



MONITORING THE ETF MARKET

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- Our investment team monitors this growth on a continuous basis for new asset class exposures that can enhance our portfolio strategies. We cannot merely assume the efficacy of specific ETFs—and, more broadly, the ETF security type—without conducting rigorous empirical tests.
- How closely do ETF returns match those of the benchmark index? What examples are there where returns to the ETF differ meaningfully from those of the benchmark index? How has tracking performance evolved and how does it differ among the various asset classes? To address these questions, our research division conducted recently an extensive analysis of the universe of ETFs trading in the U.S., analyzing the performance of each ETF relative to the benchmark index.
- CORE RESULTS OF OUR STUDY
 - On average, ETF returns closely replicate the returns to the benchmark index.
 - The liquidity characteristics of the securities comprising the benchmark indexes influence the tracking performance.
 - Annual tracking errors indicate that the extreme market events of 2008 and 2009 had a significant impact on the ETF tracking errors across all asset classes, although the largest tracking errors come from ETFs tracking less liquid asset classes
 - Liquidity of the ETF shares themselves is important: Tracking errors are larger for ETFs with fewer assets under management and for ETFs with light trading volume.
- In summary, our analysis supports our usage of ETFs for achieving specific exposures in our portfolios. As the product space continues to evolve and more granular and exciting new exposures become available, we stand ready to take advantage of these exposures, but remain cautious and diligent in verifying the structure and efficacy of each product.

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AN EMPIRICAL ANALYSIS OF EXCHANGE TRADED FUNDS

Our investment process at Innealta depends crucially on the investment characteristics of ETFs, which seek to provide investors with passive exposures to the returns of a designated benchmark index, such as the S&P 500 or the Barclays Aggregate Bond Market Index. The ETF product space has expanded significantly in recent years, and these new innovations present ever-increasing investment opportunities by providing new asset class exposures previously unavailable. Our investment team monitors this growth on a continuous basis for new asset class exposures that can enhance our portfolio strategies. The mere size of the ETF marketplace, where assets under management recently exceeded \$1 trillion, suggests this innovation has been a tremendous success. However, we cannot merely assume the efficacy of specific ETFs—and, more broadly, the ETF security type—without conducting rigorous empirical tests.

How closely do ETF returns match those of the benchmark index? What examples are there where returns to the ETF differ meaningfully from those of the benchmark index? As ETF offerings expand beyond traditional asset classes to include commodities, derivatives and ever-more-granular exposures—such as country-specific funds or emerging market high-yield bonds—how has tracking performance evolved and how does it differ among the various asset classes?

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NARROWING THE QUERY

Of primary concern to our investment process is the degree to which ETFs provide the promised exposures (i.e. how closely the daily returns track those of the benchmark index). This is important, because we select for our portfolios the ETFs we believe will serve as the best proxy for a particular exposure in our portfolios to a specific asset class. Thus, the degree to which an ETF actually provides that exposure is of critical importance. The analysis we'll discuss in this missive focuses on the daily return differences between the returns to holding the

ETF shares and the return to the benchmark index. We refer to this difference as the tracking error. A negative tracking error indicates the return to ETF shareholders is less than the return to the benchmark index.

It is important to note that the benchmark indexes themselves are un-investable, since they do not reflect actual performance of investment portfolios inclusive of costs (both direct and indirect), but instead reflect the returns to hypothetical portfolios. It is thus not a reasonable expectation for an ETF to exactly replicate benchmark performance. It is reasonable, however, to expect relatively close (two relatives here: relative to the benchmark and relative to peer ETFs that track the same benchmark) tracking of benchmark performance and to expect that the difference in actual performance relative to the benchmark does not vary too greatly over time.

CORE RESULTS OF OUR STUDY

On average, ETF returns closely replicate the returns to the benchmark index.

The median daily tracking error for all ETFs is zero, suggesting ETF tracking errors tend to average out over time. The tails of the distribution (meaning the extremes on either end of the tracking error spectrum), however, indicate that at least a fraction of ETFs exhibit meaningfully large tracking errors. At the 90th percentile, the average annualized tracking error is 5.43%, while the 10th percentile value annualizes to -3.95%.

Beyond average tracking errors, return replication requires that ETF returns consistently match benchmark returns—after all, one of the critical features of the ETF innovation is the provision of intraday liquidity. For this purpose, we analyze the absolute tracking error, which is the absolute value of the daily tracking error. The median ETF exhibits an absolute tracking error of 38 basis points per day, while some ETFs exhibit much larger differences. As discussed below, the magnitude of these return differences is related to the liquidity of the securities in the benchmark index and to the size and liquidity of the ETF itself.

The liquidity characteristics of the securities comprising the benchmark indexes influence the tracking performance.

The ETF share creation/redemption process is of critical importance to understanding ETF return dynamics. ETFs provide intraday liquidity, unlike open-end funds (mutual funds). ETFs, however, unlike open-end funds, do not provide all investors with the opportunity to transact at the net asset value (NAV, which is the fair value of the portfolio), so the ETF shares trade at a price determined by the supply of and demand for the shares in the secondary market. To tie the ETF price to the NAV, the structure allows for some traders (deemed

authorized participants, or APs) to create and redeem shares of the ETFs. In cases where the ETF share price exceeds the NAV, these authorized participants create new shares of the ETF to bring the prices back in line. Similarly, during times when the ETF price is less than the NAV, the authorized participants redeem shares, reducing the number of shares in the marketplace, placing upward pressure on the share price.

The arbitrage described above works very well for ETFs tracking indexes such as the S&P 500, which is comprised of generally highly liquid large-cap domestic U.S. stocks. In many cases, however, a portion of the securities comprising the benchmark index are illiquid or unavailable for trading altogether. Thus, ETFs tracking less liquid asset classes, such as many sectors of the fixed income market, frequently are unable to own every security comprising the index. (In fact, owning every security in the index can be undesirable, given the added transaction costs involved. This delicate balance—maximizing benchmark performance replication while minimizing the impact of transaction costs on benchmark replication—is a discussion for another day). Faced with these constraints, the ETF manager uses replication sampling, a procedure which balances the desire for portfolio liquidity with the desire to minimize tracking error (which can be driven both by differences in the owned portfolio relative to the benchmark and the transaction costs required to construct and maintain that portfolio). An example of such sampling is the iShares Barclays Aggregate Bond Fund (AGG) that tracks the Barclays Aggregate Bond Index. As of November 30, 2010, the AGG held 640 securities, a sample of the 8,221 bonds comprising the actual index. In contrast, the two most popular ETFs tracking the S&P 500 Index, the SPY and the IVV, each own shares of all 500 stocks comprising the index. This process requires the manager to make important assumptions and subjective decisions that ultimately will influence performance.

Tracking errors for ETFs replicating indexes comprised of less liquid indexes tend to be larger. For example, within fixed income ETFs, those funds investing in U.S. Treasury indexes have very low tracking errors, averaging 15 basis points per day on an absolute basis. In contrast, high yield ETFs average 80 basis points per day absolute tracking error, although those tracking errors do tend to average out over time. Similarly, Real Estate ETFs and ETFs tracking non-US indexes tend to also exhibit larger tracking errors.

How did ETFs perform during the recent financial crisis?

The time period from September 2008 to March 2009 was extraordinary for financial markets, and was characterized by large price swings, high volatility, and frozen credit markets. The annual tracking errors indicate that the extreme market events of 2008 and 2009 had a significant impact on the ETF tracking errors across all asset classes, although the largest tracking errors come from

ETFs tracking less liquid asset classes. During 2009, the average ETF return was 1.6% below the benchmark index return. On average, equity benchmarks returned 30.5% but the average equity ETF tracking error was -1.7%. Fixed income ETFs experienced -2.6% tracking errors on average during 2009. During these times of market stress, the ability of ETFs to replicate closely the returns of their benchmark indexes appears to have been diminished, particularly among less liquid asset classes.

In the high yield bond market, the most illiquid sector of the bond universe, bid-ask spreads were extraordinarily large and trading volume plummeted. Not much of a surprise, then, that high yield exhibited the largest annual tracking errors. During 2008, U.S. high yield bonds experienced large losses as the indexes declined 23%. The two most popular U.S. high yield ETFs include the iShares iBoxx \$ High Yield Corporate Bond Fund (HYG), which tracks the iBoxx U.S. High Yield Index, and the SPDR Barclays Capital High Yield Bond ETF (JNK), which tracks the Barclays U.S. High Yield Very Liquid Index. For 2008, the buy-and-hold total return to HYG shares was -18% compared to the index return -23.9%, indicating the HYG shares had annual tracking error of +5.9%. Similarly, the JNK shares returned -24.7% for 2008 while the index return was -28.4%. During 2009, however, both funds exhibited large negative tracking errors. The HYG returned 28.6% for 2009, a tracking error of -15.9% compared to the index. Similarly the JNK returned 37.5%, a tracking error of -25.9% compared to the index.

The large tracking errors to high yield bond ETFs must be viewed in light of the illiquidity of the high yield market during the financial crisis. During the financial crisis credit markets were frozen. The creation/redemption mechanism that keeps the market price close to the NAV during supply/demand imbalances for the ETF shares requires APs to transact in the basket securities. As spreads soared to extreme highs in the high yield market during the credit crisis, the creation/redemption trade was increasingly costly and risky for APs as they faced both high spreads and the uncertainty of their ability to transact in the underlying basket. The large high yield ETF tracking errors are near definitive evidence that the liquidity of the underlying securities influences the tracking ability of the ETFs.

Liquidity of the ETF shares themselves is important: Tracking errors are larger for ETFs with fewer assets under management and for ETFs with light trading volume.

The creation/redemption process permits the authorized participants to create or redeem shares in multiples of 10, 50, or 100 thousand ETF shares, depending on the rules of each particular Fund. Some ETFs trade infrequently: 10% of U.S. ETFs have average daily dollar trading volume less than \$127,000. For those

ETFs, one creation basket may be multiples of the average daily dollar volume, suggesting that the arbitrage process tying the price to the share value may be less precise. Our analysis reveals that the magnitude of tracking errors is larger for thinly traded ETFs. Additionally, tracking errors are larger for small ETFs, meaning those with lower assets under management, suggesting there are some economies of scale in fund management, specifically that ETFs must achieve critical mass in order to overcome some fixed costs of fund management.

WORTH THE MONITORING

In summary, our analysis supports our usage of ETFs for achieving specific exposures in our portfolios. Across the board, ETFs are a tremendously successful innovation providing intraday liquidity and passive exposure to an ever-increasing universe of benchmark indexes. Our study highlights that the majority of ETFs achieve their goals of replicating a specific index with great accuracy. In some cases, however, the tracking performance may meaningfully differ, a result that has important implications for investor portfolios. For this reason, we remain diligent in screening and selecting among these products for our portfolios. As the product space continues to evolve and more granular and exciting new exposures become available, we stand ready to take advantage of these exposures, but remain cautious and diligent in verifying the structure and efficacy of each product.

IMPORTANT INFORMATION

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Innealta is an asset manager specializing in the active management of portfolios of Exchange Traded Funds. Innealta's competitive advantage is its quantitative investment strategy driven by a proprietary econometric model created by Dr. Gerald Buetow, Innealta's Chief Investment Officer. The firm's products include Tactical ETF Portfolios, a U.S. Sector Rotation Portfolio and a Country Rotation Portfolio. Innealta aims to beat appropriate benchmark performance by tactically managing portfolios utilizing a proprietary econometric model. By harnessing the benefits of ETFs, Innealta is able to provide investors with exposure to multiple asset classes and investment styles in highly liquid, low cost portfolios.

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