The Financial Planner, Exchange Traded Funds, and ETF Trading Strategies to Enhance Client Wealth Maximization

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PART I: 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, 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 is little empirical information on the investment performance of pragmatic ETF investment strategies.

This paper addresses this issue, by examining the performance of pragmatic ETF investment strategies published either on a regular basis or are otherwise available through investment advisories. The objective is to determine if ETF strategies can 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, and it provides a pragmatic way for financial planners to develop strategies that "beat the market."

PART II: BACKGROUND

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.

Indeed, Poterba and Shoven (2003) have described ETFs as "prototypes for the next generation of the mutual fund industry". Because of the ever increasing number of ETFs (now in excess of 800), as well as the change in 2008 of the rules of the Securities and Exchange Commission that now allows for actively managed ETFs as opposed to in-actively managed "index" strategies, the time to research ETFs has never been more pronounced. Figure II-1 shows the growth of ETFs available to individual investors, and highlights those ETFs that, as of Dec. 31, 2008, had over $35M in assets. We use this approach to highlight the growing quantity of ETFs that serve small niches of the capital markets, but may not obtain enough capital to continue operating in the crowded ETF marketplace.

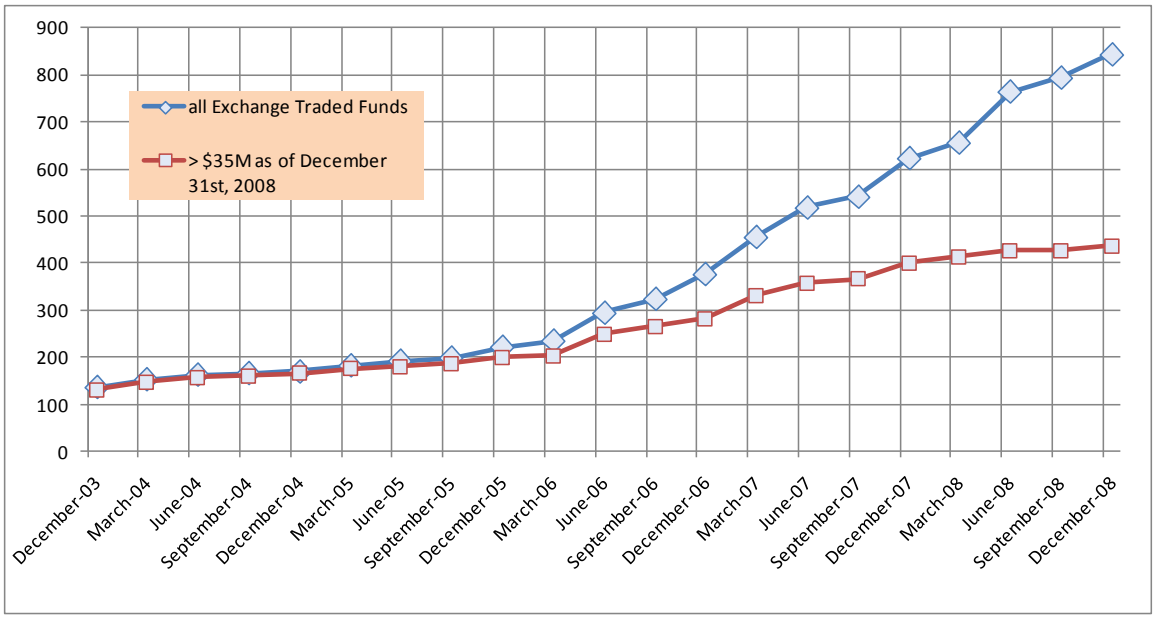

Figure II-1: Quantity of ETFs Over 5-year time horizon ending December 31, 2008

Structure and Types of ETFs

ETFs are structured as an investment vehicle that trades throughout the day like a stock. They carry tax benefits by minimizing capital gains, are often very liquid, and offer transparency in their holdings. The first ETF was established in 1993 by State Street Global Advisors under the symbol SPY. As of December 31, 2008, available ETFs could be broken up into the following categories and subcategories[1].

Domestic Equity - Large Caps, Mid Caps, Small Caps, Sectors
Foreign Equity - Large Caps, Emerging Markets
Commodities
Bonds - Short Term Corporate, Intermediate Term Corporate, Long Term Corporate, Investment Grade, High Yield, US Government, International
Synthetic shorts - Domestic Equity, International equity
Currencies
Real Estate/REITs
Private Equity

[1] http://finance.yahoo.com/etf/browser/op?f=0&c=0

Proprietary Indices

Investment Uses

ETFs are used by many different types of investors, including individual investors, institutions, and hedge funds. The motivation to use ETFs includes reducing costs, diversification, as well as ETF unique strategies, such as those that will be discussed in detail in Section IV. One popular approach gaining attention is 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)

ETFs versus Mutual Funds

There are many differences between ETFs and Mutual funds. First, ETFs passively track an index, while mutual funds may be actively managed, in hopes of beating their respective benchmark. Even in the case of passively managed index mutual funds like those from Vanguard, studies have shown that 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)

In addition, ETFs can at times trade at a premium or discount to their net asset value (NAV), while end of day NAV defines the price of an open ended mutual fund. Mutual funds also may have front end or back end loads, while ETFs do not. Lastly, ETFs can be traded throughout the day and incur commission costs, while mutual funds (normally) only trade at the end of the day and usually do not deduct commission costs associated with the transaction.

Criticisms of ETFs

While many benefits exist for ETFs, they are certainly not without their own criticisms. One criticism focuses around the low volume and resulting large bid-ask spread of some ETFs. This can add liquidity risk and reduce profit. Second, there is now significant overlap amongst ETFs, where in some cases, several ETFs track the same or very similar index. Trading commissions are also an area for concern, particularly if an investor is trying to dollar-cost-average through payroll contributions to a retirement account. Other critics suggest that ETFs have become too focused and specialized. For these ETFs, only a few companies make up the underlying index, increasing firm-specific risk. Lastly, many ETFs attempt to be tax efficient by minimizing capital gains distributions, but some fail at this as well. As recently as December 23rd, 2008, many of the ProShares® synthetic short ETFs issued dividends of approximately 20% of their value. Such a large dividend distribution can create a tax burden, as well as unbalance a portfolio's hedge of short versus long positions. Nonetheless, such criticisms appear to be more than outweighed by inverse ETF benefits in a downward trending market, where assets in inverse ETFs grew by over 100% in the 1st half of 2008. (Morgan, 2008)

PART III: RESEARCH HYPOTHESES

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 a broad market benchmark on an absolute and/or risk-adjusted basis. To test this hypothesis, we used the S&P 500 as the benchmark, and conducted

hypothesis testing similar to that described by Schadler and Cotton (2008). To provide practical evidence, we test the hypotheses when nominal trading costs are included against the size of a portfolio held by a typical investor.

PART IV: RESEARCH METHODS

This study analyzed ETF strategies available from publicly available sources, such as blogs, web sources or newsletters. Table IV-1 below summarizes 19 such strategies, but we eliminated several that could not support a 5-year price or performance history. The strategies identified represented the result of an intensive search, but is by no means exhaustive, as new ETF strategies continue to emerge. The hypothesis tests that follow are based on the subset of ETF strategies that provided at least five years of historical price or returns on a month-end basis. Strategies that are numbered with a "*" were not included because of insufficient historical price or return history. A short summary of each strategy, including ETF symbols and trading frequency is also included in Table IV-1. Additional information on each strategy is included in Appendix A, which also shows the website, blog, or investor newsletter for each of the ETF strategies.

No.	ETF Strategy Name	Strategy Summary, including Symbol(s) (if any)	5-year study candidate (Jan 2004 - Dec. 2008)
1	Sector rotation strategy	10 ETFs analyzed for strongest returns. Continually top two sectors. - 9 from SPDR select sector ETFs - 1 from style-based Russell iShares ETFs Averages 7 trades per year.	yes
2	Alpha trading strategy	Statistical mean reversion and other statistical tests applied to high volume ETFs. - Hold no more than 4 at one time. - Long and short positions included. - Strategy trades every 1-3 days.	yes
3	Ben Stein's Long-Term Portfolio	Annually rebalance to include the following: - 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) - 10% in Cash	yes
4	Ben Stein's Retirement Portfolio	Annually rebalance to the following: - 50% in StreetTracks Dow Jones Wilshire REIT ETF (RWR) - 50% in iShares Dow Jones Select Dividend (DVY)	yes

5	The Sower's Growth Portfolio	Annually rebalance to the following: - 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)	yes
6	Broad Quant Strategy #1	PWC - PowerShares Dynamic Market Portfolio - buy and hold ETF that tracks a proprietary index	yes
7	Broad Quant Strategy #2	PWO - PowerShares Dynamic OTC Portfolio - buy and hold ETF that tracks a proprietary index	yes
*	Broad Quant Strategy #3	PIV - Value Line Timeliness Select Portfolio (PIV) - buy and hold ETF that tracks a proprietary index	no
8	Switch Fund Model	Switch to equities if growth is relative strength leader over value. Otherwise, stay in cash. Averages 8 trades per year. IVV - S&P 500 IWO - Russell 2000 growth IWN - Russell 2000 value	yes
9	Lyxor Asset Management	Bottom up selection process, attempting to exploit the valuation premium on growth stocks and price momentum generated by earnings surprises	yes

*	Efficient Market Portfolios - taking income	ETF blend based on Modern Portfolio Theory: core bond (BND), cash, large cap stocks (SPY), 1-3 yr debt securities (CSJ), REITs (IYR), International (EFA), High yield bonds (HYB), small cap stocks (IWM), preferred stocks(PFF), mortgage back securities, mid cap stocks (MDY), homebuilders (XBH).	no
*	Efficient Market Portfolios - 2 to 5 years	Same as above for "taking income" Efficient Market Portfolios	no
*	Efficient Market Portfolios - 6 to 10	Same as above for "taking income" Efficient Market Portfolios	no
*	Efficient Market Portfolios - 11 to 19	Same as above for "taking income" Efficient Market Portfolios	no
*	Efficient Market Portfolios - 20+	Same as above for "taking income" Efficient Market Portfolios	no
10	Tactical Optimization - low risk	Constrained optimization using long and short ETFs with > $500 M under management. Maximize the difference between a return and risk, with a higher weight given to risk.	yes
11	Tactical Optimization - med risk	Similar to tactical optimization - low risk. Maximizes the difference between a return and risk, with equal weights given to risk and return.	yes
12	Tactical Optimization - high risk	Similar to tactical optimization - low risk. management. Maximizes the difference between a return and risk, with a higher weight given to return	yes

Table IV-1: 19 ETF Strategies Reviewed and 12 Selected for Hypothesis Testing (Source: various, please see Appendix A)

Twelve strategies in Table IV-1 were subjected to a five year review ending December 31, 2008. In all cases, the resulting statistical tests were based on monthly returns, and compared with an overall benchmark ETF for the S&P 500 index. The comparison of the strategies against the benchmark was done considering both absolute return and risk adjusted Sharpe ratio with a zero risk free rate. In all cases, we included the effects of trading costs at $7 per trade against a starting portfolio size of $100,000. For completeness of the statistical tests, we also determined the level of statistical significance that is observed when the sample of 12 strategies exceeds the S&P 500 benchmark ETF.

It is worthwhile to note that back-tested results were used for a majority of the ETF strategies listed above. In each case, month end closing prices were used to simulate buy and sell activity, so the effect of bid-ask spread and market liquidity were not included directly. Instead, we included the cost associated with the bid-ask spread by fitting data provided by Agrrawal and Clark (2009), which appears in Figure IV-1. The value of R^2 = 94% obtained from the power-law model suggests that a significant amount of the variation has been explained between the bid-ask spread and the 3-month trailing volume. Applying this power law regression model against hypothetical trades using month end closing price and volume increased the cost of trades, and provides an improved estimate of actual strategy performance shown in the following section.

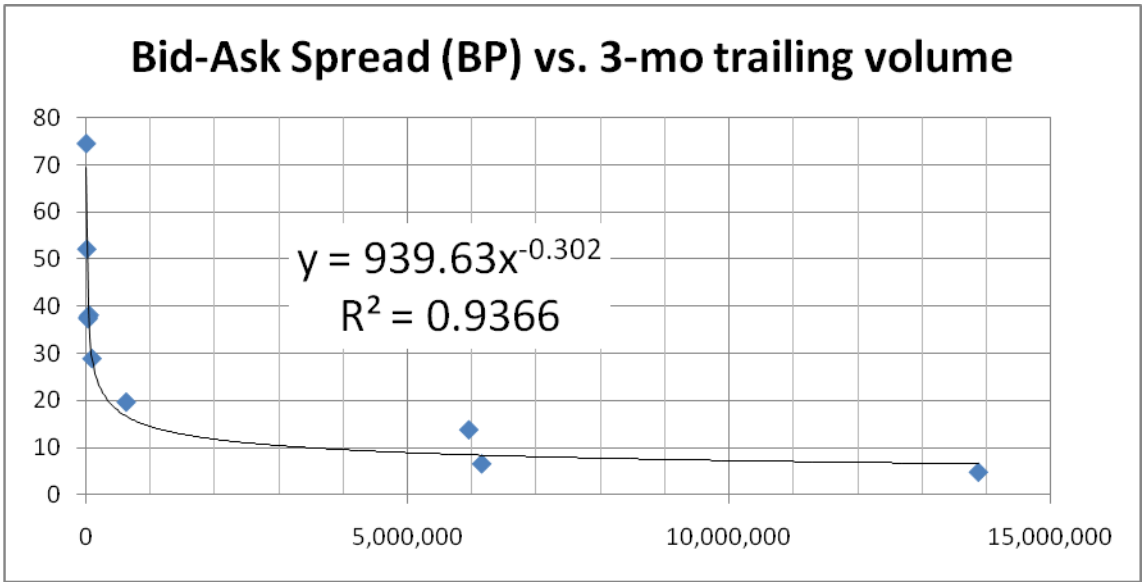

Figure IV-1: Bid-Ask Spread, in Basis Points (BP) versus Three Month Moving Average Volume, with Power Law Regression model and Goodness of Fit Measure, R^2.

PART V: RESULTS FROM ETF STRATEGY PERFORMANCE

No.	ETF Strategy	Cumulative Return	Annualized Return	Annualized Standard Deviation	Annualized Adjusted Sharpe Ratio
1	Sector rotation strategy	11.9%	2.27%	15.8%	0.14
2	Alpha trading strategy	329%	33.8%	22.5%	1.50
3	Ben Stein's Long-Term Portfolio	9.63%	1.86%	13.2%	0.14
4	Ben Stein's Retirement Portfolio	-6.42%	-1.32%	18.30%	(0.07)
5	The Sower's Growth Portfolio	0.17%	0.03%	15.70%	0.00
6	Broad Quant Strategy #1	-2.16%	-0.43%	14.6%	(0.03)
7	Broad Quant Strategy #2	-16.1%	-3.45%	17.9%	(0.19)
8	Switch Fund Model	6.25%	1.27%	7.07%	0.18
9	Lyxor Asset Management	30.71%	5.50%	21.6%	0.25
10	Tactical Optimization - low risk	37.80%	6.62%	5.20%	1.27
11	Tactical Optimization - medium risk	48.65%	8.25%	10.7%	0.77
12	Tactical Optimization - high risk	45.18%	7.74%	13.9%	0.56
	Sample Mean	41.22%	5.18%	15.5%	0.33
	Sample Mean Adjusted for Survivorship Bias	36.12%	4.18%	15.5%	0.27

S&P 500 (SPY)	-11.20%	-2.34%	12.8%	(0.18)

Table V-1: Cumulative Returns, Annualized Returns, Standard Deviations and Risk-adjusted Return over 5-year Period vs. S&P 500 Benchmark ETF assuming $100,000 investment with $7/trade commissions.

The data in Figure V-1 provides a summary of the performance of the 12 strategies selected in part IV of this study. The annualized returns are based on the geometric mean over the 5-year period, while the Sharpe ratio and standard deviation are measured on monthly returns, equivalent to the approach used by Schadler and Cotton (2008). The absolute return is reflected by either the cumulative or average annual return. Table V-1 indicates that, on an absolute return basis, over 90% of the strategies (11 of the 12 strategies sampled) exceeded the S&P 500 index ETF, which was assumed to be the State Street Global Advisors ETF with symbol SPY. This result implies that, on an absolute return basis, without regard for risk or statistical significance, nearly all the strategies sampled outperform our selected benchmark.

To examine this apparent outperformance in greater detail, risk was considered by evaluating the adjusted Sharpe ratio. As can be seen from Table V-1, the adjusted Sharpe ratios were similar to the absolute returns, with again nearly all (11 out of 12) providing excess risk-adjusted returns. The majority of strategies outperforming the benchmark on a risk-adjusted basis suggest that ETF strategies have the ability to outperform the S&P 500 benchmark, and do so by taking a proportionate amount of risk. Thus, the results from Table V-1 confirm our expectation on some market inefficiencies, so that it appears likely that ETF strategies could outperform a broad market benchmark on a risk-adjusted basis.

Therefore, when considering trading costs (commissions and bid-ask spread) and risk, and recognizing that portfolio volatility is less sensitive to the nominal costs associated with constructing and managing the type of ETF strategies within our sample, an investor may find that there is clear support for ETF-only strategies as a supplement to an existing portfolio. In addition, the results in Table V-1 suggest that the risk-adjusted performance can be improved over the S&P 500 benchmark for portfolios starting with at least $100,000, provided the transaction costs stay in line with current discount broker charges, which were assumed here to be $7 per trade.

To further examine the question of market efficiency that could be exploited by financial planners who utilize ETF strategies, we conducted statistical tests of hypothesis against the absolute and risk-adjusted returns. The results of these tests appear in Table V-2 and V-3 below, and are based on a 1-tailed t-test against the S&P 500 index.

As we are attempting to infer potential outperformance of ETF-only strategies using this sample, an additional adjustment for survivorship bias in Table V-1 appears. We believe such a correction is important, because it is very possible that less successful strategies than those found in Table V-1 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. To bound the worst case of survivorship bias influencing the results in Table V-1, we assumed that 20% did not survive, leading to a 80 basis point average annual excess return. We also included an additional 20 basis points to cover other factors, such as serial correlation of returns, dispersion of styles across managers, etc. (Bodie et al, 2005) After making this correction for survivorship bias, it appears that nearly all strategies continue to outperform out selected benchmark on an absolute return basis.

Sample Size	Sample Mean	Sample Standard Deviation	Test Statistic	p-value
12	4.18%	9.75%	2.31	0.020

Table V-2: Annualized Return Hypothesis Test Results

Sample Size	Sample Mean	Sample Standard Deviation	Test Statistic	p-value
12	0.27	0.54	2.88	0.007

Table V-3: Sharpe Ratio Hypothesis Test Results

Table V-2 reinforces the observation made previously, that on an absolute return basis, many ETF strategies appear to beat the S&P 500 benchmark over the 5-year study period with a p-value of 0.020. The p-value associated with the Sharpe ratio hypothesis test is 0.007, indicating greater statistical significance against the S&P 500 than the annualized returns.

In an attempt to assess the affect of outliers within the 12 strategy sample, the hypothesis test was re-run without strategies #2 and #10, the "Alpha Strategy" and the "Tactical Optimization – Low risk". These are two outliers with Sharpe ratios of 1.50 and 1.27, respectively, making them the two highest performing strategies on a risk adjusted basis. Arguably, they should not be completely discounted, since one is within two standard deviations of the sample mean of 0.27 (i.e. 0.27 + 2*0.545 = 1.36). Nevertheless, when excluded, and the sample size is reduced to 10, the mean and median before correcting for survivorship bias appear more closely aligned, with vales of 0.15 and 0.14, respectively, versus a mean and median of 0.33 and 0.16 before these apparent outliers were removed. Revisiting the hypothesis test illustrated in Table V-3 yields a p-value of 0.009. Thus, we still have strong statistical significance at greater than the 0.01 level, suggesting that ETF-only strategies provide higher risk adjusted returns than our selected benchmark.

The effect of statistical significance can also be presented by calculating the percent of strategies' individual statistics that exceed an associated critical value at a given level of significance. As we see in Table V-4, adjusting statistical confidence leads to the different likelihoods that ETF strategies beat the index on an absolute return basis.

Table V-4 also illustrates that all levels of statistical significance, there are notable probabilities that ETF strategies generate returns in excess to the S&P 500 benchmark. Again, this confirms what we observed earlier, that there appear to be market inefficiencies that ETF-only strategies appear to be exploiting. We believe this result reinforces De Jong and Rhee's (2008) study of ETF-only strategies using both momentum and contrarian methods that demonstrated abnormal returns at a 0.01 level of statistical significance.

	Significance Level		
	0.01	0.05	0.10
Percent of Strategies' Annualized Returns that beat index (n=12)	**42%**	**42%**	**58%**

Table V-4: Percent of Strategies with Annualized Returns that Exceed Benchmark

Lastly, the percent of strategies' Sharpe ratios that exceed the S&P 500 benchmark were calculated and appear in Table V-5 over various levels of statistical significance. The results here suggest that over one third of ETF strategies have a high statistical confidence at the p=0.01 level, which based on a level higher than seen in Table V-4, implies that a few strategies are extremely effective at managing risk against return. It also implies that a larger sample of ETF strategies (i.e. greater than 12) may be warranted to obtain a better understanding of ETF strategies employed over a 5-year period of study.

	Significance Level		
	0.01	0.05	0.10
Percent of Strategies' Sharpe Ratio that beat index (n=12)	**42%**	**67%**	**67%**

Table V-5: Expected Percent of Strategies with Mean Risk-adjusted Returns that Exceed Benchmark

PART VI: CONCLUSIONS

With the explosive growth of Exchange Traded Funds (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 there was statistical evidence indicating some inefficiencies in the market may have been exploited. This observation was based on a sample that included both trading commissions, bid-ask spread, survivorship bias, and an adjustment for risk. Our observations also held up well when the two highest performing outliers were removed from the sample. Thus, our findings support our original hypothesis, that ETF portfolios could be used by financial planners in a variety of ways to help their clients "beat the market".

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Appendix A: Additional background notes on ETF strategies

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 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 6-month period. The article suggested a few different approaches to minimize transaction costs, but because the simplest approach only required 36 trades over 5 years, or an average of about 7 per year, these alternate approaches were not evaluated. The performance presented in this paper assumed the sector rotation strategy used the closing price reported at the end of each month for each of the ETFs listed. *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 pm 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.
Source: http://www.alphatradingstrategies.com/how_it_works.html

3 Ben Stein's Long-Term Portfolio Strategyu

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 closing prices, and rebalanced once per year assuming a flat rate of $7 per trade. We further assumed that the cash position provided a 3% annual return over the 5-year evaluation period.
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 closing prices, and rebalancing occurred once per year assuming a flat rate of $7 per trade.
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 closing prices, and rebalancing occurred once per year assuming a flat rate of $7 per trade.
Source: http://www.thekirkreport.com/2007/02/jim_lowells_sow.html

6 Broad Quant Strategy #1

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 closing prices, but rebalancing was not required. A flat rate of $7 was assumed at the beginning and end of the 5-year evaluation period, but given the $100,000 initial size of the portfolio, the impact of this cost was negligible.
Source: http://finance.yahoo.com/q?s=pwc

7 Broad Quant Strategy #2

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 closing prices, but rebalancing was not required. A flat rate of $7 was assumed at the beginning and end of the 5-year evaluation period, but given the $100,000 initial size of the portfolio, the impact of this cost was negligible.
Source: *http://finance.yahoo.com/q?s=pwo*

8 Switch Fund Model

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 1 and 2 months. Over the 5 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 closing prices, and rebalancing occurred once per year assuming a flat rate of $7 per trade.
Source: http://www.mcoscillator.com/download/special/FormRsch7-3.pdf

9 Lyxor Asset Management

From Lyxor Asset Management, the Lyxor ETF WISE quantitative strategy tracks the performance of a proprietary index based on nearly 200 European equities. 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 5-year evaluation period. Given the $100,000 initial size of the portfolio, this impact of this cost was negligible.

*Source:*http://lyxoretf.com,http://www.reuters.com/finance/stocks/chart?symbol=WIS.PA

10 Tactical Optimization - low risk

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 Dec. 30th 2008, had a market capitalization of more than $500M. The selection includes ETFs from the majority of asset classes listed in Section II of this paper. Over the 5-year evaluation period, candidate ETFs also required a minimum of 6-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 closing prices, and rebalancing occurred once per quarter assuming a flat rate of $7 per trade.
Source: http://www.totalcapitalmanagement.com

11 Tactical Optimization - med risk

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.
Source: http://www.totalcapitalmanagement.com

12 Tactical Optimization - high risk

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.
Source: http://www.totalcapitalmanagement.com