant. If we use the information ratio to evaluate selection, we get similar results. Selecting the lowest expense fund increased the information ratio by 0.639 compared to random selection and selecting by lowest expenses resulted in a higher information ratio 80% of the time and had the highest information ratio 51% of the time, all highly statistically significant. The three year result shown in Part B are virtually the same. Expenses are the major determinant of stockholder returns. Expense ratios are very stable over time and are the major determinants of performance in any period. Thus, it is not surprising that selecting the lowest expense index fund results in similar results over three years compared to one year. We get very similar results for institutional investors, again all results are significant.

There are many fewer exchange traded funds following any index. There are three families that offer most exchange traded funds. Furthermore, for some indexes, some funds charge the same expenses. Since in this case they are treated as one fund, this further reduces the number following any index and thus there are on average 2.4 funds following 22 indexes. The differential return over one year compared to random selection is 0.4 basis points per month or about 5 basis points per year. The fund selected has the highest return in the next year 60% of the time and the highest information ratio 54% of the time. Thus, for ETFs, selecting the lowest expense fund only leads to slight improvement. Examining three year results leads to similar conclusions.

²² We also did for two years, but since two year, three year and one year results are so similar, we don't report them.

²³ This is somewhat skewed by the large number of funds following the S&P 500 index, but even leaving this out, there are many choices for most indexes.

²¹ In the case of ties, the lowest expense funds are treated as one fund.

Table 7
Selecting the lowest expense fund.

	A. One year results					
	Evaluating by return			Evaluating by information ratio		
	ETFs	Institutional	Retail	ETFs	Institutional	Retail
Number of indexes	22	30	24	22	30	24
Monthly performance minus performance of random fund	0.3940 (1.33)	2.77 (11.97)	3.18 (13.29)	0.1503 (4.23)	.5977 (12.06)	0.6391 (10.93)
Fraction with worse returns	0.6628	0.8596 ^a	0.8243 ^a	0.597	0.8535 ^a	0.7967 ^a
Fraction of years pick is best	0.6047 ^a	0.5977 ^a	0.5279 ^a	0.5426	0.6172 ^a	0.5076 ^a
Average choices	2.3798	10.4375	10.0558			
	B. Three year results					
	Evaluating by return			Evaluating by information ratio		
	ETFs	Institutional	Retail	ETFs	Institutional	Retail
Number of indexes	22	30	24	22	30	24
Monthly performance minus performance of random fund	0.40 (3.80)	2.63 (12.41)	3.08 (13.69)	0.1088 (3.87)	.5389 (12.16)	0.6152 (11.20)
Fraction with worse returns	0.7093	0.8772 ^a	0.8604 ^a	0.6395	0.8551 ^a	0.8473 ^a
Fraction of years pick is best	0.6589 ^a	0.6758 ^a	0.5939 ^a	0.5736	0.6289	0.5533 ^a
Average choices	2.3798	10.4375	10.0558			

This table shows the results when there are multiple funds following an index and the lowest expense fund is selected. Panel A presents the results for a one year evaluation period while Panel B presents the results for a three year evaluation period. The first row shows the number of times there were multiple funds following an index. The second row shows the additional monthly return in basis points per month in the next period earned by selecting the lowest expense fund rather than a random fund and the following period's information ratio. The number in parenthesis in the third row is the *t* value of the number above it. The fourth (?) row shows the fraction of funds with worse returns in the next period compared to the lowest cost fund. The fourth row shows the fraction of periods picking the lowest cost fund gives the highest return of information ratio in the next period. Finally, the last row shows the average number of choices.

^a Significant at 1% level.

The other selection criteria we examined were expenses adjusted by the factors that explained the difference between pre-expense returns and the returns on the index followed. This led to slight improvement in the next period's differential return. Part of this small increase is due to many of the choices being the same as they were when we selected based on lowest expenses. However, the improvement is small and not statistically significant. Since picking the fund with the lowest expenses is so easy and since the adjustment leads to only a small and not statistically significant improvement, we will use the selection rule of select by lowest expense in the rest of the paper.

Many past studies of return predictability use post expense return to predict future post expense return. We used this criteria and the results were not nearly as strong as those using either expense or expense adjusted by the predictable part of management performance. The reason can be seen by considering post expense return as pre-expense return minus expense ratio. This indicates that return not explained by the significant variables affecting management performance in Tables 2 and 3 has a large random component.

8. Which is best: an index fund or an ETF?

In the prior section of this paper, we showed that within each category of investments – retail index funds, institutional index funds and ETFs – the best indicator of which fund will have the highest return in the next period is the one with the lowest expense ratio. In this section, we will examine optimal selection when the investor chooses between only two alternatives for each index: the low cost exchange traded fund and either the low cost retail index fund or the low cost institutional index fund.

Table 8 shows that if the investor were to formulate a simple strategy, pick either the ETF all the time or the index fund all the time, the investor would be better off selecting the ETF whether the outcomes are evaluated over a one or three year horizon. For

the one year horizon (Part A of Table 8), the institutional investor would earn an extra return of 0.83 basis points per month or 10 basis points per year by picking the ETF rather than the index fund. For retail funds, the advantage is even larger: 1.62 basis points per month or 19 basis points per year. For the three year evaluation period shown in Part B, the results are similar with the institutional investor earning an extra return of 9 basis points per year and the retail investor earning an extra 20 basis points per year. Note that these differences are economically significant for passive investors and they are statistically significantly different from zero.²⁴

Next we examine whether we can improve on these results by choosing the lowest cost index fund or ETF each year for each index.²⁵ Let's start with the case of the institutional investor. From Table 8, Part C, we see that the index fund had the lower expenses 516 times. When it had the lower expenses, it had the highest return (in the next period) 77% of the time. The ETF would be picked 388 times and it would have the higher return 73% of the time. Again, the lower expense instrument in one period predicts which the higher return instrument is in the next period. If we look at evaluation over three years, the results are even stronger.

When we examine the predictability for retail investors, the results are not as strong. When index funds are picked the one year, differential return is higher only 58% of the time and when ETFs are picked, the differential return is higher 68% of the time. This suggests that selecting the index fund or ETF with the lowest expenses should lead to better performance for institutional investors but might lead to ambiguous results for retail investors.

²⁴ For taxable retail investors the higher capital gains paid by index funds would increase the advantage of ETFs.

²⁵ When the ETF and index fund have the same expense ratio we selected the ETF because prior results have shown that it was generally the best investment alternative. Assuming the index fund was chosen would lead to similar results since in most cases with expense ratios the same future returns were the same.

Table 8
Comparison of results from selecting the lowest lagged expense index fund and lowest lagged expense ETF.

A. One year evaluation period differential return and expenses (b.p. per month)						
	Institutional		Retail			
	Diff return	Expense	Diff return	Expense		
Selecting ETF rather than index fund	0.827 (2.4128)	−0.74 (−3.47)	1.615 (3.85)	−1.611 (−5.73)		
Picking low expense ETF or index fund each period rather than other	1.243 (3.70)	−1.240 (−6.20)	1.586 (3.74)	−1.688 (−6.07)		
B. Three year results differential return and expenses (b.p. per month)						
	Institutional		Retail			
	Diff return	Expense	Diff return	Expense		
Selecting ETF rather than index fund	0.784 (2.28)	−0.75 (−3.52)	1.651 (3.99)	−1.598 (−5.68)		
Picking low expense ETF or index fund each period rather than other	1.289 (3.81)	−1.211 (−5.99)	1.684 (4.04)	−1.661 (−5.96)		
C. Number of times index fund or ETF selected using prior year expenses						
	Institutional			Retail		
	Number	Highest return		Number	Highest return	
		1 year	3 years		1 year	3 years
Pick index fund	516	399	427	119	69	78
Pick ETF	388	285	298	671	454	485

This table shows the results from choosing between the index fund which had the lowest expense ratio and the ETF which had the lowest expense ratio, and then examining return and expenses in the next year. Part A top row shows how much higher the monthly return is from selecting the lowest expense ETF each year rather than the lowest expense index fund. The second row shows how much higher the monthly return was from selecting the lowest expense ratio between index fund and ETFs rather than selecting the alternative instrument. The numbers in parenthesis are t values. Part B represents the analysis for a three year evaluation period. Part C presents data on the number of times the lowest expense index fund or ETF was selected in Part A and B, row 2, rather than the alternative and the number of times this led to a higher return than selecting the alternative instrument.

The results from selecting the lowest expense index fund or ETF each period are shown in a second line in Part A and Part B of Table 8. When we examine institutional funds, results are unambiguous. Choosing the institutional index fund or ETF on the basis of lowest expense ratio in one period leads to an increase in returns compared to always selecting the ETF of 5 basis points per year for the one year horizon and 6 basis points for the three year evaluation period. The differences are statistically significant at the 0.01 level.

When we examine retail funds, picking the ETF each period or the lower expense ratio ETF or index fund each period leads to results that are almost identical. Selecting the lower expense ETF or index fund results in a reduction of 0.3 basis points per year in a one year case and an increase of 0.4 basis points in a three year evaluation period. The differences are very small and not statistically significant. Note also that for retail investors the expense ratio differences between the two strategies are close to zero.

For the institutional investor, it is clear that selecting the instrument (index fund or ETF) with the lowest expenses has the higher return than the alternative over both the one year and three year holding period. For the retail investor, the strategies cannot be differentiated and since selecting the ETF all the time is a simple strategy, it is sensible to employ it.

There are three other factors that can affect choice: loads, taxes and transaction costs. Loads can be dismissed as a consideration since none of the lowest expense index funds had loads. Taxes are fairly easy to deal with. Taxes only affect retail investors. As discussed in Section V, index funds in general, in almost all cases, have higher capital gains than ETFs. If we examine individual cases and assume the highest capital gains tax rate and assume the in-

vestor will hold the investment for many years, there are only 2 out of 119 cases where index funds were preferred and taxes could change the outcome.²⁷

Considering transaction costs does not change the optimum strategy because for most indexes the low cost instrument is the same every year. When we consider only picking the low cost ETFs, there are few transactions involved. In only 13% of the cases is there a change in the identity of the low cost ETF. So the strategy of simply buying the low cost ETF, the difference in performance is a larger number than any reasonable estimate of transaction costs. When we consider the case of picking either the lowest cost index fund or ETF, the lower cost instrument only changes 2.2% or 2.8% of the time for institutional or retail funds, respectively. The impact on transaction costs is even lower since switches to index funds involves no cost because the low cost index fund is always a no load fund. When we look at this strategy, we see the difference of 5% per year for institutional investors is also bigger than any reasonable estimate of transaction costs, given the percentage of times that any transaction takes place. Of course, for any index, transaction costs can reverse the optimum choice, but this does not occur often enough to change the optimal strategy.

9. Conclusions

Over 25% of the assets held by investment companies are held in the form of passive index funds and passive exchange traded funds. Furthermore, many indexes are followed by multiple passive funds. Empirical evidence shows that active funds underperform indexes by about 75 basis points. Given these facts, it is important for investors to understand how to make the choice among and

between index funds and ETFs for any particular index. The purpose of this paper is to explain what affects performance and how to choose between passive vehicles.

In the first part of the paper, we examine return pre-expenses which measures management's performance. Managers closely follow their index resulting in an average R^2 above 0.996 and an average beta of 1 for ETFs and 0.998 for index funds. On average, ETFs pre-expenses slightly outperform the index they follow, while index funds slightly underperform.

In the next section of the paper we examine the factors that account for differences in the performance of index funds and ETFs relative to the indexes they follow. Cross-sectionally, the major factors affecting pre-expense performance for index funds are turnover, the number of passive funds in the same family, and the return from security lending. When we examine the standard deviation of return differences from the index they follow, the main determinant is the type of index followed, with emerging market indexes and foreign stock indexes having the largest deviations. For ETFs, the major determinants of the differential return across funds following the same index are the number of passive funds in the same family and the amount of security lending they do. Once again, the standard deviation of deviations from the index is primarily determined by which index they follow, although security lending also plays a role. When we examine what determines cross-sectional return post expenses, the same factors matter. However, the expense ratio becomes much more important in affecting differential return.

We next examine how to pick the best ETF and the best index fund separately. We have two criteria: expense ratio and expense ratio plus the return from the significant factors affecting pre-expense return (management contribution to performance). Picking the lowest expense index fund rather than the average index fund improves return by 33 basis points in the next year for in-

stitutional investors or 38 basis points per year for retail investors. For ETFs, the difference is 5 basis points per year since there are fewer choices. For index funds, 82% to 85% of the funds have lower returns in the next year compared to the lowest expense fund and for 60% choosing the lowest expense fund has the highest performance of all alternatives in the next period, with the number of funds available averaging 10 funds. The results are similar when we consider performance over a three year rather than a one year period. Taking into account the factors affecting pre-expense return improves performance but given the much larger effect of expenses, the improvement is very small and nowhere near statistically significant.

Finally, we examine the choice between two alternatives: the lowest cost index fund and the lowest cost exchange traded fund. If the investor followed a strategy of selecting either the index fund or ETF each period, whichever had the lower expenses, the institutional investor would be better off by 5 basis points per year compared to always selecting the ETF while the performance of retail investors would be unchanged.

References

- Agapoba, A., 2011. Conventional mutual index funds versus exchange traded funds. *J. Financ. Mark.* 14, 323–343.
- Cremers, M., Ferreira, M., Matos, P., Starks, L., 2010. Indexing and active fund management: international evidence. *J. Financ. Econ.* 120 (3), 539–560.
- Elton, E.J., Gruber, M.J., Comer, G., Li, K., 2002. Spiders: where are the Bugs? *J. Bus.* 75, 453–472.
- Guedy, I., Huang, J., 2009. Are ETFs Replacing Index Mutual Funds?. University of Texas Unpublished paper.
- Madhavan, A., 2016. *Exchange Traded Funds and the New Dynamics of Investing*. Oxford University Press, New York.
- Poterba, J., Shoven, J., 2002. Exchange traded funds: a new investment option for taxable investors. *Am. Econ. Rev.* 92, 422–427.
- Sharpe, W., 1994. The sharpe ratio. *J. Portf. Manag.* 21 (1), 49–58.