ETF trading strategies to enhance client wealth maximization

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Abstract

This study examines the performance of pragmatic ETF-only investment strategies published either in an investment newsletter, blog, or are otherwise available through investment advisories. Our objective is to determine if ETF-only strategies can outperform either the S&P 500 or more representative benchmarks on an absolute and/or risk-adjusted basis. We surveyed a number of strategies and analyzed a subset that supported a five-year price history, including both trading commissions and bid-ask spread costs. Our findings show that while a majority of strategies beat the S&P 500 and a representative benchmark, weak statistical outperformance persisted in a smaller fraction of the sample. © 2011 Academy of Financial Services. All rights reserved.

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1. Introduction

In a survey of investment professionals, conducted in March 2008, 67% called ETFs the most innovative investment vehicle of the last two decades and 60% reported that ETFs have fundamentally changed the way they construct investment portfolios (*Knowledge@Wharton*; Anonymous, 2008). Surveys within Europe corroborate this growing trend (Amenc et al., 2009). While there are vast amounts of information on ETFs and their individual performance, there has been limited analysis on the investment performance of pragmatic ETF-only investment strategies. One recent study that demonstrated abnormal returns at a 0.01

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level of statistical significance was conducted recently by De Jong and Rhee (2008), who examined ETF-only strategies using both momentum and contrarian methods. Chang and Krueger (2010) found that ETFs appear to have performed worse than their pure index fund counterpart with lower returns, higher risks, and lower risk-adjusted returns. Grossman and Beach (2010) found that ETFs were inferior to both underlying assets and ADRs in international diversification for U.S. investors while Chu et al., (2007) found that cross autocorrelations patterns of 17 index international iShares ETFs were marginally exploitable with cautious execution. Cubes were found by Curcio et al. (2004) to be favorable to long-term investors.

This paper assesses a broader array of strategies to infer more about the population performance of ETF-only strategies available to financial planners and individual investors. The objective is to determine if ETF-only strategies can typically outperform a representative benchmark on an absolute and/or risk-adjusted basis. If this is the case, it calls into question the efficiency of the capital markets. Further, it would provide a pragmatic way for financial planners and individual investors to adopt strategies that enhance wealth maximization. Given the current cautious outlook for returns to the market, any new investment strategy, such as the ones reviewed herein, become a welcomed addition to enhanced risk-adjusted returns of the individual investor.

A small number of investors over the years have become well known for their investment skills in identifying stocks that have "beat the market." Numerous studies have been conducted with mixed results, but disproportionately few have been able to outperform the benchmark on a risk-adjusted basis after transaction costs (commission, bid ask-spread, and slippage). In general, the efficiency of the market has been upheld. The Fama–French study seriously questioned the efficiency and the use of beta, but they did not subject real-time investment portfolios to their test (Fama and French, 1992).

The rise of ETFs over the past decade has created a new class of investment possibilities that has not been subjected to the standard and rigorous efficient market hypothesis testing[1] (Poterba and Shoven, 2003). Fig. 1 shows the growth of ETFs available as of December 31, 2008. Many asset classes are now represented by ETFs (Kosnett, 2008), and are being used in unique and innovative ways, such as the so-called "130–30" strategy, which shorts 30% of the ETFs in the portfolio, and uses the proceeds along with the other 70% of assets to purchase ETFs long (Gastineau, 2008). The cost-benefit of reaching asset classes through ETFs versus mutual funds is also clear, based on the recent Vanguard studies showing the average ETF carries 12 basis points of management fee, versus 18 basis points for the average index fund and 123 basis points for a typical actively managed mutual fund (Gardner and Welch, 2005).

While many benefits exist for ETFs, they are certainly not without their own criticisms. Trading commissions are generally incurred to implement ETF-only strategies, potentially offsetting the cost benefit over mutual funds if the strategy requires frequent trades. This criticism is gradually becoming less significant as commission fees continue to decrease. In fact, in 2009 and early 2010, major discount brokerage firms Fidelity, Vanguard, and Schwab began offering $0 commissions on trades on a selected set of ETFs. These brokerage firms appear to be using this offer, along with lower expense ratios, better exposure to asset classes, and lower tracking error as a discriminator (Kapadia, 2010; Spence, 2010). As a result, high
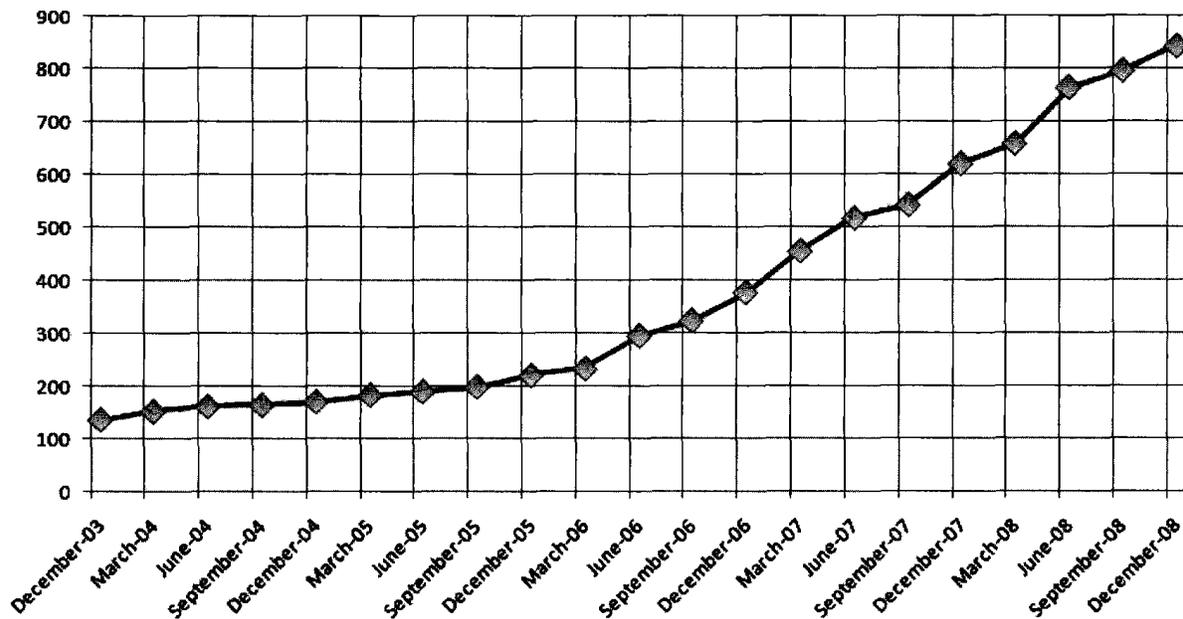
Fig. 1. Quantity of ETFs over five-year time horizon ending December 31, 2008.

turnover strategy performance can become more sensitive to bid-ask spreads, particularly for lower volume $0 commission ETFs (Randall, 2010). These considerations are included in the following analysis so that an objective and pragmatic assessment on ETF-only strategies can be obtained.

2. Research hypotheses and methods

The primary research endeavor here centers on the investigation of actively and passively managed investment strategies utilizing only ETFs. Our hypothesis tests whether ETF-only strategies can typically outperform the S&P 500, and more appropriately a representative benchmark on an absolute and/or risk-adjusted basis. To test this hypothesis, we selected representative benchmarks based upon the universe of securities from which the strategy selects. We also chose to define the benchmark as a naïve, or $1/n$, buy-and-hold allocation of these securities, where n is the number of ETFs in the strategy's universe. Such an approach minimizes turnover within the benchmark and provides a benchmark that is truly an investable alternative. This approach to benchmarking was taken for its practical considerations, but recognizes that other factors could be included to improve the quality of the benchmark, such as higher correlation of a strategy versus other benchmarks, and a beta relative to its benchmark of approximately one over the historical period studied. An excellent paper covering these and other aspects on benchmark quality can be found in Bailey (1992). We will show that, relative to an S&P 500 index ETF, our $1/n$ benchmark provides a higher correlation in all but one case. Also, significant research activity has been conducted recently by DeMiguel et al., (2009) on $1/n$, or naïve portfolio allocations,

Table 1   38 ETF strategies reviewed

Blog or Website (8 total)	**InvestmentAdvisory(18total)**
• Sector Rotation Strategy	Efficient Market Advisors Portfolios–Taking Income
• Alpha Trading Strategy	Efficient Market Advisors Portfolios–2 to 5 years
• Ben Stein's Long-Term Portfolio	Efficient Market Advisors Portfolios–6 to 10 years
• Ben Stein's Retirement Portfolio	Efficient Market Advisors Portfolios–11 to 19 years
• Sowers Growth Portfolio	Efficient Market Advisors Portfolios–20+ years
• Tactical Optimization–Conservative	• Astor Management Long/Short Balanced Program
• Tactical Optimization–Moderate	• Astor Management Style Preferred Growth
• Tactical Optimization-Aggressive	Program
Proprietary Index ETFs (12 total)	• TAG Conservative ETF Portfolio
• PowerShares Dynamic Market Portfolio	• TAG Moderate ETF Portfolio
• PowerShares Dynamic OTC Portfolio	• TAG Aggressive ETF Portfolio
• ValueLine Timeliness Select Portfolio	• Foxhall Global ETF Series Growth Strategy
• Lyxor ETF WISE Quantitative Strategy	ELF Capital Management, LLC
PowerShares FTSE RAFI U.S. 1000 Portfolio	Avatar Associates Capital Preservation ETF
PowerShares FTSE RAFI U.S. 1500 Small-Mid	Composite portfolio
Portfolio	New Frontier Advisors New Frontier Global
PowerShares FTSE RAFI Asia Pacific ex-Japan	Income Portfolio
Portfolio	Adviser Investments Multi-Factor Momentum
PowerShares FTSE RAFI Dev. Markets ex-U.S.	ETF Strategy portfolio
Portfolio	Braver Wealth Management Tactical Allocation
PowerShares FTSE RAFI Dev. Markets ex-U.S.	Strategy
Small-Mid Portfolio	Members Trust Company Income Portfolio
PowerShares FTSE RAFI Emerging Markets Portfolio	
PowerShares FTSE RAFI Europe Portfolio	Capital Allocation & Management ETF Tax
PowerShares FTSE RAFI Japan Portfolio	Deferred Income & Growth

Newsletter (1 total)
• Switch Fund Model

This table shows 38 ETF Strategies reviewed, and 18 selected based upon availability of 5-year return history (*Source:* various, please see Appendix).

suggesting the approach is a simple and efficient method, further supporting their use as an appropriate benchmark. Lastly, we conducted hypothesis testing similar to that described by Schadler and Cotton (2008), by taking the difference in periodic returns between the strategy and its representative benchmark.

This study analyzed ETF-only strategies available from sources such as blogs/Websites, proprietary indices, newsletters, or through investment advisories (Dobosz, 2009). The strategies identified represented the result of an intensive search, but is by no means exhaustive, as new ETF strategies continue to emerge.[2] Table 1 provides the names of 39 strategies found, sorted by their available source. The performance analysis that follows is based on the subset of these strategies that had at least five years of historical data available through December 31, 2008. Strategies that satisfied this criterion are bulleted in Table 1. A short summary of each strategy analyzed appears in the Appendix, including a source for more information.

Eighteen strategies in Table 1 were subjected to a five year review ending December 31, 2008. In the case of strategies implemented by investment advisories as well as the Alpha
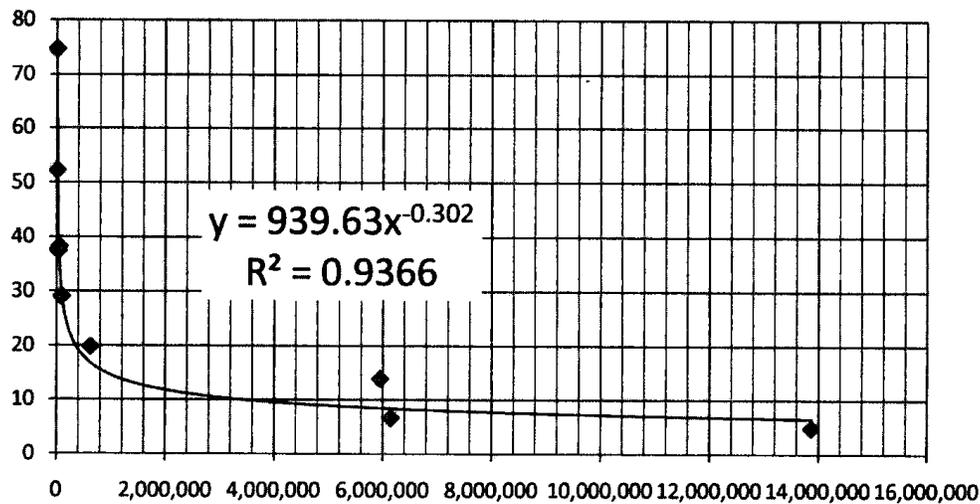
Fig. 2. Bid-ask spread, in basis points (BP) versus three month moving average volume, with power law regression model and goodness of fit measure, R^2.

Trading Strategy, net-returns, after commissions and fees, were available and were analyzed without any adjustments on their returns. For the Alpha Trading Strategy, net-returns were provided on a monthly basis, while the other investment advisories provided net-returns on a quarterly basis. The remaining strategies did not provide net-return information, so performance was based on a simulating each strategy over the historical period and imposing commissions and bid-ask spread costs. Simulating a strategy assumed month end adjusted closing prices, so that returns included the effect of dividends generated by the ETFs. We also assumed trading costs at $7 per trade against a starting portfolio size of $100,000 for each strategy simulated. To include the cost associated with the bid-ask spread, we developed a best-fit model against trading volume using data provided by Agrrawal and Clark (2009), which appears in Fig. 2. The value of $R^2 = 94\%$ obtained from the power-law model suggests that a significant amount of the variation has been explained. Applying this power law regression model against hypothetical trades with known volume increased the cost of trades, and provided an improved estimate of each simulated strategy's performance, especially for lower volume ETFs considered.

3. Benchmark performance characterization

Unlike the previous studies performed by Shadler and Cotton (2008), many of the strategies identified for analysis in Table 1 contained more investment alternatives than could be realistically measured against an equity-based benchmark. To provide an appropriate and practical benchmark for each strategy, we started with the universe of investment components identified by the strategy, and applied a $1/n$, or naive buy-and-hold allocation approach. Depending on the particular strategy, the benchmarks contained between 1 and 19 components, as shown in Table 2.[3] A complete list of the components in each benchmark is provided in the Appendix.

Table 2 Benchmark components

1/n buy-and-hold benchmark components (n = number of benchmark components)	n	Sharpe ratio	Standard deviation	Cumulative return (including dividends)
U.S. Domestic Sectors + Small Caps	10	(0.035)	3.84%	2.4%
High Volume ETFs, long and short	12	(0.168)	1.34%	0.9%
Core equity with emerging market exposure	6	0.005	4.68%	9.9%
Dividend paying equities and REITs	2	(0.034)	5.50%	−5.8%
Domestic and International Growth	8	(0.026)	4.67%	0.8%
Broad U.S. Stock index–Russell 3000	1	(0.098)	3.96%	−12.2%
Russell Midcap Growth	1	(0.066)	5.16%	−12.9%
S&P 500 and cash	2	(0.110)	1.87%	1.5%
SPDR Dow Jones Euro STOXX	1	(0.003)	5.50%	4.6%
Domestic and international equity; large, mid, and small cap domestic equity, commodities, bonds, domestic sectors, domestic equity shorts and real	19	(0.030)	3.82%	3.6%
Long Domestic sectors, short S&P 500, and cash	11	(0.037)	3.34%	4.5%
Large, mid, and small cap domestic equity, international equity, and bonds	5	(0.039)	3.61%	3.0%
S&P 500, International and bonds	3	(0.029)	2.93%	7.9%
Domestic, international, and emerging market equity	3	0.023	5.57%	14.0%
Other benchmarks				
S&P 500 Index with dividends (SPY)	1	(0.102)	3.67%	−11.1%
Vanguard Total Bond Market Index (VBMFX)	1	0.117	1.12%	25.2%
Cash (one-month *t*-bill)	1	—	0.13%	16.2%

The table shows benchmark components, size, risk-adjusted return, and cumulative return over five-year period ending December 31, 2008. Other benchmarks included for general perspective on risk and return of domestic equity, debt, and risk-free assets.

A review of Table 2 suggests that risk and return over the five-year historical period can vary significantly among the various benchmarks. It also appears that the greatest realized gains and losses among the benchmarks occurred at the highest standard deviation. Similarly, benchmarks with the lowest standard deviation had smaller magnitudes of cumulative returns.

The other benchmarks in Table 2 are provided to help put into context broader market conditions over the five-year study period. Specifically, it shows that the larger risk taken in equity markets, as measured by the standard deviation of the S&P 500 index with dividends, realized a large negative return. Alternatively, the smaller risk in the debt markets produced a return larger than any of the 1/n buy-and-hold benchmarks. This performance reflects the bull market that occurred from 2004 to 2007, and the significant bear market of 2008.

4. Results from ETF strategy performance

Before reviewing the performance of each strategy, it is worthwhile to highlight why the effort was undertaken to not simply benchmark performance against the widely accepted S&P 500 benchmark, as shown in Table 2, or some other broad equity-based benchmark. Table 3 shows the correlation coefficients associated with each strategy against both their 1/n

Table 3 Correlation of strategies

ETF strategy	Correlation vs. 1/n benchmark	Correlation vs. S&P 500 (including dividends–SPY)
Sector Rotation Strategy	82.9%	73.1%
Alpha Trading Strategy	−18.3%	9.1%
Ben Stein's Long-Term Portfolio	99.5%	95.7%
Ben Stein's Retirement Portfolio	99.9%	79.2%
The Sower's Growth Portfolio	99.9%	96.8%
PowerShares Dynamic Market Strategy	94.7%	41.0%
PowerShares Dynamic OTC Strategy	89.4%	87.0%
Switch Fund Strategy	58.9%	56.0%
Lyxor ETF WISE Quantitative Strategy	45.5%	29.5%
Tactical Optimization–Conservative	58.6%	52.5%
Tactical Optimization– Moderate	54.2%	44.8%
Tactical Optimization– Aggressive	50.6%	36.0%
Long/Short Balanced Program Strategy	45.8%	51.1%
Style Preferred Growth Program Strategy	93.4%	90.4%
Tactical Asset Group– Conservative ETF Portfolio	81.2%	67.6%
Tactical Asset Group– Moderate ETF Portfolio	83.3%	73.2%
Tactical Asset Group– Aggressive ETF Portfolio	89.3%	87.2%
Foxhall Global Growth Strategy	67.4%	48.9%

This table shows correlation of strategies vs. their 1/n buy-and-hold benchmark and the S&P 500 ETF SPY.

buy-and-hold benchmark, as well as the S&P 500 adjusted for dividends. While there are certainly some cases when the correlation of the strategy against the S&P 500 is >90%, many are not. Furthermore, the 1/n buy-and-hold benchmark provides a higher correlation coefficient in all except two strategies: the Alpha Trading Strategy, and Long/Short Balanced Strategy. And, all except for one of the strategies has at least a moderate correlation (>40%) against its benchmark, which is one simple and straightforward measure of benchmark quality. The impact of the negative correlation of the Alpha Trading Strategy versus its 1/n benchmark will be addressed in the forthcoming section. Thus, Table 2 supports the use of the 1/n buy-and-hold strategy as a more appropriate benchmark than the broad equity-based S&P 500, and could offer investors a simple alternative to consider.

The data in Table 4 provides a summary of the performance of the 18 strategies cited above. The strategies have been sorted by cumulative net-return, and reflect either actual or simulated trading costs. Simply comparing the cumulative return of −11.1% of the S&P 500 with dividends shows that nearly all (17 of the 18) ETF strategies performed better than this benchmark, while a comparison against the S&P 500's Sharpe ratio of −0.102 shows show that all (18 of the 18) ETF strategies outperformed it. However, in almost all cases, the S&P 500 is not a preferred benchmark, as illustrated by the universe of ETFs many of the strategies consider, and reinforced by the correlation coefficients shown in Table 3. When the cumulative returns and Sharpe ratio are compared against their representative 1/n buy-and-hold benchmarks, similar, but less overwhelming evidence of outperformance is found. Comparison of cumulative returns showed that 72% (13 of 18) strategies beat their representative benchmark's return, while 78% (14 of 18) strategies beat their representative benchmark's Sharpe ratio.

Table 4 Cumulative and risk-adjusted returns

No.	ETF strategy	Cumulative return–strategy	Sharpe ratio–strategy
2	Alpha Trading Strategy	329.2%	0.371
11	Tactical Optimization–Moderate	46.0%	0.139
12	Tactical Optimization–Aggressive	42.7%	0.106
10	Tactical Optimization– Conservative	35.4%	0.177
9	Lyxor ETF WISE Quantitative Strategy	31.8%	0.067
16	Tactical Asset Group–Moderate ETF Portfolio	26.7%	0.140
15	Tactical Asset Group–Conservative ETF Portfolio	21.5%	0.194
17	Tactical Asset Group–Aggressive ETF Portfolio	21.5%	0.085
13	Long/Short Balanced Program Strategy	21.1%	0.165
18	Foxhall Global Growth Strategy	15.8%	0.084
3	Ben Stein's Long-Term Portfolio	9.7%	(0.006)
1	Sector Rotation Strategy	9.0%	(0.000)
8	Switch Fund Strategy	4.0%	(0.080)
5	The Sower's Growth Portfolio	0.6%	(0.030)
14	Style Preferred Growth Program Strategy	0.1%	(0.016)
6	PowerShares Dynamic Market Strategy	−2.1%	(0.047)
4	Ben Stein's Retirement Portfolio	−6.3%	(0.039)
7	PowerShares Dynamic OTC Strategy	−16.1%	(0.079)

This table shows cumulative and risk-adjusted returns, net of trading costs, over five-year period. For simulated investment returns, assumes $100,000 investment with $7/trade commissions.

Additional review of the cumulative and risk adjusted performance illustrates a few interesting aspects. First, these results appear robust when highest and lowest performing strategies are excluded (Alpha Trading and PowerShares Dynamic OTC), where the majority of strategies still outperform their $1/n$ benchmark. Also, the level of outperformance does not appear to be dependent on trading frequency. In fact, the only strategies that appear particularly sensitive to trading costs (among those that were simulated) are The Sower's Growth Portfolio and the two Ben Stein portfolio strategies. When these costs are ignored, which may be possible with the advent of $0 commissions ETFs and increased trading volume of ETFs selected by these strategies in the future, all three of these strategies provide a cumulative return larger than their $1/n$ benchmark. Unfortunately, on a risk adjusted basis, this improvement only occurred with the Sower's Growth portfolio.[4]

5. Significance tests on ETF strategies

To further examine the question of market efficiency that could be exploited by financial planners and individual investors who utilize ETF-only strategies, we conducted statistical tests of hypothesis against the returns. We conducted significance tests against either monthly or quarterly differences, depending on data availability, between each strategy and its $1/n$ benchmark, as well as between each strategy and the S&P 500 returns including dividends. As in the previous section, this analysis includes all transaction costs. Because we are interested in various levels of statistical significance outperformance, our tests are based on a one-tailed t test at the 0.01, 0.05, 0.10, and 0.015 levels. Table 5 shows the results of

Table 5 Number of strategies exceeding the S&P 500 with dividends

			Significance levels			
			0.01	0.05	0.10	0.15
Quantity exceeding S&P 500 with dividends	17	Quantity exceeding S&P 500 with dividends	2	3	8	10
Percent exceeding	94%	Percent exceeding	11%	17%	44%	56%

This table shows number of strategies exceeding the S&P 500 with dividends, in absolute and statistically significant quantities, including transaction costs.

the tests against the S&P 500 index with dividends, while Table 6 shows the results of the tests against each strategy's $1/n$ by-and-hold benchmark. As a reference, the second columns in Table 5 shows the quantities that exceeded these benchmarks mentioned previously.

From Table 5 and similar to Shadler and Cotton (2008), the absolute versus statistically significant number of strategies exceeding the S&P 500 is quite different. As greater levels of statistical significance are imposed, fewer strategies exceed it. Under the least restrictive level of statistical significance of 0.15, 56% of the strategies significantly outperformed the S&P 500, dropping to 11% at the most restrictive level of statistical significance of 0.01. Unfortunately, the S&P 500 with dividends is really not the appropriate benchmark to be used to study the efficiency of these ETF-only strategies, as discussed previously. Thus, these statistical tests were also performed against their $1/n$ buy-and-hold benchmark, with the results appearing in Table 6.

Similar to Table 5, Table 6 shows that the absolute versus statistically significant number of strategies exceeding the $1/n$ benchmark is quite different. In fact, only one strategy, the Alpha Trading Strategy, shows outperformance at statistically significant level at the 0.10 level and stronger. Because of its low correlation to its benchmark, we ran an optimization to maximize the correlation of the $1/n$ benchmark that adjusted the allocation levels in each of the 12 positions identified in the Alpha Trading Strategy benchmark. Under this set of optimal weights for each of the 12 positions, the correlation between the Alpha Trading Strategy and it was 34%. More importantly, the Alpha Trading Strategy continued to outperform this alternative optimal benchmark.

When the statistical significance is relaxed to 0.15, 28% of the strategies show statistical outperformance. The other four strategies that outperformed their $1/n$ benchmark are the PowerShares Dynamic Market Strategy, the Tactical Optimization–Moderate Strategy, The Tactical Optimization–Aggressive Strategy, and the Tactical Asset Group–Moderate ETF

Table 6 Number of strategies exceeding their $1/n$ benchmarks

			Significance levels			
			0.01	0.05	0.10	0.15
Quantity exceeding $1/n$ benchmark	13	Quantity exceeding $1/n$ benchmark	1	1	1	5
Percent exceeding	72%	Percent exceeding	6%	6%	6%	28%

This table shows number of strategies exceeding their $1/n$ benchmarks, in absolute and statistically significant quantities, including transaction costs.

portfolio. These results suggest that the $1/n$ benchmarks are an efficient alternative to the actively managed ETF strategies with strong statistical significance. At a weak level of statistical significance of 0.15, approximately one-quarter of strategies outperform these benchmarks.

To evaluate the effect of trading costs on the simulated portfolios, we set trading commissions to zero, and assumed volume was sufficiently high to make bid-ask costs negligible. In this case, Tactical Optimization–Aggressive strategy statistically outperformed its $1/n$ benchmark at 0.10, the Tactical optimization–Moderate outperformed its $1/n$ benchmark at 0.05 level, and the Tactical Optimization–Conservative outperformed its $1/n$ benchmark at the 0.01 level.[5] These results suggest that mean-variance optimization strategies that use ETFs may benefit significantly from lower trading costs, and that the more conservative the strategy, the greater its sensitivity to these costs.

As we are attempting to infer potential outperformance of ETF-only strategies using this sample, an additional adjustment for survivorship bias is made. We believe such a correction is important, because it is very possible that less successful strategies than those found and used in this paper could impact our ability to infer performance about the population of ETF-only strategies. Brown et al. (1992) made estimates on the magnitude of the excess returns on a given sample. Using Brown's worst case of survivorship bias, we assumed that 20% did not survive. For our sample, this suggests that an inference about the population from this sample implies that approximately 4% of strategies outperform their representative benchmark at the 0.10 level, while approximately 22% outperform at the 0.15 level. While this correction does not fundamentally change the findings here, it does provide improved insight into the likelihood that an ETF-only strategy in practice can truly outperform a representative benchmark in a statistically significant way.

6. Conclusions

With the explosive growth of ETFs in the last several years, this paper explored an important and relevant aspect on their use. We identified a number of ETF strategies currently in use or proposed in the recent past, and observed that over 90% outperformed equity markets measured by the S&P 500, while over 70% outperformed a more appropriate $1/n$, or naïve, buy-and-hold benchmark. This observation was based on a sample that included both trading commissions and bid-ask spread costs. To test the significance of the outperformance, we conducted a one-tailed statistical t test on the difference in periodic returns. Strong statistical significance of outperformance against the S&P 500 Index is found in approximately 11% of the sample, increasing to 56% of the sample at a weaker level of significance. Owing to the fact that the S&P 500 is often not an appropriate benchmark, a comparison was also made to a more appropriate benchmark that was representative of a passive investable alternative consistent with each strategy's investment policy. In this case, and after an adjustment for survivorship bias, we found that approximately 4% outperformed a more appropriate benchmark at the 0.01 level. At a weaker level of significance at the 0.15 level, we found approximately 22% of the sample outperformed the $1/n$ benchmark.

These findings suggest that ETF-only strategies may allow individual investors and financial planners to exploit inefficiencies in the equity markets, and to a lesser extent against a $1/n$ buy-and-hold benchmark. The conclusion of the research clearly advances the case of ETFs. Individual investors cannot afford to ignore these potential portfolio enhancing instruments. This is in part because of the fact that some of the ETF-only strategies are made possible by providing exposure to asset classes previously virtually unavailable such as hedge funds or through mutual funds with significantly higher fees and execution problems. However, given the short history of ETFs as available investment products, as well as the weak levels of statistical significance observed here, additional future study of this topic is warranted.

Acknowledgments

Notes

1. http://e-m-h.org/.
2. For strategies implemented and managed through investment advisories, Barclays Global Investors' iShares has begun compiling and distributing historical investment performance quarterly in a document entitled "Managed Solutions Guide."
3. Sharpe ratio is for the five-year period, and is not annualized. Excess returns are determined by the difference between benchmark monthly return and risk free rate. Risk free rate defined as one-month T-bill provided by Ibbotson, and available from Ken French's Website http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/.
4. A complete summary of simulated strategy performance, before fees and costs were deducted, are available from the author.
5. A full list of p-values obtained from testing each strategy is available upon request from the authors.

Appendix: Additional background information on ETF strategies analyzed

1. Sector rotation strategy

The sector rotation strategy was proposed in an online article in September 2005 as a simple, but active strategy to follow sector trends. The sectors were represented by the nine

SPDR ETFs (XLY, XLP, XLE, XLF, XLV, XLI, XLB, XLK, XLU), representing sectors of the S&P 500 Index. To compliment these large cap sectors, the article also suggested 12 style-based Russell iShares ETFs, although it suggested that, in fact, the iShares small cap Russell 2000 ETF (IWM) was a more than sufficient compliment to the nine SPDR ETFs. Consequently, these 10 ETFs were evaluated on a monthly basis using the top two sectors returns based on their most recent six-month period. The article suggested a few different approaches to minimize transaction costs, but because the simplest approach only required 36 trades over five years, or an average of about seven per year, these alternate approaches were not evaluated. The performance presented in this paper assumed the sector rotation strategy used the adjusted closing price reported at the end of each month for each of the ETFs listed.

Selected benchmark: Buy and hold each SPDR ETF and the Russell 2000 ETF with equal amounts.

Source: http://www.etfscreen.com/sectorstrategy.php

2. Alpha trading strategy

Started in June 2008, the Alpha Trading Strategy is a proprietary statistical strategy using a long and short approach. It considers only high volume ETFs, and holds no more than four positions of equal weight at any time. The alpha strategy is based upon a short term estimation of mean reversion and "other statistical triggers", as cited on the strategy's website. The list of high volume ETFs considered included XLF (financial), SPY (S&P 500), XLE (energy), XLI (industrials), DIA (DOW 30), and XLP (consumer staples). Trading signals are generated at 3:54 p.m. EST, a few minutes before markets close, which is presumably sufficient time to execute trades given the high volume of the candidate ETFs. The resulting portfolio can be net long, net short, or market neutral, and are often exited within a few days. For this strategy, the owner of the web site provided back-tested performance data before June 2008, and actual performance thereafter. The back-tested and actual performance included commissions based on using Interactive Brokers LLC, which at $0.007/share and a $100,000 portfolio size, is expected to provide costs comparable to the $7 flat rate assumed for the other strategies.

Selected benchmark: Long and short equal amounts of each candidate ETF considered by the strategy, and do not perform any rebalancing over the historical period.

XLF (financial), long and short
SPY (S&P 500), long and short
XLE (energy), long and short
XLI (industrials), long and short
DIA (DOW 30), long and short
XLP (consumer staples), long and short
Source: http://www.alphatradingstrategies.com/how_it_works.html

3. Ben Stein's long-term portfolio

Published on February 14, 2007, Ben Stein proposed a long-term strategy that tries to capture "big picture themes," where a core equity portfolio should include emerging market exposure. This passive strategy attempts to maintain the following portfolio weights:

30% in Total Stock Market ETF (VTI)
20% in iShares MSCI EAFE Index (EFA)
10% in iShares MSCI Emerging Markets Index (EEM)
10% in iShares Cohen & Steers Realty Majors (ICF)
10% in iShares Russell 2000 Value Index (IWN)
20% in Cash

The portfolio performance was estimated using adjusted month-end adjusted closing prices, and rebalanced once per year assuming a flat rate of $7 per trade. We further assumed that the cash position provided a return over the five-year evaluation period equivalent to the risk free rate associated with one-month *t*-bills.

Selected benchmark: Buy and hold equal dollar amounts of each ETFS listed in the strategy.

Source: http://www.thekirkreport.com/2007/02/ben_steins_mode.html

4. Ben Stein's retirement portfolio

Also published on February 14, 2007, Ben Stein proposed an alternative, more conservative strategy. He suggested that a more conservative portfolio was potentially better suited for those nearing retirement and wishing to target a 5% withdrawal rate over a 30 year retirement phase. This passive strategy attempts to maintain the following portfolio weights.

50% in Streettracks Dow Jones Wilshire Reit ETF (RWR)
50% in iShares Dow Jones Select Dividend (DVY)

The portfolio performance was estimated using adjusted month-end adjusted closing prices, and rebalancing occurred once per year assuming a flat rate of $7 per trade.

Selected benchmark: Buy and hold equal amounts of each ETF listed in the strategy.

Source: http://www.thekirkreport.com/2007/02/ben_steins_mode.html

5. The sower's growth portfolio

Published in February 2007, this strategy was proposed by Jim Lowell, editor of several publications including ETFtrader at Marketwatch and What Every Fideltiy Investor Needs to Know. Designed for "sowing the seeds of growth," he proposed the following allocations for the strategy intended for long-term investors.

25% in iShares MSCI EAFE (EFA)

15% in iShares DJ U.S. Total Market (IYY)
15% in Mid Cap SPDR Trust (MDY)
10% in Diamonds Trust (DIA)
10% in iShares Russell 2000 (IWM)
10% in iShares MSCI Emerging Markets (EEM)
7.5% in Fidelity NASDAQ Composite (ONEQ)
7.5% in Power Shares Dynamic Market (PWC)

This portfolio performance was estimated using adjusted month-end adjusted closing prices, and rebalancing occurred once per year assuming a flat rate of $7 per trade.

Selected benchmark: Buy and hold equal amounts of each ETF listed in the strategy.

Source: http://www.thekirkreport.com/2007/02/jim_lowells_sow.html

6. Powershares dynamic market strategy

From a prospectus published in December 2008 by PowerShares LLC, this strategy is completely defined within a single ETF (PWC). Designed to represent the broad market, the strategy is based on a proprietary index that includes 2,000 U.S. stocks and evaluated based on 25 factors covering aspects of company fundamentals, stock valuation, timeliness, and risk. Because the strategy is entirely represented by a single ETF, portfolio performance was estimated using adjusted month-end adjusted closing prices, but rebalancing was not required. A flat rate of $7 was assumed at the beginning and end of the five-year evaluation period, but given the $100,000 initial size of the portfolio, the impact of this cost was negligible.

Selected benchmark: Buy and hold a broad U.S. stock index adjusted for dividends, identified as the Russell 3000, using trading symbol IWV.

Source: http://finance.yahoo.com/q?s=pwc, http://money.cnn.com/quote/etf/etf.html?symb=pwc

7. Powershares dynamic OTC strategy

This strategy was also published in a prospectus on December 2008 by PowerShares LLC, and is completely defined within a single ETF (PWO). It represents OTC stocks tracked by a proprietary index. Because the strategy is entirely represented by a single ETF, portfolio performance was estimated using adjusted month-end adjusted closing prices, but rebalancing was not required. A flat rate of $7 was assumed at the beginning and end of the five-year evaluation period, but given the $100,000 initial size of the portfolio, the impact of this cost was negligible.

Selected benchmark: Buy and hold a midcap growth index adjusted for dividends, identified as the Russell midcap growth, using trading symbol IWP.

Source: http://finance.yahoo.com/q?s=pwo, http://money.cnn.com/quote/etf/etf.html?symb=pwo

8. Switch fund strategy

In an investor newsletter from Formula Research dated December 30, 2003, a strategy was proposed that switches between the S&P 500 Index and cash, depending upon relative strength between the Russell 2000 value and growth indices. The relative strength calculation is based on the value-based ETF (IWN) and the growth-based ETF (IWO) returns from the previous one and two months. Over the five year evaluation period, this approach required 39 trades (approximately 8 per year) in and out of the ETF SPY, our proxy for the S&P 500 Index. This portfolio performance was estimated using adjusted month-end adjusted closing prices, and assumed a flat rate of $7 per trade.

Selected benchmark: Buy and hold 50% S&P 500 Index using trading symbol spy, and hold 50% cash.

Source: http://www.mcoscillator.com/download/special/formrsch7–3.pdf

9. Lyxor ETF wise quantitative strategy

From Lyxor Asset Management, the Lyxor ETF WISE quantitative strategy tracks the performance of a proprietary index based on nearly 200 European equities. The index is reported to be based on a bottoms-up selection process using valuation premium on growth stocks and earnings surprises affecting momentum. As its prospectus suggests, the ETF tracks an index designed to exploit the valuation premium on growth stocks and price momentum generated by earnings surprises. For this strategy, the web source provided back-tested performance data before November 2007, and actual performance based on the symbol WIS.PA thereafter. The back-tested and actual performance included commissions based on a flat rate of $7 assumed at the beginning and end of the five-year evaluation period. Given the $100,000 initial size of the portfolio, this impact of this cost was negligible.

Selected benchmark: Buy and hold 100% of a broad European ETF identified as the SPDR DJ Euro STOXX, using trading symbol FEZ.

Source: http://lyxoretf.com, http://www.reuters.com/finance/stocks/chart?symbol=wis.pa

10. Tactical optimization–conservative

The tactical optimization strategy was developed by the author over the last several years. The low risk version performs a nonlinear optimization to maximize the difference between expected return and risk, with a higher weight given to risk. Risk is measured directly by standard deviation of daily returns, and return is measured on an absolute basis. The optimization is based on total price change, daily return variation, and daily return covariance of a group of ETF that, as of December 30, 2008, had a market capitalization of more than $500M. The selection includes ETFs from the majority of asset classes available as ETFs. Over the five-year evaluation period, candidate ETFs also required a minimum of six-months of price history, and a correlation coefficient against the other candidate ETFs over this period of less than 80%. To further reduce risk associated with a single ETF, the optimization

constrained the portfolio weights to 15%. Portfolio performance was estimated using adjusted month-end adjusted closing prices, and rebalancing occurred once per quarter assuming a flat rate of $7 per trade.

Selected benchmark: Buy and hold 19 categories included in the strategy with equal weight. Excluded currencies because insufficient return history in a broad currency index. These categories and corresponding ETFs are:

1. Large cap domestic equity–SPY
2. Large cap foreign equity–EFA
3. Emerging markets–EEM
4. Commodities–PIMCO Commodity Real Ret Strat Instl (PCRIX)
5. Midcap domestic–MDY
6. Bonds–AGG
7. Small cap domestic equity–IWM
8. Domestic sectors–XLY, XLP, XLE, XLF, XLV, XLI, XLB, XLK, XLU
9. Domestic shorts–short Spy
10. Real estate–IYR
11. Currency–excluded.

Source: http://www.totalcapitalmanagement.com

11. Tactical optimization–moderate

This strategy is identical to the description above for the low risk tactical optimization, except it utilized an objective function that applies equal weights to risk and return. Performance is also based on back-tested results that include commissions and the effect of bid-ask spread.

Selected benchmark: Buy and hold 19 categories included in the strategy with equal weight. Excluded currencies because insufficient return history in a broad currency index.

Source: http://www.totalcapitalmanagement.com

12. Tactical optimization–aggressive

This strategy is identical to the description above for the low risk tactical optimization, except it utilized an objective function that applies a higher weight to return, and consequently a lower weight to risk. Performance is also based on back-tested results that include commissions and the effect of bid-ask spread.

Selected benchmark: Buy and hold 19 categories included in the strategy with equal weight. Excluded currencies because of insufficient return history in a broad currency index.

Source: http://www.totalcapitalmanagement.com

13. Long/short balanced program strategy

The stated investment objective from Astor Asset Management LLC states "...by purchasing long equity ETFs of diversified noncorrelating market sectors and averages. Conversely, the Astor Long/Short Balanced Program will utilize defensive positioning during contractions, which can range from cash positioning to using ETFs with inverse market exposure."

Selected benchmark: Buy and hold equal amounts in 11 positions, including nine sectors SPDRs (XLY, XLP, XLE, XLF, XLV, XLI, XLB, XLK, XLU) as well as short position in SPY, and cash based on one-month *t*-bill rate.

Source: Quarterly fact sheet available at http://www.astorllc.com

14. Style preferred growth program strategy

The stated investment objective from Astor Asset Management LLC states The Astor Style Preferred Growth Program has an actively managed portfolio allocation to large, mid, and small cap domestic and international ETFs, along with allocations to both specialty sector and fixed income ETFs. By analyzing various economic indicators as they relate to the markets, we overlay the ETF management with a tactical ETF strategy designed to help limit drawdowns and volatility in the portfolio.

Selected benchmark: Buy and hold equal amounts in large, mid and small domestic equities (SPY, MDY, IWM), international equities (EFA), as well as a broad fixed income ETF (AGG).

Source: Quarterly fact sheet available at http://www.astorllc.com

15. Tactical asset group–conservative ETF portfolio

The description from the investment advisory describes the strategy as one tactically allocated towards global equity and fixed income. It further states that for this particular portfolio, it targets a long-term annual return in positive markets of 4–6%. It also states that equities are measured by MSCI World Equity index, and bonds are measured by Barclays Capital Global Aggregate Bond index.

Selected benchmark: Buy and hold equal amounts in domestic equities (SPY), international equities (EFA), as well as a broad fixed income ETF (AGG).

Source: Quarterly performance summary sheet available at http://www.tagllc.net

16. Tactical asset group–moderate ETF portfolio

The description from the investment advisory describes the strategy as one tactically allocated towards global equity and fixed income. It further states that for this particular portfolio, it targets a long-term annual return in positive markets of 7–9%. It also states that

equities are measured by MSCI World Equity index, and bonds are measured by Barclays Capital Global Aggregate Bond index.

Selected benchmark: Buy and hold equal amounts in domestic equities (SPY), international equities (EFA), as well as a broad fixed income ETF (AGG).

Source: Quarterly performance summary sheet available at http://www.tagllc.net.

17. Tactical asset group–aggressive ETF portfolio

The description from the investment advisory describes the strategy as one tactically allocated towards global equity and fixed income. It further states that for this particular portfolio, it targets a long-term annual return in positive markets of 10%. It also states that equities are measured by MSCI World Equity index, and bonds are measured by Barclays Capital Global Aggregate Bond index.

Selected benchmark: Buy and hold equal amounts in domestic equities (SPY), international equities (EFA), as well as a broad fixed income ETF (AGG).

Source: Quarterly performance summary sheet available at http://www.tagllc.net

18. Foxhall global growth strategy

The description from the investment advisory describes a strategy as that is a 100% equity portfolio, with allocations to global developed markets, Pacific Rim and Global Emerging Markets, and Global Hard Assets.

Selected benchmark: Buy and hold equal amounts in broad US equities (IWV), international equities (EFA), and emerging markets (EEM). No global hard asset equities were identified with a sufficient history. Neglecting this aspect of the strategy is not considered significant in the benchmark because the strategy states that a base line asset allocation for this component is 10%.

Source: Quarterly performance summary sheet available at http://www.tagllc.net

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