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S&P 500 ETFs and index funds: Are fees all there is to it?

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Abstract

It appears that expense ratio is a key factor for investors in selecting between index-tracking ETFs and index funds. However, are fees all there is to it? Are exchange-traded index-tracking funds "better" vehicles than their counterpart index funds in terms of fees as well as other performance/risk measures? We provide an in-depth analysis into other factors that may be pertinent to one's decision with respect to ETFs or index funds.

Since their inceptions in the mid-1970s, index-tracking mutual funds have attracted many cost-conscious investors. The introduction of the first index-tracking exchange-traded fund (ETF)—SPDR® S&P 500® ETF Trust by State Street Bank and Trust Company, in the early-1990s, opened up a wide range of other options to these investors. In its January 5, 2011 issue, the Wall Street Journal reported a price war among index-tracking ETFs and mutual funds (Burton [2011]). The article cited that "Vanguard Group, BlackRock Inc., Charles Schwab Corp. and State Street Corp. are locked in a race to see who can cut expenses the fastest, vying for penny-pinching investors…" The article also pointed out that it could be misleading if investors simply compared expense ratios since additional costs may come in various forms, for example, a wide bid-ask spreads, commission charged for buying or selling, etc.

The Wall Street Journal article presents a common view among investors that the differentiating factor between index-tracking ETFs and index funds is expenses. However, are fees all there is to it? Are exchange-traded index-tracking funds "better" vehicles than their counterpart mutual funds in terms of fees as well as other performance/risk measures? Should investors prefer one over another? Are there differences between ETFs (or between index funds) of different providers? This study aims to answer these questions by comparing and contrasting the cost, performance, and risk of two widely followed index-tracking ETFs to those of two index funds.

The paper is structured as follows. We begin by providing a brief overview of our sample data, followed by the fee structure of our sample. Next, we proceed to the section on methodology and present some results from our findings. Finally, we end with our conclusions.

SAMPLE

Exhibit 1 reports fund characteristics of our sample, which include two widely followed index-tracking ETFs and two index funds. The ETFs of choice are iShares S&P 500 Index Fund (IVV) and SPDR S&P 500 ETF Trust (SPY, offered by State Street Global Investors) while the index funds are Spartan® 500 Index Fund Investor Class (FUSEX, offered by Fidelity) and Vanguard 500 Index Fund Investor Shares (VFINX). While the inception dates and net assets values vary, the funds closely resemble each other. They are in the same Morningstar category (large blend), have the same Morningstar rating (3 stars), and their investment objectives are

very similar. We notice that the older funds are much larger in net asset value than their younger counterparts.

For our analysis, we employ 10-year daily data, from 2/5/2001 – 2/4/2011, for a total of 2,516 data points. These data were provided by MacroRisk Analytics from their database.

[Insert Exhibit 1 here]

Summary statistics of returns and risk are presented in Exhibit 2. We can conclude there is certainly not much to differentiate between our sample ETFs and index funds. Their mean daily returns are between 0.015% and 0.016% while their daily standard deviations are between 1.347% and 1.372%. There appears to be some deviation between the ETFs and index funds with relation to their correlation with the S&P 500 Index.

[Insert Exhibit 2 here]

FEE STRUCTURE

Exhibit 3 reports the fee structure of our sample. Under the U.S. Securities Exchange and Commission's (SEC) guideline for fees (available at http://www.sec.gov/answers/mffees.htm), the two major fee categories are the operating expenses and the shareholder fees. All fees in the operating expenses category are paid by the fund out of fund assets. They include

- Management fees: These are fees paid to investment adviser for managing the portfolio.
- Distribution (and/or service) fees—also known as rule 12b-1 fees: These fees were authorized by the SEC in 1980 under the Investment Company Act; the rule allows registered mutual funds to use fund assets to pay for the cost of promoting sales of fund shares. Rule 12B-1 fees have been a subject of heated discussions in recent years. SEC has recently proposed new rules and rule amendments which would replace rule 12b-1. Further details on 12b-1 fees are provided in the next paragraph.
- Other expenses: These are fund operating expenses not included in the other two groups of fees. Some examples are legal expenses, accounting expenses, etc.

According to the Wall Street Journal, mutual fund investors paid more than $9 billion in rule 12b-1 fees in 2009; however, most investors do not understand what they paid for (Damato [2010]). Rule 12b-1 fees are paid to cover the distribution expenses and shareholder service expenses. Some examples of the distribution expenses and shareholder service expenses include, but not limit to, fees paid to the brokers who facilitated the buying and selling of the shares of the fund. Another example is the advertising and printing costs incurred during the fund's marketing campaign. Under the current ruling of the Financial Industry Regulatory Authority (FINRA)—an independent regulator for all securities firms conducting business in the United States—a fund may claim itself to be "no-load" as long as the combined amount of the fund's 12b-1 fees or shareholder service fees does not exceed 0.25% of the fund's average annual net assets. To "enhance clarity, fairness and competition when investors buy mutual funds," SEC's Chairperson, Mary Schapiro, announced new proposed rules to replace rule 12b-1 fees on July 21, 2010. The deadline for the public to submit written comments for the proposal was November 5, 2010. SEC is now reviewing the comments from numerous individuals and entities.

Exhibit 3 shows that investors of both ETFs—IVV and SPY—paid 0.09% (9 bips) of the average annual net assets to cover annual operating expenses. The annual operating expenses are higher for their mutual fund counterparts—0.10% for FUSEX and 0.18% for VFINX. Neither the ETFs nor the index funds charged rule 12b-1 fees. (For evidence of high dispersion in expense ratios across S&P 500 index funds, see Haslem et al. [2006]).

The second category, shareholder fees include sales load, redemption fee, exchange fee, account fee, and purchase fee. A brief summary of each is provided below.

- Sales load (also known as sales charge) is a commission paid to the brokers when investors purchase or sell fund shares. The two types of sales loads are "sales load on purchases" (also known as front-end sales load), and "deferred sales charge" (also known as back-end sales load). The front-end sales load will be collected when investors purchase fund shares; the back-end sales load will be charged when investors sell their fund shares.
- Redemption fee is very similar to a deferred sales load (back-end load); the only difference is that redemption fees are charged by mutual funds and are paid to the mutual funds, not to the brokers.
- Exchange fee is a fee imposed by the mutual fund company if investors transfer to another fund under the management of the same group.

- Account fee is a fee charged by some mutual fund companies for the maintenance of the account. Most funds will waive this fee if the account value is above the minimum balance.
- Purchase fee is a fee charged by the fund company when investors purchase the fund shares. It is very similar to a front-end sale load, except that purchase fee is paid to the mutual fund company, not to the broker.

Exhibit 3 shows that while both ETFs did not charge any shareholder fees, both index funds charged a nominal amount of account fee ($10 and $20, respectively) if the minimum account balance falls below $10,000. In summary, the total annual operating expenses of our sample ETFs are lower than those of our sample index funds, providing some justification for investors focusing on only fees when deciding between index-tracking ETFs and index funds. (For a thorough examination between ETFs and index funds, based solely on fees, see Kostovetsky [2003]).

It is obvious that an individual investor can be overwhelmed by the complexity of the fee structure. Therefore, most individual investors focus only on how many bips in total they will be charged. In its February 12, 2011 issue, the Wall Street Journal reported that "Morningstar Inc. and IndexUniverse.com introduced new tools this week[i] to help investors gauge the true costs and risks of ETFs"(Laise [2011]). The article pointed out that the new tools "look beyond the fund's stated expenses…" Based on the new tools, "Investors will pay a bit more to hold the SPDR ETF [ticker symbol SPY] than its iShares competitor [ticker symbol IVV]." "[Morningstar] estimates the SPDR's holding cost at 0.23% [23 bips] as of Jan. 25, versus 0.16% [16 bips] for iShares S&P500." The article cited "One reason: The SPDR doesn't lend out its portfolio holdings to other investors, an activity that many ETFs engage in to generate additional income that can offset expenses."

We have examined the prospectus of our sample. IVV has a securities lending program approved by its board and a designated securities lending agent to serve the fund. SPY does not report a securities lending program; however, it provides information for institutional investors who are interested in lending their holdings to short sellers. FUSEX states clearly under "Principal Investment Strategy – Lending securities to earn income for the fund"; specifically, "In addition to the principal investment strategies discussed above, the fund may lend securities to broker-dealers or other institutions to earn income." However, VFINX provides no information on securities lending program.

It is unclear how the above information on securities lending transpires for individual investors in making their investment decisions. According to the article, "The tools aren't broadly available to individual investors yet." It is aimed to help financial advisors better understand ETFs, and is now under beta testing. The article does not mention how the new tools measure risks involved in lending securities to short sellers. For the best interests of their clients, those financial advisors who will employ the new rating system should also understand how the risks of lending securities to short sellers are incorporated. A sound investment decision should not be based on cost only. The following sections provide an in-depth analysis on the risk and performance of our sample.

[Insert Exhibit 3 here]

METHODOLOGY

Besides fee structure, we investigate further the characteristics of our sample via their performance and risk relative to the S&P 500 Index. In doing so, we employ the traditional or standard capital asset pricing model (CAPM) and the dual-beta model in our estimation of alpha, beta, CAPM R^2, and tracking error.

The existing literature suggests that investors' response to a down-market are significantly different from those of an up-market. Glosten et al. [1993] discovered a phenomenon displayed in financial markets—volatility asymmetry; that is, the asymmetric response of volatility to positive and negative shocks, whereby a negative shock to an asset's price is likely to cause volatility to rise by more than a positive shock of the same magnitude.

A separate but related field to volatility asymmetry is the ongoing debate on beta and CAPM's validity. Fama and French [1992], in their cross-sectional analysis, failed to find any relationship between beta and average returns in the U.S. market. Instead, they find size (i.e., the return on small stocks minus the return on large stocks) and a value factor (i.e., the return on value stocks minus the return on growth stocks) to be of significance in explaining average returns and therefore, valid proxies for risk. This model is often referred to as the Fama-French three-factor model. Pettengill et al. [1995], on the other hand, provide contrary evidence, in that there is a significant relationship between beta and returns so long as one segregates beta into her up-market and down-market components (henceforth, referred to as the dual-beta model).

Further literature on (up- and down-market) beta can be found in Moelli [2007] and the references therein.

Since investors are more concerned with downside than upside risk (Estrada [2006]), one could argue in favor of the dual-beta model and the relevance of its beta estimates during up- and down-market fluctuations over the estimates of the standard CAPM model. Nevertheless, for our analysis, we provide standard, up-market, and down-market alpha and beta estimates.

The standard CAPM model

The standard CAPM model can be expressed as

$$\left(r_j - r_f\right)_t = \alpha_j + ß_j(r_m - r_f)_t + \varepsilon_t, \quad (1)$$

where r_f is the risk-free rate (we use the overnight U.S. Federal funds rate as proxy), r_j is the return on asset *j*, $\left(r_j - r_f\right)_t$ is the observed excess return on asset *j*, α_j is the estimated regression intercept, called alpha, $(r_m - r_f)_t$ is the estimated excess return on the market index (here, the S&P 500 index, SPX), and ε_t is the unexplained portion of the model. The standard CAPM model was utilized by Rompotis [2009] in his study on the index tracking ability of Vanguard ETFs and index funds.

The dual-beta model

The dual-beta model estimates the parameters separately for up-market, when the daily return for the market-index is non-negative, and down-market, when the daily return for the market-index is negative. The dual-beta model can be expressed as

$$\left(r_j - r_f\right)_t = \alpha_j^+ D + ß_j^+(r_m^+ - r_f)_t D + \alpha_j^-(1 - D) + ß_j^-(r_m^- - r_f)_t(1 - D) + \varepsilon_t, \quad (2)$$

where α_j^+, β_j^+, α_j^-, and β_j^- are the estimated parameters for up-market and down-market days respectively; $r_m^+ = r_m$ on days the market did not decline and $r_m^- = r_m$ on days it did; D is a dummy variable, which takes the value of 1 when the market index daily return is non-negative.

If indeed there is no beta asymmetry, then Equation (2) collapses to Equation (1). As such, $\alpha_j^+ = \alpha_j^-$ and $\beta_j^+ = \beta_j^-$.

Comparison of an asset to an existing portfolio

Equations (1) and (2) are commonly used when comparing an asset or portfolio against a benchmark or index. Instead of taking r_m, r_m^+, and r_m^- as different variations of market/index return, we could replace it with asset or portfolio returns, thereby allowing us to compare an asset/portfolio to another asset/portfolio. This is especially useful when it is unclear which alternative asset or portfolio is preferred.

Conditional volatility and correlation

The standard CAPM model, as well as the dual-beta model, is "unconditional" in nature, in that it assumes variances to be homoscedastic, i.e., having equal statistical variances. To remove the assumption of equal statistical variances, we employ respectively the autoregressive conditional heteroscedasticity (ARCH) model and the dynamic conditional correlation (DCC) model. These models allow accounting for "conditional" variance and covariance. The most popular ARCH model is the generalized ARCH—GARCH (1,1)—model by Bollerlsev [1986]. The asset's conditional variance (h_t) can be described as

$$h_t = \gamma + \alpha\varepsilon_{t-1}^2 + \beta h_{t-1}, \tag{3}$$

subject to $\gamma > 0, \alpha, \beta \geq 0, \alpha + \beta < 1$. We estimate the conditional correlation between the ETFs (or index funds) and SPX by using the DCC (1,1) model (Engle [2002]). The time-varying covariance matrix can be expressed as $H_t \equiv D_t R_t D_t$, where D_t is a diagonal matrix of GARCH (1,1) volatilities, $R_t = Q_t^{*-1} Q_t Q_t^{*-1}$ is the time-varying correlation matrix, with Q_t being

$$Q_t = (1 - a - b)\bar{Q} + a\left(\Xi_{t-1}\Xi_{t-1}'\right) + bQ_{t-1}, \tag{4}$$

where $\bar{Q}$ is the unconditional covariance, Q_t^* is a diagonal matrix comprising the square root of the diagonal elements of Q_t, while *a* and *b* are scalars. The coefficients of (3) and (4) are estimated by the maximum likelihood procedure using the BFGS algorithm.

FINDINGS AND DISCUSSIONS

Conditional vs. unconditional statistics

In Exhibit 4, we present the cumulative wealth of investing in our sample ETFs (IVV and SPY) and index funds (FUSEX and VFINX) versus SPX. We begin at $1 on February 5, 2001 and end on February 4, 2011. Our sample funds outperformed SPX but are indistinguishable between each other, with a range of $1.1578 (VFINX) to $1.1644 (IVV) at the end of our sample period. This is consistent with our summary statistics in Exhibit 2 as it is with Exhibit 5, whereby our sample funds tracked the daily volatility of SPX.

[Insert Exhibit 4 here]

[Insert Exhibit 5 here]

Some differences, however, begin to surface when we examine Exhibit 6, a graphical representation of conditional correlation between our sample funds and SPX. Although we noted deviation between the ETFs and index funds with relation to their unconditional correlation with SPX (Exhibit 2), the differences appear more pronounced here. For IVV, its conditional correlation ranged from a low of 0.9535 to a high of 0.9986 while for SPY, it was respectively 0.9411 and 0.9993. For FUSEX (VFINX), the range was 0.9941 (0.9998) and 1.000 (1.0000).

[Insert Exhibit 6 here]

Standard CAPM vs. dual-beta

We report results for the standard CAPM and the dual-beta models in Exhibit 7. We use daily return for a 10-year lookback period ending February 4, 2011 to get our estimations. Panel A shows the alpha, beta, CAPM R^2, and tracking error for each of our sample using SPX as benchmark. First and foremost, we notice that the estimated parameters for the standard CAPM model are quite different from those obtained via the dual-beta model. This finding should come

as no surprise, given that investors weigh downside uncertainty more heavily than upside potential (Estrada [2006]). It also highlights the importance of the dual-beta model in providing insightful details over and above what the standard CAPM model could have accomplished.

[Insert Exhibit 7 here]

Index funds

Panel A shows that the estimated parameters are almost identical for the two index funds, FUSEX and VFINX. While the differences between the standard CAPM model and the dual-beta model persist, both index funds have almost identical numbers under each model. For example, under the standard CAPM model, both have the same α (0.018) and β (0.994), and under the dual-beta model, both have higher α^+ and lower α^-, and lower β^+ and higher β^-. This trend continues across all parameters. With similar CAPM R^2 and tracking error,[ii] the results suggest that the index funds' performance and risk are indifferent, which makes one wonder how VFINX, with a total annual operating expense of 0.08% more than FUSEX (Exhibit 3), could garner $58.5bn more in net assets than FUSEX (Exhibit 1). Given a choice, FUSEX is preferred over VFINX.

ETFs

Unlike the index funds, many of the estimated parameters in Panel A for the ETFs are different. The differences become more pronounced when using the dual-beta model. For example, under the standard CAPM model, both have the same α (0.018); however, IVV has a much higher α^+ (0.086) than SPY (0.004), and a much lower α^- (0.015) compared to SPY (0.054). While IVV has a lower standard β (0.967) compared to SPY (0.980), it has a wider range between β^+ (0.945) and β^- (0.975) compared to SPY (β^+ = 0.981 and β^- = 0.988). In terms of CAPM R^2 and tracking error, IVV has a comparative advantage over SPY. It is somewhat unclear at this stage which ETF is preferred.

Panel B reports results comparing the pair of ETFs with each other and the pair of index funds with each other. As described in *the dual-beta model*, we could take r_m, r_m^+, and r_m^- of Equations (1) and (2) as returns of SPY, with r_j being returns of IVV (see results for IVVspy). The results suggest a preference for IVV. In relation to SPY, IVV exhibits a larger positive up-

market alpha (0.086) than its negative down-market alpha (-0.041). Further, IVV has lower standard, up-market, and down-market betas than SPY. Furthermore, the results for FUSEXvfinx and VFINXfusex in Panel B confirm our earlier conjecture that these two index funds are indifferent in their performance and risk.

ETFs vs. index funds

Panel C reports results comparing each of the ETFs with the pair of index funds. Our results suggest that both index funds are preferred over SPY. First, SPY's absolute loss during up-market exceeds that of its down-market gains (see Panel C, under SPYfusex and SPYvfinx). Second, SPY has a higher tracking error than the index funds (Exhibit 7, Panel A) and lastly, related to the tracking error, SPY has a lower CAPM R^2, which suggests a lower confidence level. On the other hand, IVV appears to dominate both index funds (see Panel C, under IVVfusex and IVVvfinx). IVV's positive up-market alpha is larger than its negative down-market alpha in relation to VFINX (0.028 vs. -0.003) and FUSEX (0.029 vs. -0.004). It also has lower standard, up-market, and down-market betas. However, the index funds clearly dominate IVV on CAPM R^2 and tracking error.

Selecting between our sample ETFs and index funds is not as clear cut as simply choosing the product with the lowest fee. Earlier, we had concluded that FUSEX is preferred over VFINX (see Panels A and B.) Results from Panel B suggest that IVV takes precedence over SPY. As to whether one's choice should be with IVV or FUSEX, it is left to the investor. The operating expenses are 0.09% for IVV and 0.10% for FUSEX. IVV, being an ETF, has advantages that an index fund doesn't possess, e.g., it is traded throughout the day, it can be shorted, etc. While IVV has a favorable risk/return profile, it lacks the tracking ability of FUSEX. If indeed a passive investor's goal is to track an index, then risk and return (based on beta and alpha) should be irrelevant. Hence, it may be that IVV is more suited for short-term exposure to the S&P 500 Index, with opportunities for profit taking, while FUSEX is more desirable for long-term tracking of the S&P 500 Index.

CONCLUSION

It appears that operating expense is a key factor for investors in selecting between index-tracking ETFs and index funds. In this study, we provide an in-depth analysis into other factors that may be pertinent to one's decision with respect to ETFs or index funds.

Our sample ETFs (IVV and SPY) and index funds (FUSEX and VFINX) were chosen as they are widely available, offered by large providers, and possessed very similar investment objectives, Morningstar category, and Morningstar ratings. The differences are their operating expense and the inherent nature of their risk/return profile. In dissecting the funds' risk/return profile, in relation to their individual selves as well as to each other, we utilize the standard CAPM model and the dual-beta model. The dual-beta model unveiled certain fund characteristics that were masked by the standard CAPM model, suggesting the need to decompose the standard CAPM into its up-market and down-market components. Further analysis was via the GARCH and DCC models.

Our results indicate that the dominant ETF and index fund are respectively, IVV and FUSEX. As to which of these two is preferred, it depends on the investor's objective. It appears that IVV is suited for short-term exposure to the S&P 500 Index, with opportunities for profit taking, while FUSEX is desirable for long-term tracking of the S&P 500 Index.

REFERENCES

Bollerslev, Tim. “Generalized autoregressive conditional heteroscedasticity.” *Journal of Econometrics*, 31 (1986), pp. 307-327.

Burton, Jonathan. “The incredible shrinking fee.” *The Wall Street Journal* (January 5, 2011).

Damato, Karen. “What exactly are 12b-1 fees, anyway?” *The Wall Street Journal* (July 6, 2010).

Engle, Robert. “Dynamic conditional correlation: A simple class of multivariate generalized autoregressive conditional heteroscedasticity models.” *Journal of Business & Economic Statistics*, 20 (2002), pp. 339–350.

Estrada, Javier. “Downside risk in practice.” *Journal of Applied Corporate Finance*, 18 (2006), pp. 117–125.

Fama, Eugene F., and French, Kenneth R. “The cross-section of expected stock returns.” *Journal of Finance*, 47 (1992), pp. 427–467.

Glosten, Lawrence. R., Jaganathan, Ravi, and Runkle, David E. “On the relation between the expected value and the volatility of the nominal excess return on stocks.” *Journal of Finance*, 48 (1993), pp. 1779–1801.

Haslem, John. A., Baker, H. Kent, and Smith, David M. “Are retail S&P 500 index funds a financial commodity? Insights for investors.” *Financial Services Review*, 15 (2006), pp. 99–116.

Kostovetsky, Leonard. “Index mutual funds and exchange-traded funds.” *Journal of Portfolio Management*, (Summer 2003), pp. 80–92.

Laise, Eleanor. “New Ways to Gauge ETF Costs.” *The Wall Street Journal* (February 12, 2011).

Morelli, David. “Beta, size, book-to-market equity and returns: A study based on UK data.” *Journal of Multinational Financial Management*, 17 (2007), pp. 257–272.

Pettengill, Glenn N., Sundaram, Sridhar, and Mathur, Ike. “The conditional relation between beta and returns.” *Journal of Financial and Quantitative Analysis*, 30 (1995), pp. 101–116.

Rompotis, Gerasimos. G. “Interfamily competition on index tracking: The case of the Vanguard ETFs and index funds.” *Journal of Asset Management*, 10 (2009), pp. 263–278.

Exhibit 1. Fund Characteristics

Funds	iShares S&P 500 Index Fund	SPDR S&P 500 ETF Trust	Spartan 500 Index Fund Investor Class	Vanguard 500 Index Fund Investor Shares
Ticker symbol	**IVV**	**SPY**	**FUSEX**	**VFINX**
Fund inception date	5/15/2000	1/22/1993	2/17/1988	8/31/1976
Net assets ($ billion)	23.04	78.53	38.27	96.77
Stock exchange	NYSE Arca	NYSE Arca	-	-
Morningstar category	Large Blend	Large Blend	Large Blend	Large Blend
Morningstar rating	3 stars	3 stars	3 stars	3 stars
Investment objective	The "Fund" seeks investment results that correspond generally to the price and yield performance, before fees and expenses, of the S&P 500 Index.	The Trust intends to provide investment results that, before expenses, generally correspond to the price and yield performance of the S&P 500 Index.	The fund seeks to provide investment results that correspond to the total return (i.e., the combination of capital changes and income) performance of common stocks publicly traded in the United States.	The Fund seeks to track the performance of a benchmark index that measures the investment return of large-capitalization stocks.

Source:
Prospectus as of 9/30/2010, 9/30/2010, 12/31/2009, and 12/31/2009, respectively.

Exhibit 2. Summary Statistics of Returns and Risk

	IVV	**SPY**	**FUSEX**	**VFINX**	**SPX**
Mean	0.015%	0.016%	0.015%	0.015%	0.008%
Median	0.073%	0.070%	0.071%	0.071%	0.067%
Standard Deviation	1.347%	1.372%	1.369%	1.370%	1.370%
Maximum	11.100%	14.520%	11.642%	11.573%	11.580%
Minimum	-9.165%	-9.844%	-9.044%	-9.025%	-9.035%
Ratio *	0.0113	0.0114	0.0112	0.0112	0.0060
Correlation	0.9891	0.9842	0.9999	1.0000	N.A.

* Ratio = Mean return divided by standard deviation.

Exhibit 3. Fee Structure

Funds	**IVV**	**SPY**	**FUSEX**	**VFINX**
Management fee	0.09%	0.09%	0.07%	0.15%
12b-1 fee	None	None	None	None
Other fee	None	None	0.03%	0.03%
Total annual operating expenses	**0.09%**	**0.09%**	**0.10%**	**0.18%**
Sales charges: Front-end load or breakpoints	None	None	None	None
Contingent deferred sales charges or back-end load	None	None	None	None
Redemption fee	None	None	None	None
Convertible share class (exchange fee)	No	No	No	No
Account fee	No	No	$10/year†	$20/year†
Total shareholder fees	None	None	$10/year†	$20/year†
Portfolio turnover (percent of average NAV)	7%	5.40%	11%	12%
Source: Prospectus as of	9/30/2010	9/30/2010	12/31/2009	12/31/2009

Note: † for fund balances under $10,000

Exhibit 7. Performance and Risk—CAPM and Dual-Beta Statistics

This Exhibit reports the alpha, beta, CAPM R^2, and tracking error for our samples. We use 10-year daily data ending 2/4/2011. Panel A reports results using SPX as the benchmark, e.g., IVVspx lists results for IVV when compared to SPX. Panel B reports results using the counterpart within its own ETF or index fund group as the benchmark, e.g., IVVspy are results for IVV when compared to SPY. Panel C reports results using the counterpart outside its own group.

Panel A	**IVVspx**	**SPYspx**	**FUSEXspx**	**VFINXspx**
Alpha (Standard)	0.018	0.018	0.018	0.018
Alpha (Up-Market)	0.086	0.004	0.054	0.057
Alpha (Down-Market)	0.015	0.054	0.018	0.017
Beta (Standard)	0.967	0.98	0.994	0.994
Beta (Up-Market)	0.945	0.981	0.982	0.981
Beta (Down-Market)	0.975	0.988	0.999	0.999
CAPM R^2 (Standard)	0.973	0.963	0.994	0.994
CAPM R^2 (Up-Market)	0.945	0.935	0.981	0.981
CAPM R^2 (Down-Market)	0.959	0.942	1.000	1.000
Tracking Error (Standard)	0.036	0.042	0.017	0.017
Tracking Error (Up-Market)	0.038	0.042	0.023	0.022
Tracking Error (Down-Market)	0.034	0.041	0.003	0.002

Panel B	**IVVspy**	**SPYivv**	**FUSEXvfinx**	**VFINXfusex**
Alpha (Standard)	0.000	0.000	0.000	0.000
Alpha (Up-Market)	0.086	-0.068	-0.001	-0.001
Alpha (Down-Market)	-0.041	0.041	0.001	0.000
Beta (Standard)	0.971	1.008	1.000	1.000
Beta (Up-Market)	0.948	1.028	1.000	1.000
Beta (Down-Market)	0.972	1.009	1.000	1.000
CAPM R^2 (Standard)	0.979	0.979	1.000	1.000
CAPM R^2 (Up-Market)	0.963	0.963	0.999	1.000
CAPM R^2 (Down-Market)	0.965	0.966	1.000	0.999
Tracking Error (Standard)	0.032	0.032	0.003	0.003
Tracking Error (Up-Market)	0.031	0.032	0.003	0.003
Tracking Error (Down-Market)	0.032	0.031	0.003	0.002

Panel C	**IVVvfinx**	**IVVfusex**	**SPYvfinx**	**SPYfusex**
Alpha (Standard)	0.000	0.000	0.001	0.001
Alpha (Up-Market)	0.028	0.029	-0.046	-0.046
Alpha (Down-Market)	-0.003	-0.004	0.035	0.035
Beta (Standard)	0.973	0.973	0.986	0.986
Beta (Up-Market)	0.964	0.964	0.999	0.999
Beta (Down-Market)	0.976	0.976	0.989	0.989
CAPM R^2 (Standard)	0.979	0.979	0.969	0.969
CAPM R^2 (Up-Market)	0.965	0.966	0.953	0.953
CAPM R^2 (Down-Market)	0.960	0.960	0.943	0.943
Tracking Error (Standard)	0.032	0.032	0.038	0.038
Tracking Error (Up-Market)	0.030	0.029	0.036	0.036
Tracking Error (Down-Market)	0.034	0.034	0.041	0.041

Exhibit 4. Cumulative Wealth

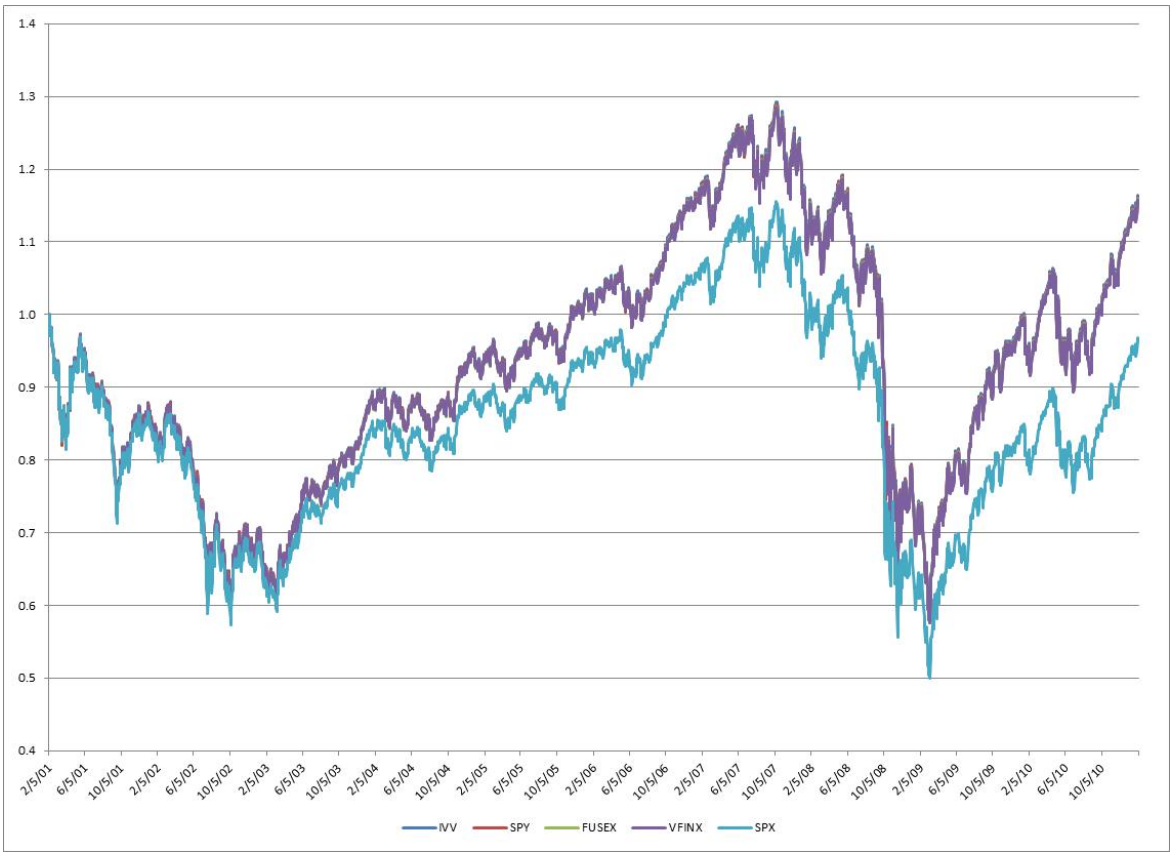


Exhibit 5. Conditional Volatility with the GARCH (1,1) Model

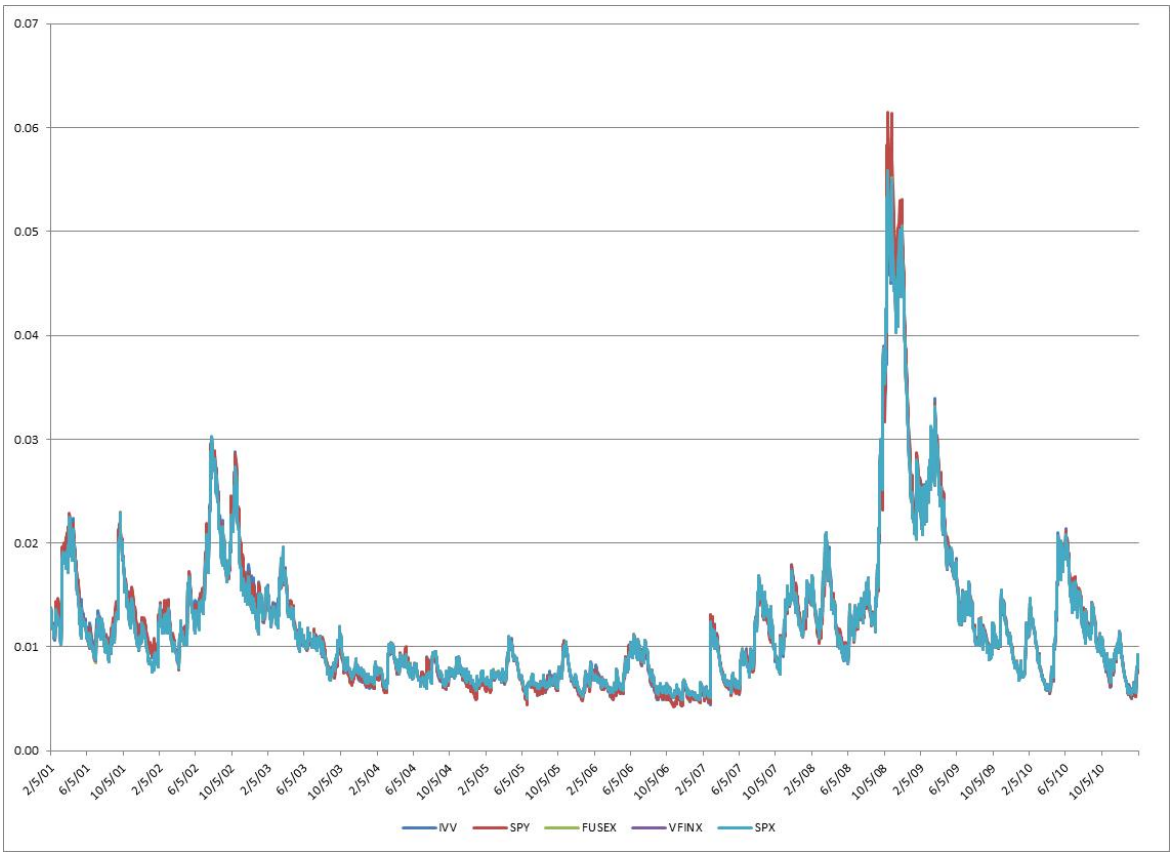
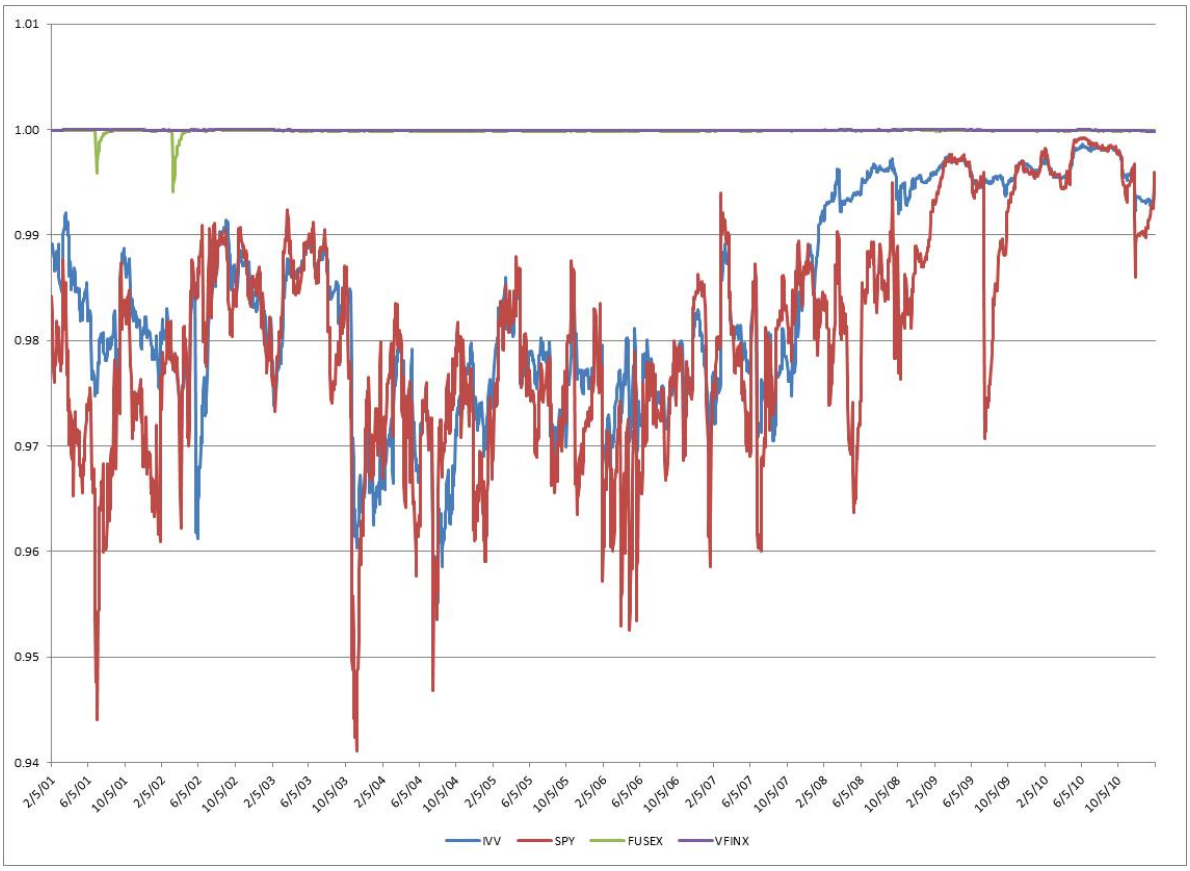


Exhibit 6. Conditional Correlation with SPX, using the DCC (1,1) Model



[i] The new tools referred in the article is a new A to F rating system introduced by Morningstar and IndexUniverse at the fourth Annual Inside ETFs Conference held on February 6-8, 2011 in Hollywood, Florida.
[ii] Tracking error is the standard deviation between the returns of the portfolio and the benchmark.