The CBOE S&P 500 BuyWrite Index (BXM) – A Review of Performance

Executive Summary

The market exposure gained from owning the CBOE S&P 500 BuyWrite Index (BXM™) is similar to owning the S&P 500® basket of securities with the added feature of writing an at-the-money S&P 500 covered call option on the third Friday of every month. Since its 1986 inception, BXM has earned returns on par with the S&P 500 Index, but with less volatility. The BXM tends to underperform the S&P 500 Index during periods of sharply rising markets. In quiet market conditions, the BXM has the potential to outperform the S&P 500 Index due to the premium collected on the sale of the call option. The BXM Index has outperformed the S&P 500 Index in periods of falling markets. This strategy is a potential solution for investors concerned about reducing overall portfolio volatility.

Summary of Results

From June 1986 through January 2012, the BXM produced a:

• Similar return but lower volatility relative to the S&P 500 Index
• Return in excess of all other comparative indices
• Standard deviation lower than all other equity and commodity indices
• Standard deviation lower than the 30-Year Treasury Index
• Sharpe ratio that was superior to that of other equity and commodity indices evaluated

The BXM

The BXM Index is designed to gain exposure to the U.S. equity market, while earning an option premium that can offset losses during declining stock markets. Call options are frequently-traded investments, and the S&P 500 Index is one of the most liquid index options markets. For the seller of an at-the-money call option, if the index does not rise during the life of the call option, the seller keeps the premium. If the index is above the strike price at expiration, the call seller pays the call buyer the difference between the stock index value and the strike price. For those periods where the return on the S&P 500 Index exceeds the income generated by the strategy, the BXM will underperform the S&P 500 Index.

Exhibit 2 - Growth in the Value of $1 (June 30, 1986 - January 31, 2012)

Exhibit 2 - The value of a dollar invested on June 30, 1986. Cumulative returns for all asset classes in this study. As of January 31, 2012 the value of one dollar invested in the CBOE BXM was $9.43 on par with the value of one dollar invested in the S&P 500 which was $9.44.

The Study

Hewitt EnnisKnupp reviewed the BXM Index. We examined performance relative to a number of total return indexes, including the S&P 500 Index, other commonly referenced indices, and a peer group of active core U.S. equity mutual funds. Of equal importance, we attempt to analyze risk-adjusted performance. We examine the call premium as a source of return and then evaluate the impact of adding the BXM to a portfolio consisting of equities and fixed income. Sources for the exhibits include Bloomberg, CBOE, and various index providers.

Exhibit 3 - Compound Annualized Returns (June 30, 1986 - January 31, 2012)

Exhibit 3 - Compound annual returns for all asset classes over the period from June 30, 1986 to January 31, 2012. Compound annual returns depend only on the beginning and ending values of the indexes and the elapsed time period. The growth rate of 9.17% for the CBOE BXM indicates that one dollar growth at this constant rate would have grown to $9.43 since inception.

Exhibit 1 - Profit-and-loss Diagram for the CBOE BXM

Exhibit 1 - Illustrates the return pattern of a covered call option writing strategy such as the CBOE BXM.
with a much lower annualized volatility. The CBOE BXM has performed in-line with the S&P 500 on an annualized basis (June 30, 1986 - January 31, 2012). CBOE BXM has performed in-line with the S&P 500 annualized returns while at a much lower level of volatility.

Exhibit 4 - Annualized Standard Deviations (June 30, 1986 - January 31, 2012)

Exhibit 5 - Histogram of Monthly Returns (June 30, 1986 - January 31, 2012)

Exhibit 6 - Risk-Return Tradeoff (June 30, 1986 - January 31, 2012)

Exhibit 7 - Summary Statistics for BXM and Other Investments (June 30, 1986 - January 31, 2012)

Results Over Time
We further review the BXM strategy via monthly returns. Rolling five-year annualized BXM returns relative to the S&P 500 Index help demonstrate how closely the two track. The rolling five-year annualized standard deviation of the BXM relative to the S&P 500 Index has remained fairly constant over the last 25 years. At many points through history the BXM's standard deviation has been approximately two-thirds of the S&P 500 Index. Exhibits 8, 10, and 11 reinforce statements made earlier that the BXM is likely to outperform in down markets, typically do well in quiet markets, and lag in strong bull markets. Finally, we examine the BXM and S&P 500 Index returns during major market events.

Exhibit 8 - Rolling Five-Year Annualized Returns (June 30, 1986 - January 31, 2012)

Exhibit 9 - Rolling Five-Year Standard Deviation (June 30, 1986 - January 31, 2012)

Exhibit 10 - Annualized standard deviation for all asset classes over the period from June 30, 1986 to January 31, 2012. The CBOE BXM has performed in-line with the S&P 500 on an annualized basis with a much lower annualized volatility.

The Call Premium – A Significant Source of Return

Selling an at-the-money call option each month earned an average gross premium of 1.8% of the notional value of the S&P 500 Index, which averages 21.6% per year. There is substantial variation of the premium income that can be earned by this strategy. The premium earned by selling call options can reduce the negative impact of falling markets. A significant source of return to this strategy comes from the tendency of index options to trade at prices above their fair value. As the demand for index options is high, and the natural number of options sellers is low, the buyers of options tend to pay a premium. Essentially, the implied volatility tends to be at a higher level than realized volatility. Sellers of index options, over long periods of time, earn this risk premium of the excess of implied over realized volatility as compensation for selling volatility.

Adding BXM to a Portfolio

We examine the impact of adding up to 15% of the BXM Index to a standard portfolio consisting of U.S. bonds and global equity. Historical returns were used to construct the efficient frontiers.

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Exhibit 11 - The CBOE BXM and S&P 500 returns and universe ranking comparison during extreme market conditions. Historical rankings are based on the U.S. large-cap core equity manager universe data provided by eVestment Alliance. Average number of managers included in the universe under consideration was 170. During extreme down markets the CBOE BXM has consistently outperformed the S&P 500 by 11.5 percentage points and was ranked in the top 15th percentile while S&P 500 ranked among the bottom 90th percentile.

Exhibit 12 - Implied Volatility (VIX) minus Subsequent S&P 500 Realized Volatility – Average Per Year (2000 - 2012)


Adding BXM to a Portfolio

We examine the impact of adding up to 15% of the BXM Index to a standard portfolio consisting of U.S. bonds and global equity. Historical returns were used to construct the efficient frontiers.

Exhibit 14 - Expansion of the Mean-Variance Efficient Frontier when CBOE BXM is added to the Asset Mix of U.S. Bonds and Global Equity (June 1, 1986 - January 31, 2012)
Evidence of Investability

Multiple products, passive and active, track the BXM Index. For the purposes of this study, we examine two passive exchange-traded investment vehicles, the Powershares S&P 500 BuyWrite Portfolio ETF (PBP) and the iPath CBOE S&P 500 BuyWrite exchange-traded note (BWV). Our goals are to sample how well passive products track the underlying BXM Index and to make comparisons with the SPDR S&P 500 (SPY) ETF. Since December 2007, the PBP and the BWV have produced an annualized tracking error of 0.7% and 0.3% versus the BXM Index, respectively.

Exhibit 15 - Investable Instruments and Supplementary Statistics
Since Year-End 2007
(December 31, 2007 - January 31, 2012)

<table>
<thead>
<tr>
<th>Statistics</th>
<th>BWV ETN</th>
<th>PBP ETF</th>
<th>SPY ETF</th>
<th>CBOE BXM</th>
<th>S&amp;P 500</th>
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<tr>
<td>Annualized Return</td>
<td>-0.19%</td>
<td>-1.51%</td>
<td>-0.58%</td>
<td>0.47%</td>
<td>-0.54%</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>16.5%</td>
<td>16.3%</td>
<td>20.5%</td>
<td>16.3%</td>
<td>20.5%</td>
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<tr>
<td>Autocorrelation</td>
<td>0.24</td>
<td>0.25</td>
<td>0.24</td>
<td>0.24</td>
<td>0.24</td>
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<tr>
<td>Skew</td>
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<td>-0.92</td>
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<td>-0.88</td>
<td>-0.49</td>
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<tr>
<td>Kurtosis</td>
<td>1.44</td>
<td>1.60</td>
<td>0.11</td>
<td>1.54</td>
<td>0.10</td>
</tr>
<tr>
<td>Jensen’s Alpha</td>
<td>0.19%</td>
<td>-1.23%</td>
<td>-0.00%</td>
<td>-0.75%</td>
<td>0.00%</td>
</tr>
<tr>
<td>Correlation to S&amp;P 500</td>
<td>0.91</td>
<td>0.91</td>
<td>1.00</td>
<td>0.91</td>
<td>1.00</td>
</tr>
</tbody>
</table>

Exhibit 15 - After the 2002 introduction of the BXM Index, many investors inquired about investability of the index, and dozens of actively managed buywrite products were launched in the past decade. In 2007 two exchange-traded products (ETPs) designed to try to match the BXM Index were introduced – the PowerShares S&P 500 BuyWrite Portfolio ETF (PBP) and the iPath CBOE S&P 500 BuyWrite Index exchange-traded note (BWV). Both of these products have expense ratios of 0.75% that are factored into the returns above. The standard deviation for the PBP and BWV is about 4 percentage points lower than the SPY standard deviation. Please read the ETP prospectus for information about investment risk, counterparty risk, and expenses.

This paper was prepared by Hewitt EnnisKnupp at the request of Chicago Board Options Exchange, Incorporated (CBOE). CBOE provided financial support for this paper. The BXM Index is designed to represent a hypothetical strategy. The actual performance of investment vehicles such as mutual funds can have significant differences from the performance of hypothetical indices. Investors attempting to replicate the BXM Index should discuss with their advisors possible timing and liquidity issues. Past performance does not guarantee future results. This paper contains index performance data based on back-testing, i.e., calculations of how the index might have performed prior to launch. Back-tested performance information is purely hypothetical and is provided in this paper solely for information purposes. Index returns do not reflect management fees, transactions costs or expenses. Nothing in this paper should be deemed as investment advice or a recommendation by Hewitt EnnisKnupp or CBOE to buy or sell securities. Neither Hewitt EnnisKnupp nor CBOE assumes any responsibility for any losses you might suffer by reason of adopting any investment strategy discussed in this paper. CBOE®, Chicago Board Options Exchange® and VIX® are registered trademarks and BuyWrite and BXM are service marks of CBOE. CBOE calculates and disseminates the BXM Index. The methodologies of the BXM Index is owned by CBOE and may be covered by one or more patents or pending patent applications. Standard & Poor’s®, S&P®, and S&P 500® are registered trademarks of Standard & Poor’s Financial Services, LLC and are licensed for use by CBOE. CBOE’s options based on S&P 500 indexes and financial products based on the BXM Index are not sponsored, endorsed, marketed or promoted by Standard & Poor’s and Standard & Poor’s makes no representations regarding the advisability of investing in such products.

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