ON THE SIGNIFICANCE OF RETURNS ACHIEVED WITH EQUAL SECTOR WEIGHTED PORTFOLIOS

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Abstract

For years, the market portfolio has been a bastion of long term returns for the passive investor. With the launch of SSGA's Select Sector SPDR ETFs has come evidence that a portfolio weighted equally among the sectors of the S&P 500 has outperformed the market over the past 10 years on both an absolute and risk adjusted basis. In this paper we test the outperformance of such an equally weighted portfolio against an expanded dataset to that of Sturm (2010) and that offered by the SPDR marketing material. By using sector index data for the S&P 500, the S&P TSX, and an approximation for an expanded set of Select Sector SPDR ETF returns, we find that returns of Equal Sector portfolios tend to be less volatile than the market, and also that the Equal Sector strategy tends to outperform on a risk-adjusted basis during heightened market volatility. But, we also find that the periodic excess returns of an Equal Sector strategy are not statistically significant over the period of December 31, 1989 to December 31, 2009, suggesting that excess returns of an equal sector strategy may be transitory, and therefore unreliable.

Keywords: Select Sector, SPDR, Equal Weight, Portfolio, Strategy, S&P, 500, TSX

Dedication

We dedicate this paper to retail investors, who as of 2005 represented just over 25% of US equities ownership (down from nearly 90% many years earlier).[1]

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[1] Securities Industry & Financial Markets Association, Fact Book 2007

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Introduction

In December of 1998, State Street Global Advisors (SSGA) launched the *Select Sector SPDRs* (Sector SPDRs), a set of nine Exchange Traded Funds (ETFs) tracking the returns of the individual sectors that compose the S&P 500 Index. "Together, the nine Select Sector SPDRs represent the S&P 500 as a whole. However, each Select Sector SPDR can also be bought individually," explains SSGA's *Select Sector SPDR* website. It is this ability to manage your exposure to each sector that makes the Sector SPDRs appealing. Reading further, the website explains that in fact, an *Equal* Sector Strategy has outperformed the S&P 500 over the past 10 years.

As opposed to simply buying the cap weighted market portfolio, or weighting each sector based upon an active strategy, the Equal Sector Strategy (ES Strategy) suggests that outperforming the market is achievable simply by holding each sector with equal weight. The Select SPDR website provides performance details of a hypothetical $10,000 investment in an ES Strategy, and compares it with an identical investment in the S&P 500 Index over the period of December 2000 to December 2010. Interestingly, the quarterly rebalanced example outperforms the Index with a return of $4,663 (3.9%[2]) over the period versus $1,507 (1.4%) for the S&P 500. We found this notably intriguing as it requires very little manager influence. Over time, as the sectors over or under-perform in relation to one-another, the only management required would be to periodically rebalance back to an equal weighting.

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[2] All returns are stated as annual equivalent rates (AER) unless otherwise specified.

In the Capital Asset Pricing Model (CAPM) framework, it is the market clearing portfolio in particular that is the portfolio with the highest Sharpe Ratio. Yet, with monthly rebalancing, Sturm (2010) finds substantially higher Sharpe and Treynor ratios, with positive excess monthly returns of 4%[3], and an Alpha of 0.003[4]. In his conclusion, he states that:

> *…an equally weighted portfolio of the sector funds reliably outperforms the SPY over all measures of performance during the sample period January 2000-December 2007. This result is interesting because it is easily replicable by individual investors…*

Sturm's findings, using a sub-set of the data in the Sector SPDR marketing material, lend further credibility to the Equal Sector Strategy. Yet, in his introduction, Sturm warns that:

> *… the evidence in this paper should be viewed as preliminary because the Select Sector SPDRs have only been available for about nine years – a little more than 2 business cycles.*

In our paper, we seek to clarify whether an Equal Sector Strategy is reliably a superior alternative than holding the market portfolio. To verify and expand the tests of outperformance employed by Sturm and as presented in the Sector SPDR marketing material, we will construct an elongated dataset and perform statistical tests of the performance of ES Strategies against a market benchmark. Further, we will discuss explanations for sub-optimality of the market portfolio, and possible reasons for the outperformance of an ES strategy in particular.

Literature Review

Fama (1965) finds independence amongst consecutive price changes across time. This random behavior implies that there is an efficient market for securities, and actual prices are suitable

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[3] Significant at the 0.05 level.
[4] Significant at the 0.01 level.

estimators for intrinsic value. From these characteristics, he suggests that the market portfolio cannot be consistently outperformed.

Sturm (2010) introduces the Sector Select ETFs and asks if there is any sense in holding all nine of the available sector ETFs rather than one SPY, the ETF for the broad market. To address this question, he discusses a number of ways to weight the sectors separately, and tests their performance using 96 monthly observations. In his paper, he discusses buy and hold, overcorrection, momentum, 52-week high, mean-variance optimization, and finally, equal weighted strategies.

As an example of one of his analysis, Sturm examines sector fund returns based on their 6- and 12-month highs. Ranking the funds, he implements a 52-week high strategy, buying the four funds that exhibit the highest "price-to-high-price" ratio (where price is the price of a fund at the end of the month, and high price refers to the fund's highest price within the look-back period). He shorts the four sector funds with the smallest ratios. His findings are consistent with those of George and Hwang (2004), who find that the average monthly return for the 52-week high portfolio will outperform the momentum strategy. So, although this technique is superior to the momentum strategy, neither of these is able to outperform the equal sector strategy.

For his optimal risky portfolio (ORP), Sturm derives weights using a Markowitz mean-variance strategy for each year throughout the sample. He presents performance measures for a long-only ORP strategy, a long/short ORP strategy (in which the investor can short up to 5% of any sector), the ES strategy, and a market portfolio (long) strategy. His results show that the ES strategy is the only one that significantly outperforms the market, and concludes that the more complicated Markowitz mean-variance strategy does not create excess returns. In particular, he states that “an equally weighted portfolio of the nine Select Sector funds appears to outperform the S&P 500 SPDR over not only the sample period, but each year in the sample period.”

But Sturm also discusses some limitations to his findings. He recognizes that he has used a small sample size, so he addresses the stability of the returns each year using the differences between average monthly returns and Sharpe ratios, as well as Alphas, to check for trends and outliers. He finds stability and consistency pertaining to all his tests, implying that the outperformance of the equal sector portfolio is reliable. Next, he notes that his tests do not consider transaction costs, and that the expenses incurred would vary, depending on the specific strategy. Since the equal sector strategy generated significant results, he points out that the cost to implement this strategy must be less than the average excess monthly returns to provide any benefit.

Schwert (2003) claims that anomalies have historically tended to disappear once they have been documented, as research leads to more efficient markets. He addresses the question of whether or not a number of anomalies have provided opportunities to profit in the past, including: Data snooping, the size effect, the turn-of-the-year effect, the weekend effect, the momentum effect, short-term interest rates, expected inflation, and stock returns, and dividend yields and stock returns. Of the anomalies mentioned, the size effect and momentum effect are of particular interest to this paper.

Ferguson and Schoefield (2010) claim that the “small-stock effect” is often cited as the explanation of greater returns in equal weight portfolios. The size effect stems from empirical research showing that small-capitalization firms have earned higher average returns than what the CAPM would predict. However, implementing tests based on a portfolio consisting of only small companies benchmarked against a the market portfolio, Schwert finds that no period tested led to a Jensen's Alpha significantly different than zero. He concludes that the small-firm anomaly has disappeared. This is important, as the small size effect has long been considered a reason for outperformance.

DeBondt and Thaler (1985, 1987) find a contrarian anomaly, stating that past losers have had higher average returns than former winners. This explanation for outperformance can be extended easily to the rebalancing schedules of an equal weighted portfolio, as the manager is in effect supplementing his portfolio with sectors that have underperformed in the last period, and selling those sectors which have outperformed. Ferguson and Schoefield (2010) point to this as being the inherent "buy low/sell high" character of an equal weight strategy. But based upon the Fama-French three-factor model, Schwert concludes that there is no evidence to suggest that this strategy results in abnormal returns. Sturm also creates portfolios based on overreaction and momentum strategies and finds that the funds do not capture momentum or overreaction techniques.

Hsu (2006) shows that cap weighted portfolios are not the optimal portfolios when a mild pricing inefficiency exists in the market. He claims that cap-weighted portfolios will overweight stocks with high prices relative to their true fundamentals, and conversely underweight stocks with low prices relative to fundamentals. Doing so effectively assigns more weight to overvalued stocks and less weight to undervalued stocks. Assuming that these pricing errors are short-lived, the market prices will approach their fair values. Chen et al. (2007) claim that based on the assumption that these divergences will revert to fundamentals, the cap-weighted portfolio is not actually mean-variance efficient. Further, Hsu finds that portfolios formed from weights based on alternative measures of firm size (book, income, and sales) outperform the cap-weighted portfolio yet maintain similar risk characteristics.

Duchin and Levy (2009) compare and contrast a mean-variance diversification strategy (Markowitz) with a naïve $\frac{1}{n}$ diversification strategy (Talmudic), where n is the number of available assets. They claim that the $\frac{1}{n}$ strategy has the advantage of not relying on historical parametres that may be biased in the future, and conversely has the disadvantage that it does not consider any relevant information regarding the input parameters. Further, they note that the mean-variance strategy is highly susceptible to potential sampling errors. They subsequently find that the Markowitz strategy dominates for in-sample analysis. For out-of-sample tests, the Talmudic strategy prevails for relatively small portfolios, while the Markowitz theory excels when pertaining to relatively large portfolios out-of-sample.

Ferri et al. (1984) provide empirical evidence testing whether or not mutual fund managers have market timing abilities. Their method is based on changes in asset composition within a portfolio, with respect to changes in market prices. Specifically, they observe funds prior to periods of low stock prices to examine whether or not fund managers have successfully employed asset allocation changes to take advantage of shifts in market prices before a shift occurs. They find that despite their best efforts, managers do not possess consistent market timing abilities.

A study by Ibbotson and Kaplan (2000), based on mutual and pension fund performance, aims to find the level of performance explained by asset allocation policy. Specifically, they address the questions of how much variability in returns the asset allocation policy explains, how returns between funds differ as a result of different allocation policies, and what proportion of returns are explained by allocation policy returns. They find that slightly more than 100 percent of policy returns explain the fund return when expenses are considered, rejecting the case for active management. This confirms that, since the aggregate of investors is the market, the average return across all subsamples of the market (such as within pension and mutual funds) cannot be greater than the return on the market itself.

Hypothesis

With the literature challenging whether excess returns from *active* managers are expected to be negligible, is it practical to believe that a *passive* strategy could consistently outperform the market over time? More specifically, we ask:

> *Is the outperformance of an Equal Sector Strategy relative to the market portfolio transitory, or can it reasonably be expected given historical precedent.*

To answer our question, we perform the following three hypothesis tests:

1. Nine Equal Sector SPDRs Strategy

To confirm the findings of Sturm and the marketing material of the Sector SPDRs*,* we perform a two-sided test of the null hypothesis that excess returns are equal to zero

$$H_0 : ER = 0 \qquad\qquad H_A : ER \neq 0$$

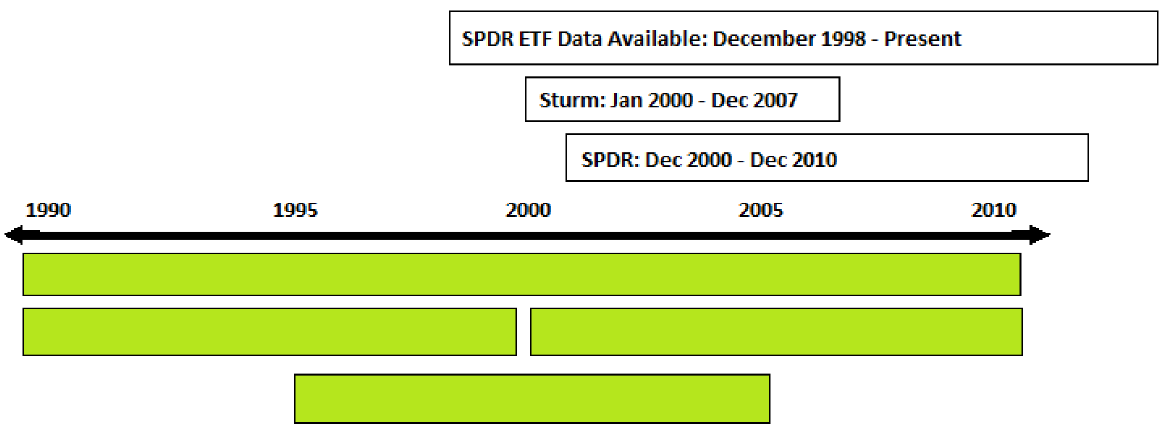
and the null hypothesis that Jensen's Alpha is equal to zero

$$H_0 : \alpha = 0 \qquad\qquad H_A : \alpha \neq 0$$

with * indicating significance at the 95% level as reported in the results.

The quarterly rebalancing dataset used in the example presented on the *Select Sector SPDR* website makes use of 40 quarterly return periods, or observations, over the period of December 2000 to December 2010. The monthly rebalancing dataset used in Sturm's analysis makes use of 96 monthly observations over the period of January 2000 to January 2007. We wish to expand the dataset to include the past twenty years, and create portfolios of both quarterly and monthly rebalancing. Finally, we will further separate our period of interest into three sub-sets for analysis:

- December 31, 1989 to December 31, 2009 (Greater Set: Twenty Years)
    - Herein referred to as 1990 to 2009
- December 31, 1989 to December 31, 1999 (Subset: Ten Years)
    - Herein referred to as 1990 to 1999
- December 31, 1994 to December 31, 2004 (Subset: Ten Years)
    - Herein referred to as 1995 to 2004
- December 31, 1999 to December 31, 2009 (Subset: Ten Years)
    - Herein referred to as 2000 to 2009



2. *Ten Equal S&P 500 Sectors Strategy*

The Global Industry Classification Standard (GICS), developed by MSCI and Standard & Poor's (S&P), separates businesses into ten Sectors according to their principal business activity. But, as is outlined in *Data* below, there are only nine Sector SPDRs, with no separate ETF for the Telecom sector. Therefore, the Equal Sector SPDR strategy tested above is not truly an equally weighted sector strategy.

Here, we use sector data for all ten GICS sectors to perform the above tests with the inclusion of Telecom as the tenth sector and compare the results with those found in hypothesis test 1.

3. Ten Equal S&P TSX Sectors Strategy

Finally, we perform the above tests on a portfolio of the ten Canadian GICS sectors as indexed by S&P. By analyzing the results of our tests with a different market and benchmark, we hope to gain perspective from our results that may allow us to identify any market specific biases in the first two tests above.

Data

Price data for the *Select Sector SPDR* ETFs only begins December 16, 1998, but thankfully there is S&P 500 Sector Index data since before 1990[5]. Thus, in testing our first hypothesis, we will need to use the S&P Sector Index data as a proxy for the returns of the Sector SPDR ETFs. The results from our tests based upon this approximation could be considered an estimation of the "best case scenario" if we assume that the returns of the S&P 500 Sector Index and the Sector SPDRs should vary only in small/ normal tracking error and a management expense ratio (MER). But, it turns out that the Sector SPDRs are actually based upon slightly different benchmarks than the S&P Sector Indices. As stated on the *Select Sector SPDR* website:

Each Select Sector Index is calculated using a modified "market capitalization" methodology. This formula ensures that each of the component stocks within a Select Sector Index is represented in a proportion consistent with its percentage of the total market cap of that particular index. However, all nine Select Sector SPDRs are diversified mutual funds with

[5] Insert exact date.

respect to the Internal Revenue Code. As a result, each Sector Index will be modified so that an individual security does not comprise more than 25% of the index.

As shown in the table below, the returns of the ETFs can largely be explained by the returns of the S&P Indices. [6] But while there are in fact ten GICS sectors, there is no *Select Sector SPDR* ETF for the Telecom sector. This is due to the concentration among its constituents. As of July 2011, the Telecom sector consisted of only eight companies, of which ATT accounted for more than 49%, and Verizon, 28%. Instead, SSGA added the components of the Telecom sector to their *Select Sector SPDR* Info Tech ETF. Thus, for the purposes of *hypothesis test 1*, we will do the same, by combining the Info Tech and Telecom Sectors to create a custom index closely approximating the returns of the Sector SPDR Info Tech ETF.

Since we have the sector index price levels (which are base 100 on December 30, 1994), we need only to know the market caps of the two sectors at the beginning or end of our period of interest in order to construct a custom Sector SPDR Info Tech index. As of December 31, 2009, the market capitalization of the Info Tech sector represents 87.136% of the combined sector's market caps, with Telecom representing the remaining 12.864%. Using this information we are able to create a proportionally combined Info Tech and Telecom index being 99.73% correlated with the *Select Sector SPDR* Info Tech ETF over the ten year period beginning December 31, 1998.

No other S&P 500 sector has concentration issues like Telecom. The sector with the next fewest members is Materials, with 30 members. The largest single holding in any other sector is in Energy, where Exxon accounts for 26% of the Sector. We do not see this as a large issue, as

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[6] Insert R-squared for each index / ETF.

the *Select Sector SPDR* Energy ETF (XLE) has maintained 98.23% correlation with the S&P 500 Energy index (S5ENRS) over the ten year period beginning December 31, 1999.

For hypothesis 2 and 3, we will not need to make any modifications to the data available.

All data has been gathered and then derived from the index / price level as obtained on the Bloomberg Professional service.

Procedure

Construction of the equal sector portfolios is simple: After calculating periodic returns for the sectors – both quarterly and monthly – our equal sector strategy returns can be found by computing a simple average of the returns of the components for the period.

Where returns are reported, they have been converted to annual equivalent rates, using the formula:

$$R = (1 + E[R_i])^n - 1 \qquad (1)$$

where n is the number of time periods i within a year, and $E[R_i]$, the expected periodic return, is found as the average of the historically observed returns or excess returns, for example:

$$E[R_i] = Average(R_i) \qquad (2)$$

To test for outperformance, we will look at the statistical significance of both excess returns and Jensen's Alpha of an Equal Sector Strategy portfolio versus the S&P 500 with both monthly and quarterly rebalancing. Excess return is calculated as being:

$$E[ER] = Average(R_p - R_m) \qquad (3)$$

We interpret Jensen's Alpha as being the abnormal excess return from what would be predicted in the CAPM model given the portfolio's volatility as measured by beta. For example, a portfolio with a beta of 1.1 could be expected to have an excess return of 0.1 in the context of a 1% market return and zero risk free rate. But if the portfolio achieved an excess return of 0.15, it would have an alpha of 0.05. The exact formula is:

$$\alpha = R_p - \left[R_f + \beta\left(R_m - R_f\right)\right] \qquad (4)$$

where R_p is the return of the portfolio, R_m is the return of the market, R_f is the risk free rate,[7] and β is the portfolio beta, calculated as:

$$\beta = \frac{Cov(R_p, R_m)}{Var(R_m)} \qquad (5)$$

To determine risk adjusted performance, we look at both the Sharpe Ratio and the Treynor Ratio. The Sharpe Ratio is interpreted as a reward-to-variability measure, calculated as:

$$S = \frac{R_p - R_f}{\sigma} \qquad (6)$$

where σ is variability as measured by the standard deviation of portfolio returns. Standard deviations have been annualized using the formula:

$$\sigma = \sigma_i * \sqrt{n} \qquad (7)$$

Similar to the Sharpe ratio, the Treynor ratio is interpreted as being a reward-to-volatility measure, calculated as:

$$T = \frac{R_p - R_f}{\beta} \qquad (8)$$

[7] For our purposes, we have assumed the risk free rate to be a constant zero.

Additionally, we have measured the information ratios of an Equal Sector Strategy portfolio over various time horizons. The information ratio is useful as it seeks to identify how consistent a strategy is. Has the strategy outperformed the benchmark every period, or is the outperformance merely due to a few large but rare observations? The ratio is defined as:

$$IR = \frac{R_p - R_m}{Tracking\ Error} \tag{9}$$

where $Tracking\ Error$ is the annualized standard deviation of the difference between the returns of the portfolio and the returns of the index.

Empirical Results

As the index data we have used to compute our results has not been modified to account for management expense ratios, our results can be concluded to represent a “best case scenario”.

1. Nine Equal Sector SPDRs Strategy

A table of the numerical results for our first hypothesis test can be found in Appendix 1.

For the greater data set, 1990 to 2009, the quarterly rebalanced ES Strategy resulted in positive excess returns of 0.82% and a positive Jensen’s Alpha of 1.54%, although neither could be shown to be statistically significant at the 0.05 level. As such, we are unable to reject the null hypothesis for this time period that the excess returns and Jensen’s Alpha are periodically zero. These results were confirmed by the monthly rebalanced test, which also showed slightly lower Alpha and excess return, neither of which was statistically significant at the 0.05 level either.

Despite the results not being significant at the 0.05 level, it is interesting to note also that the Equal Sector Strategy had a higher Sharpe ratio than the market and a Beta below 1 in tests with both monthly and quarterly rebalancing in the greater set.

For two of the three subsets, 1990 – 1999 and 1995 to 2004, the monthly and quarterly rebalanced excess returns and Alphas were not significant at the 0.05 level, with the 1990 – 1999 period actually showing negative excess return and alpha. But, despite this negative excess return, the Equal Sector strategy maintained a Beta lower than 1 and a lower standard deviation than the market in both time periods. Despite the lower volatility of the equal sector portfolio in the 1990 – 1999 time period, the risk adjusted return as measured by the Sharpe ratio was lower than the market for the period due to the negative excess return with both monthly and quarterly rebalancing. Given these results, we are unable to reject the null hypothesis that the excess returns and Jensen's Alpha are periodically zero for the two subsets 1990 – 1999, and 1995 – 2004.

The 2000 - 2009 time period is the only period for which positive excess returns and Alpha's were significant at the 0.05 level, meaning we reject both null hypothesizes for this time period. This is most interesting in that Sturm's findings and those that are reported in the Sector SPDR marketing materials are derived from a subset of this period. Similar to the findings of Sturm and SSGA, the ES Strategy also results in higher Sharpe ratios and a Beta less than 1 for both quarterly and monthly rebalancing portfolios.

We have assumed a constant risk-free rate of zero for our purposes, as this is consistent with Sturm. However, we tested the results from this hypothesis with constant risk-free rates based on U.S. 10-year treasuries, obtained from the Federal Reserve Bank of St. Louis (for each respective period). Interestingly, for quarterly rebalancing, we observe negative Alphas for each period except the 2000-2009 subset, although none of these values are significant. For monthly rebalancing, the Jensen's Alpha for each period becomes negative, with p-values at or near 2 for each period, meaning that we cannot reject the null hypothesis. We continue to observe the same trend for Sharpe and Treynor ratios, with the 1990 – 1999 set remaining the only period to underperform the market. However, it is interesting to note that, although the Sharpe and Treynor ratios for the ES strategy within the 2000 – 2009 period are still greater than those of the market portfolio, all of these values from this subset fall into negative territory for both monthly and quarterly rebalancing.

2. Ten Equal S&P 500 Sectors Strategy

A table of the numerical results for our second hypothesis test can be found in Appendix 2.

The results of the Ten Equal Sectors tests are interesting in that they reflect the results found in the Nine Equal SPDR ETF tests. Like the Nine Equal SPDRs tested in hypothesis test 1, the Ten Equal S&P Sectors showed positive excess returns and alphas with both monthly and quarterly rebalancing in the greater set and every subset except the 1990 – 1999 period. Also similar to hypothesis test 1, no excess returns or Alphas were significant at the 0.05 level in any period but the 2000 – 2009 period.

It is interesting though, that the outperformance of the Ten Equal Sectors, measured by excess returns and Alphas, was less than the outperformance of the Nine Equal SPDRs. The Nine SPDRs returned more than 70 basis points more Alpha and Excess Returns with both monthly and quarterly rebalancing than the Ten Equal Sectors in the 2000 – 2009 subset.

Much like the Nine Equal SPDRs, the Ten Equal Sector portfolios also showed Betas of less than 1 and exhibited higher Sharpe Ratios in all cases but 1990 – 1999, with both quarterly and monthly rebalancing.

3. Ten Equal S&P TSX Sectors Strategy

A table of the numerical results for our final hypothesis test can be found in Appendix 3.

For the greater data set, 1990 to 2009, the quarterly rebalanced ES Strategy resulted in positive excess returns of 1.38% and a positive Jensen's Alpha of 2.6%, with Alpha being significant at the 0.05 level, but the excess return not. As such, we are unable to reject the null hypothesis for this time period that the excess returns are periodically zero, but we do reject the null hypothesis that the Alphas are zero. These results were confirmed by the monthly rebalanced test. It is also interesting to note also that the Equal Sector Strategy had a higher Sharpe ratio than the market and a Beta below 1 in tests with both monthly and quarterly rebalancing in the greater set.

For two of the three subsets, 1990 – 1999 and 1995 to 2004, the monthly and quarterly rebalanced excess returns and Alphas *were* significant at the 0.05 level, and the ES Strategy maintained a Beta lower than 1 and a lower standard deviation to than market in both time periods. Given these results, we reject the null hypothesis that the excess returns and Jensen's Alpha are periodically zero for the two subsets 1990 – 1999, and 1995 – 2004.

The 2000 - 2009 time period is the only period for which positive excess returns and Alpha's were not significant at the 0.05 level, meaning we cannot reject both null hypothesizes for this time period. What is most striking here is that significance has been found for exactly the opposite time periods than what was evident for the S&P 500 hypothesis tests.

In the greater set and all subsets, the ES Strategy portfolios had betas less than 1, lower volatility (standard deviation of returns), and higher Sharpe ratios than the market.

It is interesting to note that the addition of a reasonable risk-free rate of around 5% to this data set resulted in negative Jensen's Alpha values for the 1990 – 2009 and 2000 – 2009 quarterly sets, although now, none of the Alphas were statistically significant (for monthly rebalancing, all Alphas were negative). In fact, the last subset (1995 – 2004) loses its positive Alpha significance at a risk-free of roughly 1.8%. However, even at a risk-free rate of 5%, the ES strategy continued to show superior Sharpe and Treynor ratios for each of the time periods tested, compared to the market.

Discussion

While our results can be interpreted to confirm the findings of Sturm and the marketing materials of the SPDR website for the same time period, when expanding the dataset it becomes clear that the outperformance of the ES Strategy is not as consistent as first presented. That said, it is interesting to note that in all of our tests, across all time periods, and with monthly and quarterly rebalancing, the ES Strategy produced portfolios with Betas lower than 1 and volatility (standard deviation of returns) less than the market portfolio.

Both hypothesis 1 and hypothesis 2 are based upon the S&P 500, and so it is interesting for their results to show a similar pattern. It appears that the findings can most easily be explained by breaking the greater dataset into the two periods 1990 – 1999, and 2000 – 2009, where the former did not produce positive significant alpha, and the latter did. Given the sharp contrast of these results, the outperformance of the ES Strategy appears to be transitory in nature.

Interestingly, the 2000 – 2009 period was the most volatile of the periods as measure by standard deviation and Beta. The S&P 500's largest sectors, Info Tech and Financials, are also the index's most volatile. Over the last twenty years, Info Tech's composition within the S&P 500 peaked at 26% at the beginning of the year 2000, and reduced to 14% of the index at the start of 2010. The financial sector topped at 16% at the start of 2005, and although it subsequently fell to just over 7% at the beginning of 2010, it has historically maintained a moderate position within the index[8]. Over our twenty-year test period, Info Tech and Financials were the most volatile of any sectors, with Betas of 1.44 and 1.27 respectively. A reduced weighting in these sectors from an ES Strategy favors risk-adjusted performance. Similarly, since volatility erodes returns (Two periods: $100*1.1*0.9 = $99), it is possible that the natural overweighting of the most volatile sectors in the S&P 500 is leading to sub-optimal performance, and that an ES Strategy is able to protect investors from volatility.

Ferguson identifies the process of rebalancing as an explanation for the equal sector outperformance. The concept is that the equal sector strategy follows a contrarian buy-low/sell-high strategy when it rebalances. This coincides with DeBondt and Thaler's findings that stock prices follow a mean reverting process. Given that the S&P 500 was most volatile over the period of 2000 – 2009, and that it was in this period that the ES Strategy reliably outperformed, perhaps this strategy could explain the outperformance as measured by significant excess returns and Alpha. Similarly, when comparing the first 10 years to the last 10 years in the Ten Equal S&P TSX Sector test, it is the more volatile first ten years (1990 – 1999) as measured by standard deviation of returns and Beta that shows significant outperformance as measured by Alpha.

An ES Strategy could also outperform when the market is experiencing economic "bubbles," such as the tech bubble in the mid- and late-90's and the more recent crash of 2008. We observe that the gains of the S&P 500 cap-weighted portfolio leading up to the burst of the tech bubble may have actually offset the losses that followed. Further, the ES strategy may have resulted in more exposure to smaller, more susceptible companies that lacked value. It appears as

[8] Historical Average of 10.6 percent

though the outperformance of the ES Strategy in the 2000 – 2009 period of hypothesis tests 1 and 2 was positively impacted by the market corrections in the recession of 2001 and the crash of 2008.

Fama emphasized the importance of consistent periods of outperformance among various samples, noting that every so often, an investor or manager may outperform by chance from pure luck. Therefore, the outperformance of the ES Strategy in the S&P 500 from 2000 – 2009, as well as the findings of Sturm, could also be explained simply as the chance result of the economic conditions that prevailed within his test period. Ultimately, any evidence of consistent outperformance by an ES Strategy would challenge the theory of market efficiency. Conversely, our findings of transitory outperformance lend themselves to at least some form of weak market efficiency.

One notable observation from our results is that the Alphas from our TSX dataset are significant for 3 of the 4 periods tested. However, the corresponding excess returns are not significant. This means that while the portfolio could not be expected to outperform the benchmark periodically on an absolute basis over any of the time periods, it could be expected to outperform on a risk-adjusted basis. Although this alpha is of value, it is important to remember that we have not accounted for transaction costs. A second hurdle for the retail investor is the lack of a complete set of ETFs based upon the TSX's sectors. It is unlikely that the S&P TSX will soon have a full set of ten sector ETFs due to concentration within the sectors.

Finally, in the case of our results for hypothesis test 1, we must take note that the Health Care SPDR shows very low correlation (0.6324) to the Health Care sector of the index. Further, the corresponding R-squared value of 0.397 from table ___ indicates that the movement within the ETF is not explained well by movements in the Health Care component of the index. Sturm mentions that the SPDR managers are able to overweight some members of the sector, or include non-sector members, if they believe that tracking error can be reduced. We observe a tracking error of 0.0370 – relatively high to the other sectors and when considering its 3.92% annualized return. As a result, we assume that the composition of the Health Care SPDR is not exactly indexed to the sector index. However, when further considering the low R-squared, we find an interesting observation. In differencing the monthly returns of the Health Care SPDR and the sector index, we find that a significant portion of the discrepancy (as measured by an absolute value of the difference in returns greater than or equal to 0.01) occurs primarily in most months from the inception of the ETF (December 1998) until June 2002. The largest discrepancy occurs in December 1999, with a difference in returns of 0.17 in favour of the ETF. However, beyond June 2002, we observe only one inconsistency in the absolute value of returns that is greater than or equal to 0.01. Further, we calculated an R-squared value of 0.99 for the truncated set extending from July 2002 until December 2010. Therefore, although the managers may have been doing a poor job attempting to reduce the tracking error initially, they have since improved in practice.

Thus, while our results in hypothesis test 1 support the findings of Sturm and the marketing material for the period of 2000 – 2009, the findings for the greater set and subsets are dependent upon the assumption that the ETF can be approximated by the sector index.

Conclusion

The ES Strategy was immediately intriguing because the data presented by Sturm and the SPDR website seemed to provide convincing results that the cap-weighted market portfolio could be beaten by such a simple and passive strategy. This easily replicable strategy is inconsistent with classical theory, so we felt obligated to test the validity of the anomaly.

Sturm (2010) tested this strategy using the Select Sector SPDR ETFs from the only period for which data was available. His results appeared to support consistent outperformance of the ES Strategy, yet the strength of his conclusion was weakened by the small test period. Although we too were initially limited to a small test period by the available ETF data, we reasoned that, since the ETFs are meant to track the sectors of the S&P 500 and S&P TSX indices, then the sector data would be a practical substitute. Statistical tests further supported our method. Our results are consistent with Sturm (2010). We produced statistically significant performance measures for the same period as Sturm. However, the extension of our results offered no evidence that this strategy would reliably produce positive excess returns.

In conclusion, we have found no evidence to suggest that an ES Strategy with either monthly or quarterly rebalancing should outperform the market on an absolute basis, and therefore conclude the positive excess returns in the period 2000 – 2009 were likely transitory. But, our results in the Canadian market, showing significant alphas in 3 of 4 test periods, as well as consistently lower betas, standard deviation of returns, and higher Sharpe and Treynor ratios suggest that an ES Strategy may exhibit less volatility than the market, although risk adjusted outperformance was not shown to be statistically significant across all tests. Finally, our results suggest that an ES Strategy is most likely to outperform the market in periods of heightened volatility.

Appendices

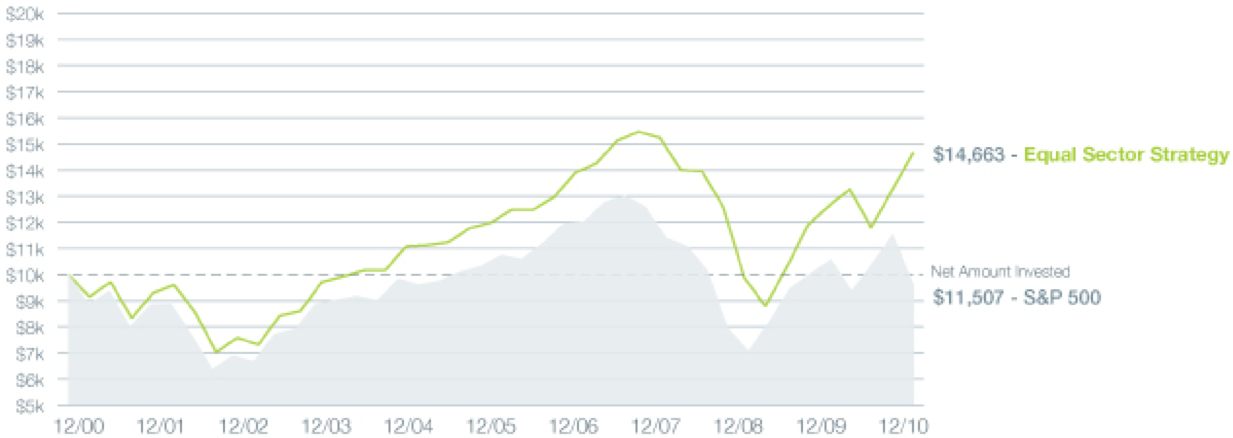
A. Select Sector SPDR Marketing Example

Hypothetical $10,000 Investment, Quarterly Rebalanced

Equal Sector Performance

The following chart shows the performance of an Equal Sector Strategy over the last 10 years:

Comparison of Change in Value of a $10,000 Investment*



* 10 Years Ended December 31, 2010
Source: Morningstar. The chart above shows how a hypothetical investment of $10,000 in the Equal Sector Strategy at its inception would have performed vs. an investment in the S&P 500 index. The hypothetical example does not represent the returns of any particular investment.

Equal Sector Weight Strategy vs. the S&P 500*

	One Year	Three Year	Five Year	10 Year
Equal Sector Strategy	16.13	-1.27	4.12	3.90
S&P 500	15.06	-2.85	2.29	1.41

Performance data quoted represents past performance. Current performance data may be higher or lower than actual data quoted. For the most current month-end performance data please visit www.sectorspdrs.com. Past performance does not guarantee future results.
* Average Annual Returns as of December 31, 2010
Total return performance shown is based on an equally-weighted investment in the underlying 9 Select Sector SPDR Funds. The Equal Weight Sector Strategy is represented by the nine Select Sector SPDRs ETFs that are purchased individually, allocated equally, and rebalanced quarterly. As a result, each sector has an initial weighting of 11.1%. The expense ratio for each Select Sector SPDR is 0.20%. There are no sales loads on Select Sector SPDR shares but ordinary brokerage commissions do apply and this expense is not reflected in performance calculations. If such expenses were reflected, the performance shown would be lower. Investors are responsible for rebalancing the portfolio quarterly.
Asset allocation cannot assure a profit nor protect against a loss. Sector ETF products are also subject to sector risk and non-diversification risk, which generally will result in greater price fluctuations than the overall market. Investment return and principal value of an investment will fluctuate so that an investor's shares, when sold or redeemed, may be worth more or less than the original cost.

Source: http://www.sectorspdr.com/equalsectorstrategy/

B. Table of S&P 500 Sector ETFs and Indices

Sector	SPDR	MER	Correl (ETF, Sector)	Beta (ETF,SPY)	R^2 (ETF, Sector)	Trk Err (ETF, Sector)	Sector Index	Beta (Sector, SP500)
Consumer Discr.	XLY	0.20%	0.9803	1.0875	0.961	0.0117	S5COND	1.0812
Consumer Stap.	XLP	0.20%	0.9027	0.4559	0.817	0.0161	S5CONS	0.5906
Energy	XLE	0.20%	0.9823	0.8378	0.963	0.0129	S5ENRS	0.6825
Financials	XLF	0.20%	0.9957	1.1987	0.990	0.0065	S5FINL	1.2737
Health Care	XLV	0.20%	0.6324	0.7196	0.397	0.0370	S5HLTH	0.7194
Industrials	XLI	0.20%	0.9800	1.1175	0.958	0.0117	S5INDU	1.0527
Materials	XLB	0.20%	0.9972	1.1493	0.992	0.0051	S5MATR	1.0222
Utilities	XLU	0.20%	0.8234	0.5033	0.677	0.0295	S5UTIL	0.4625
Info Tech	XLK	0.20%	0.9915	1.4645	0.983	0.0125	S5INFT	1.4488
Info Tech	XLK	0.20%	0.9973	1.4645	0.975	0.0063	Custom Index	1.4707
Telecom	-	-	-	-	-	-	S5TELS	0.9058
S&P 500	SPY	0.10%	1.0000	1	-	0.0031	SPX	1

1. Nine Equal Sector SPDRs Strategy

Quarterly Rebalancing

Period	1990 - 2009	1990 - 1999	1995 - 2004	2000 - 2009
R_p	8.18%	14.45%	12.36%	2.18%
R_m (S&P 500)	7.31%	16.31%	11.84%	-1.15%
Excess Return	0.82%	-1.66%	0.48%	**3.36%***
p-value	(0.345)	(1.951)	(0.778)	(0.020)
α (Jensen)	1.54%	-0.12%	2.30%	**3.27%***
p-value	(0.052)	(1.136)	(0.112)	(0.017)
σ_p	15.09%	12.52%	15.51%	16.94%
σ_m (S&P 500)	16.30%	13.69%	17.64%	17.77%
β	0.900	0.899	0.841	0.922
Tracking Error	3.89%	2.68%	5.33%	4.51%
Sharpe ESW	0.542	1.154	0.797	0.129
Sharpe S&P 500	0.449	1.192	0.671	-0.065
Treynor ESW	0.091	0.161	0.147	0.024
Treynor S&P 500	0.073	0.163	0.118	-0.011
Information Ratio	0.212	-0.619	0.089	0.745
N	80	40	40	40

Monthly Rebalancing

Period	1990 - 2009	1990 - 1999	1995 - 2004	2000 - 2009
R_p	7.98%	14.46%	12.13%	1.85%
R_m (S&P 500)	7.12%	16.34%	11.53%	-1.43%
Excess Return	0.81%	-1.64%	0.54%	**3.32%***
p-value	(0.324)	(1.967)	(0.734)	(0.021)
α (Jensen)	1.41%	-0.65%	2.28%	**3.18%***
p-value	(0.067)	(1.633)	(0.105)	(0.019)
σ_p	14.12%	12.74%	13.88%	15.24%
σ_m (S&P 500)	14.99%	13.42%	15.60%	16.12%
β	0.914	0.934	0.844	0.908
Tracking Error	3.67%	2.45%	5.03%	4.47%
Sharpe ESW	0.566	1.135	0.874	0.121
Sharpe S&P 500	0.475	1.218	0.739	-0.089
Treynor ESW	0.087	0.155	0.144	0.020
Treynor S&P 500	0.071	0.163	0.115	-0.014
Information Ratio	0.221	-0.669	0.108	0.742
N	240	120	120	120

2. *Ten Equal S&P 500 Sectors Strategy*

Quarterly Rebalancing

Period	1990 - 2009	1990 - 1999	1995 - 2004	2000 - 2009
R_p	7.98%	14.93%	12.13%	1.36%
R_m (S&P 500)	7.31%	16.31%	11.84%	-1.15%
Excess Return	0.63%	-1.23%	0.27%	**2.53%***
p-value	(0.400)	(1.888)	(0.851)	(0.041)
α (Jensen)	1.30%	0.26%	1.69%	**2.44%***
p-value	(0.055)	(0.694)	(0.180)	(0.036)
σ_p	15.09%	12.53%	15.95%	16.84%
σ_m (S&P 500)	16.30%	13.69%	17.64%	17.77%
β	0.908	0.903	0.876	0.925
Tracking Error	3.36%	2.47%	4.52%	3.88%
Sharpe ESW	0.529	1.191	0.761	0.081
Sharpe S&P 500	0.449	1.192	0.671	-0.065
Treynor ESW	0.088	0.165	0.139	0.015
Treynor S&P 500	0.073	0.163	0.118	-0.011
Information Ratio	0.189	-0.500	0.059	0.652
N	80	40	40	40

Monthly Rebalancing

Period	1990 - 2009	1990 - 1999	1995 - 2004	2000 - 2009
R_p	7.77%	14.94%	11.84%	1.01%
R_m (S&P 500)	7.12%	16.34%	11.53%	-1.43%
Excess Return	0.61%	-1.22%	0.27%	**2.47%***
p-value	(0.381)	(1.934)	(0.836)	(0.041)
α (Jensen)	1.14%	-0.18%	1.63%	**2.36%***
p-value	(0.079)	(1.240)	(0.170)	(0.040)
σ_p	14.15%	12.64%	14.19%	15.34%
σ_m (S&P 500)	14.99%	13.42%	15.60%	16.12%
β	0.924	0.931	0.877	0.925
Tracking Error	3.10%	2.11%	4.19%	3.79%
Sharpe ESW	0.549	1.182	0.834	0.066
Sharpe S&P 500	0.475	1.218	0.739	-0.089
Treynor ESW	0.084	0.160	0.135	0.011
Treynor S&P 500	0.071	0.163	0.115	-0.014
Information Ratio	0.196	-0.579	0.065	0.653
N	240	120	120	120

3. *Ten Equal S&P TSX Sectors Strategy*

Quarterly Rebalancing

Period	1990 - 2009	1990 - 1999	1995 - 2004	2000 - 2009
R_p	8.59%	11.38%	12.95%	5.85%
R_m (S&P TSX)	7.13%	9.09%	9.98%	5.20%
Excess Return	1.38%	2.15%	2.77%	0.62%
p-value	(0.276)	(0.119)	(0.141)	(0.772)
α (Jensen)	**2.60%***	**3.16%***	**4.32%***	1.74%
p-value	(0.017)	(0.013)	(0.009)	(0.311)
σ_p	14.90%	14.41%	16.26%	15.46%
σ_m (S&P TSX)	17.04%	15.61%	18.31%	18.52%
β	0.827	0.888	0.843	0.782
Tracking Error	5.65%	4.33%	5.88%	6.75%
Sharpe ESW	0.576	0.790	0.796	0.378
Sharpe S&P TSX	0.418	0.582	0.545	0.281
Treynor ESW	0.104	0.128	0.154	0.075
Treynor S&P TSX	0.071	0.091	0.100	0.052
Information Ratio	0.245	0.497	0.471	0.092
N	80	40	40	40

Monthly Rebalancing

Period	1990 - 2009	1990 - 1999	1995 - 2004	2000 - 2009
R_p	8.24%	10.95%	12.34%	5.59%
R_m (S&P TSX)	6.87%	8.98%	9.65%	4.80%
Excess Return	1.29%	1.82%	2.47%	0.75%
p-value	(0.334)	(0.130)	(0.226)	(0.751)
α (Jensen)	**2.62%***	**2.74%***	**4.40%***	2.05%
p-value	(0.023)	(0.013)	(0.012)	(0.287)
σ_p	13.45%	13.58%	14.13%	13.33%
σ_m (S&P TSX)	15.50%	14.67%	16.36%	16.33%
β	0.803	0.896	0.797	0.728
Tracking Error	5.92%	3.78%	6.38%	7.49%
Sharpe ESW	0.613	0.806	0.873	0.419
Sharpe S&P TSX	0.443	0.612	0.590	0.294
Treynor ESW	0.103	0.122	0.155	0.077
Treynor S&P TSX	0.069	0.090	0.096	0.048
Information Ratio	0.217	0.483	0.387	0.101
N	240	120	120	120

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