

# An Historical Evaluation of the CBOE S&P 500 BuyWrite Index Strategy

October 2006

## The Buy-Write Strategy

A “Buy-Write” strategy, also called a “covered call”, is an investment strategy in which the investor buys a stock or a basket of stocks and writes (or sells) call options that cover the stock position. The strategy can be used to enhance portfolio returns under certain market conditions and to reduce volatility. In down markets, the option premium received cushions the price decline in an equity portfolio. The trade-off is that in strong equity markets, the upside potential of the equity investment is truncated as the option is exercised above the strike price. A buy-write strategy is often expected to outperform a purely passive stock index strategy in bear markets and underperform the purely passive stock index in bull markets. The profit/loss profile of the buy-write strategy is displayed in Exhibit 1.

## The BXM Index

The CBOE S&P 500 BuyWrite Index (BXM) is a benchmark index designed to track the performance of a hypothetical buy-write strategy on the S&P 500 Index. Announced in 2002, the BXM was the first buy-write index offered to the market. The methodology of the BXM Index is based on (1) buying an S&P 500 index portfolio, and (2) writing the near-term, at-the-money S&P 500 “covered” call option, generally on the third Friday of each month. The premium collected from the sale of the call is added to the portfolio’s total value. The call is held until expiration, typically the 3rd Friday of the following month, at which time a new one-month, at-the-money call is written. If exercised, the expired option is settled in cash. The CBOE launched futures contracts on the BXM on October 2, 2006.

## Profit and Loss Expectations for Buy-Write

Exhibit 1

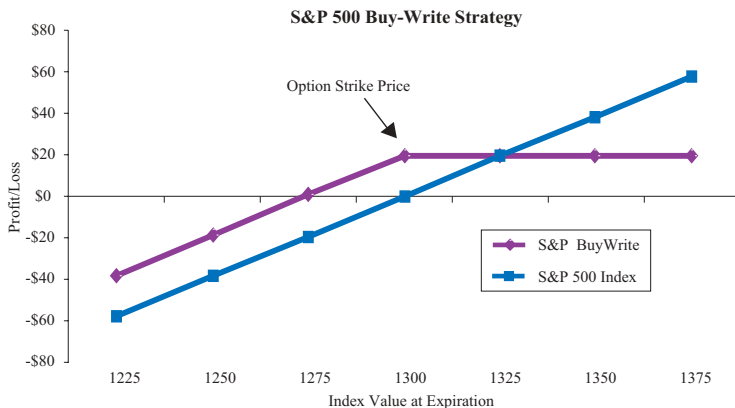
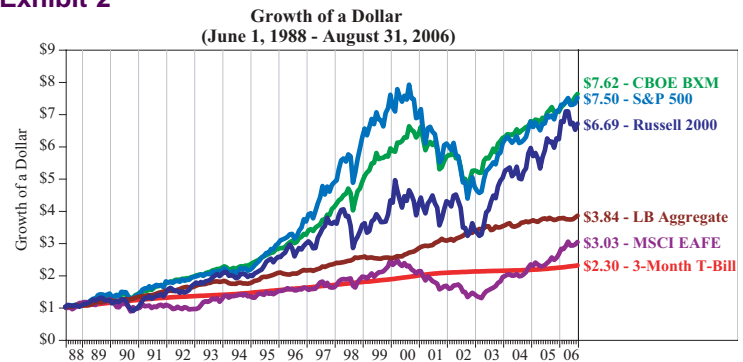


Exhibit 2



The value of a dollar invested on June 1, 1988, based on cumulative returns for all asset classes included in the study. As of August 31, 2006 the value of one dollar invested in CBOE BXM was \$7.62 while a dollar invested in the S&P 500 was worth \$7.50. Note: for starting prices the chart uses the daily closing prices on June 1, 1988 for the BXM index (the first day of calculation) and May 31, 1988 for the other indexes. Source: CBOE for BXM data, Callan Associates for index returns.

## The Callan Study

Callan Associates conducted an evaluation of the CBOE S&P 500 BuyWrite Index. We examined the performance of the BXM in comparison to the S&P 500 and from a total portfolio perspective. This study builds on the research conducted by a Duke University professor (Whaley 2002) and Ibbotson Associates (Feldman and Roy 2005), extending their analyses with a longer history. Return, risk and risk-adjusted performance are examined over an extended period and through cycles of up and down equity markets. The performance of the BXM is compared to the S&P 500 and market indexes depicting other asset class-

es, as well as to the performance of active large cap equity managers. Risk-adjusted performance—measures of efficiency, or return per unit of risk—are calculated using both the popular Sharpe Ratio (which is based on the assumption of a normal distribution of returns) and the Stutzer (2000) Index, a ranking tool that is not biased by the skew and kurtosis evident in the covered call strategy. The study then evaluates the impact of adding the BXM to typical diversified investor portfolios, substituting the BXM for a portion of the large cap equity allocation.

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## Summary of Results

The results show that the BXM Index has generated superior risk-adjusted returns over the last 18 years (18 years and 3 months, to be exact), generating a return comparable to that of the S&P 500 at approximately two-thirds of the risk. The compound annual return of the BXM Index since June 1, 1988 is 11.77 percent, compared to 11.67 percent for the S&P 500. The BXM returns were generated with a standard deviation of 9.29%, two-thirds of the 13.89% volatility of the S&P 500. The risk-adjusted performance, as measured by the monthly Stutzer Index over the 18-year period, was 0.20 for the BXM vs. 0.15 for the S&P 500. A comparison using the monthly Sharpe Ratio yielded similar results (0.22 vs. 0.16, respectively), confirming the relative efficiency of the BXM over the study period. Cumulative results are dependent on the time period selected for evaluation, so Callan examined performance over individual years, over rolling five-year periods, and through up and down cycles in the equity markets. The BXM clearly underperformed the S&P 500 during the run-up in the equity market in the second half of the 1990s, and just as clearly outperformed the S&P 500 during the market downturn from April 2000 through March 2003. The BXM generates a return pattern different from that of the S&P 500, offering a source of potential diversification. The addition of the BXM to a diversified investor portfolio would have generated significant improvement in risk-adjusted performance over the past 18 years.

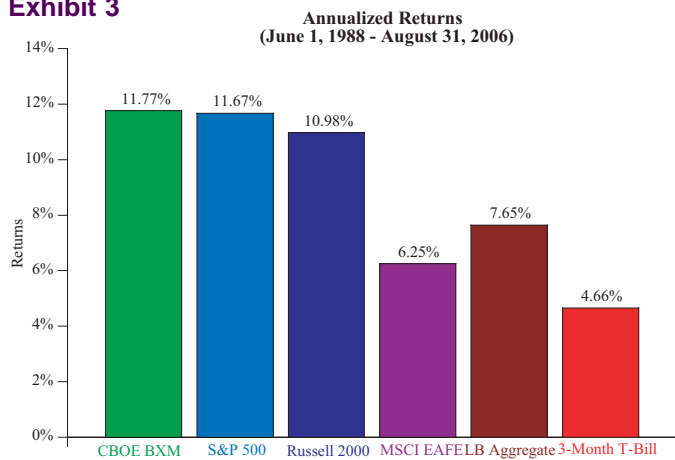
## Comparisons of Return and Risk: BXM vs. S&P 500

Callan evaluated the return patterns for the BXM index versus the S&P 500 over the period June 1, 1988 through August 31, 2006. We also evaluated BXM returns versus a collection of market indexes depicting the performance of other asset classes, and versus a peer group of active core equity mutual funds. During the 219-month time period studied, the BXM generated:

- Slightly higher returns with substantially lower volatility than the S&P 500 and Russell 2000 stock indexes. Returns are markedly higher than those of the MSCI EAFE index.
- Higher returns and higher volatility than the Lehman Aggregate bond index and 90-day Treasury bills.
- Higher risk-adjusted returns than the S&P 500 as measured by both the Sharpe Ratio and the Stutzer Index. The Stutzer Index is a measure of portfolio efficiency that takes into account the negative skew evident in the BXM returns.
- Lower returns than the S&P 500 in strong equity markets but clearly superior returns in down markets. A monthly buy-write strategy collects premium income but has a truncated monthly upside when the option is exercised above the strike price. Therefore, the buy-write strategy is expected to outperform a pure passive stock index strategy in bear markets and underperform the purely passive stock index in bull markets. The profit/loss profile of the buy-write strategy is displayed in Exhibit 1.

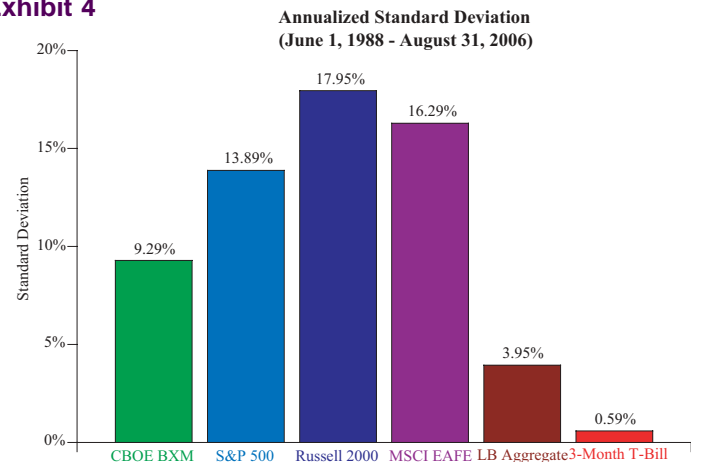
## Analysis of Cumulative Results

### Exhibit 3



Annualized returns for all asset classes over the period June 1, 1988 to August 31, 2006. The CBOE BXM averaged an 11.77% annual return, slightly higher than that for the S&P 500. The return for the BXM implies that one dollar compounding at this constant rate would have grown to \$7.62 over the study period.

### Exhibit 4

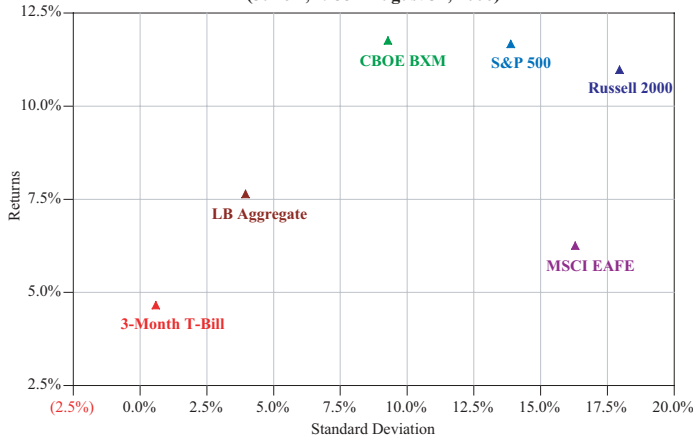


Annualized standard deviations for all asset classes over the period June 1, 1988 to August 31, 2006. The 9.29% standard deviation for the CBOE BXM was approximately two-thirds that of the 13.89% standard deviation for the S&P 500.

# An Historical Evaluation of the CBOE S&P 500 BuyWrite Index Strategy

**Exhibit 5**

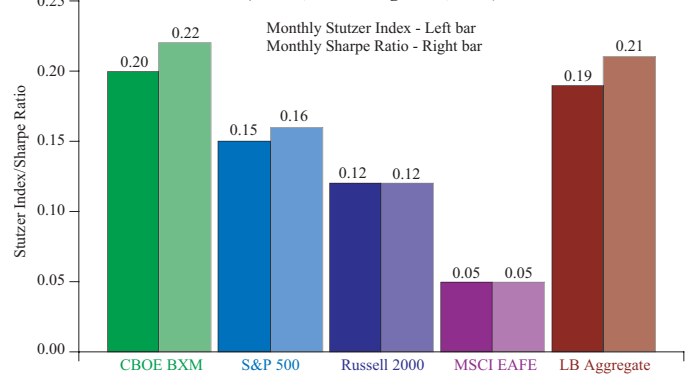
**Annualized Return versus Risk  
(June 1, 1988 - August 31, 2006)**



Annualized return and standard deviations for all asset classes over the period June 1, 1988 to August 31, 2006. The CBOE BXM generated return comparable to that of the S&P 500 at approximately two-thirds of the risk as measured by standard deviation.

**Exhibit 6**

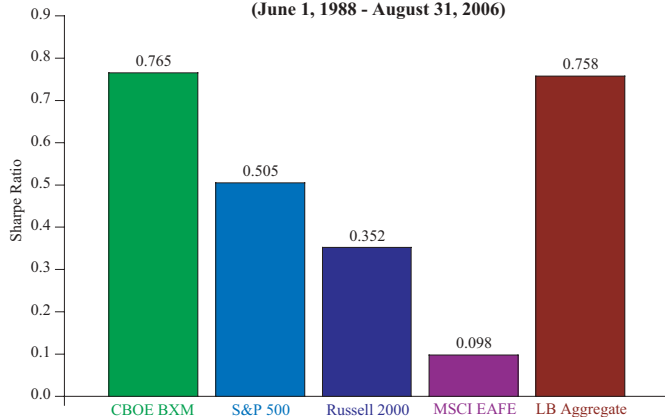
**Risk-Adjusted Returns (Monthly Stutzer Index vs. Monthly Sharpe Ratio)  
(June 1, 1988 - August 31, 2006)**



Monthly Stutzer Index and Sharpe Ratio calculations for all asset classes over the period from June 1988 to August 2006. The Stutzer (2000) index is a measure of risk-adjusted returns. It is a ranking tool analogous to the Sharpe Ratio that is not biased by skew and kurtosis in asset returns. The Ibbotson (2005) study demonstrated that measurable skew and excess kurtosis exist in the returns for the CBOE BXM, a result confirmed in Exhibit 8. The Stutzer Index indicates that the BXM generated considerably better risk-adjusted performance than the S&P 500 even after taking into account the negative skew.

**Exhibit 7**

**Annualized Sharpe Ratio  
(June 1, 1988 - August 31, 2006)**



Annualized Sharpe ratio calculations for all asset classes over the period June 1, 1988 to August 31, 2006. The Sharpe ratio is a measure of risk-adjusted returns. These results indicated that the CBOE BXM has a superior risk-adjusted performance to that of the S&P 500. The Sharpe ratio does not take into account skew and kurtosis in the distribution of assets. The magnitude of the superior risk-adjusted performance for the BXM indicated by the Sharpe Ratio is similar to that reported using the Stutzer Index, suggesting that the performance of the BXM is not materially affected by the negative skew and excess kurtosis.

**Exhibit 8**

**Summary statistics for the CBOE BXM and select asset classes, calculated monthly, since June 1, 1988.**

Statistic	CBOE BXM	S&P 500	Russell 2000	MSCI EAFE	LB Aggregate	3 Month T-Bill
Monthly Compound Return	0.93%	0.92%	0.87%	0.51%	0.62%	0.38%
Monthly Standard Deviation	2.68%	4.01%	5.18%	4.70%	1.14%	0.17%
Monthly Sharpe Ratio	0.22	0.16	0.12	0.05	0.21	-
Monthly Stutzer Index	0.20	0.15	0.12	0.05	0.19	-
Autocorrelation	-0.02	-0.05	0.10	-0.04	0.16	0.97
Skew	-1.24	-0.44	-0.49	-0.16	-0.34	0.03
Excess Kurtosis	4.56	0.88	0.98	0.43	0.13	-
Annualized Compound Return	11.77%	11.67%	10.98%	6.25%	7.65%	4.66%
Excess Return (over S&P 500)	0.09%	0.00%	-0.69%	-5.42%	-4.03%	-7.02%
Annualized Standard Deviation	9.29%	13.89%	17.96%	16.29%	3.95%	0.59%
Downside Risk (relative to zero)	6.06%	8.61%	11.69%	10.72%	1.90%	0.00%
Correlation (to S&P 500)	0.87	1.00	0.74	0.63	0.18	0.08
Annualized Sharpe Ratio	0.77	0.51	0.35	0.10	0.76	-

Summary statistics for BXM and select asset classes, calculated monthly, since June 1, 1988. The Stutzer Index is a measure of risk-adjusted returns that is not biased by skew and kurtosis. It is equal to the Sharpe Ratio for a normally distributed asset.

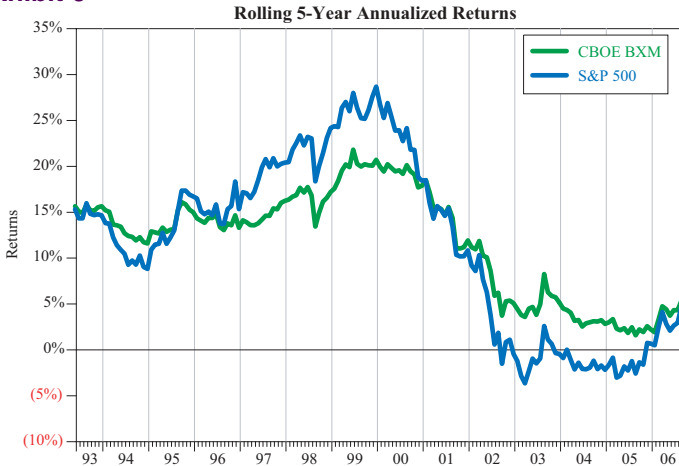
# An Historical Evaluation of the CBOE S&P 500 BuyWrite Index Strategy

## Analysis of Periodic Results

Cumulative results are dependent on the time period selected for evaluation. The starting date of June 1, 1988 was selected because it marks the first date at which S&P reported total returns on a daily basis. Callan examined performance of the

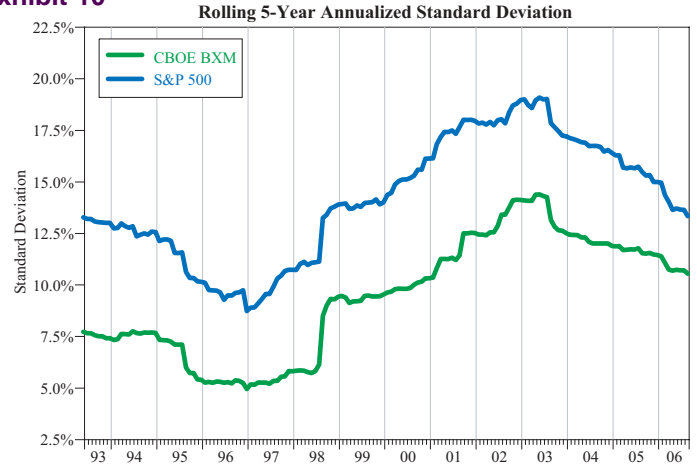
BXM over individual years, over rolling five-year periods, and through up and down cycles in the equity markets to more fully assess the performance of the strategy.

**Exhibit 9**



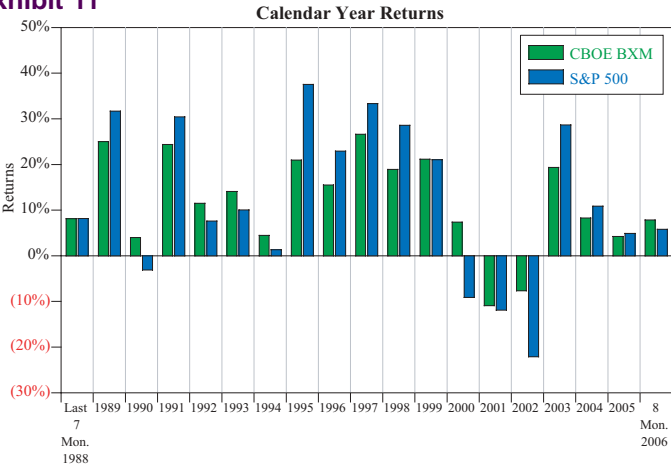
The five-year annualized returns for the CBOE BXM and the S&P 500 calculated over rolling periods since June 1, 1988. The BXM underperformed the S&P 500 during the bull equity market in the late 1990s and outperformed the S&P 500 in the period following the bursting of the internet bubble and the decline in the equity market that started in April 2000. Note that the five-year returns for the BXM remained positive for the entire period following April 2000, while the five-year returns for the S&P 500 turned negative in 2002 and remained largely negative until 2006.

**Exhibit 10**



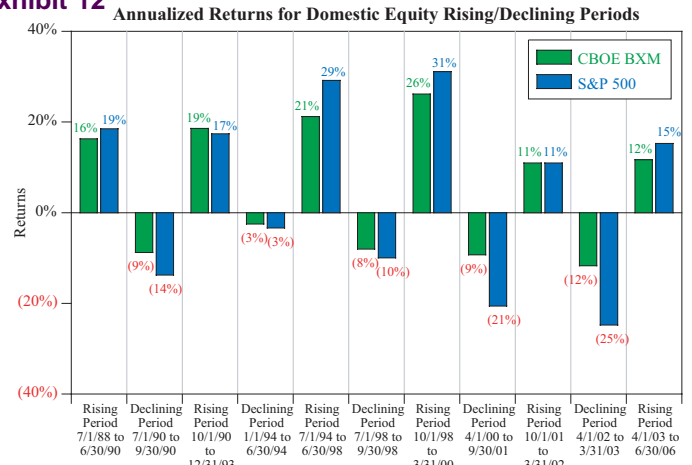
The five-year annualized standard deviation for the CBOE BXM and the S&P 500 calculated over rolling periods since June 1, 1988. The BXM has exhibited consistently lower volatility than the S&P 500 over the period June 1, 1988 to August 31, 2006.

**Exhibit 11**



Calendar year returns for CBOE BXM and S&P 500 since January 1, 1989 (returns for 1988 and 2006 are not annualized). The BXM underperformed the S&P 500 late in the bull equity market (1995-1998) and outperformed the S&P 500 in the period following the bursting of the Internet bubble and the decline in the equity market that started in April 2000 (particularly 2000 and 2002).

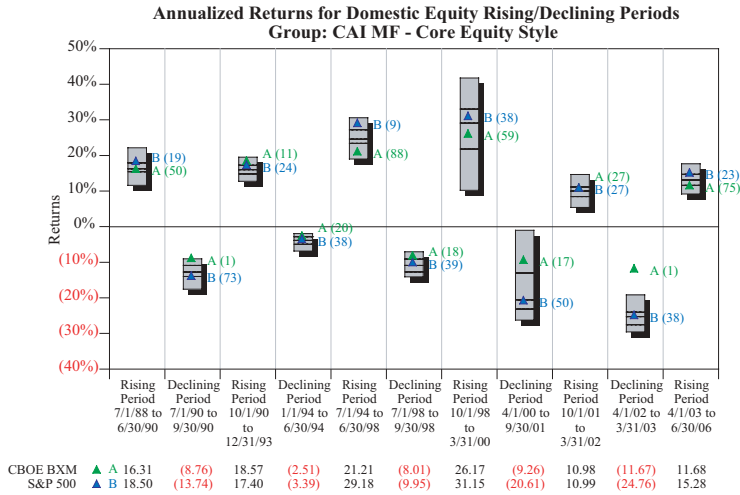
**Exhibit 12**



The annualized returns for the CBOE BXM and the S&P 500 since June 1, 1988, divided into periods of rising and declining equity markets. The BXM underperformed the S&P 500 during most rising equity markets and consistently outperformed the S&P 500 in all periods of declining equity markets, demonstrating the return cushion provided by income from writing the calls. The worst drawdown for the S&P 500 was -47.4% from September 5, 2000 through October 9, 2002. During this same period, the BXM suffered a drawdown of -32.5%, approximately one-third less than the S&P 500.

# An Historical Evaluation of the CBOE S&P 500 BuyWrite Index Strategy

**Exhibit 13**

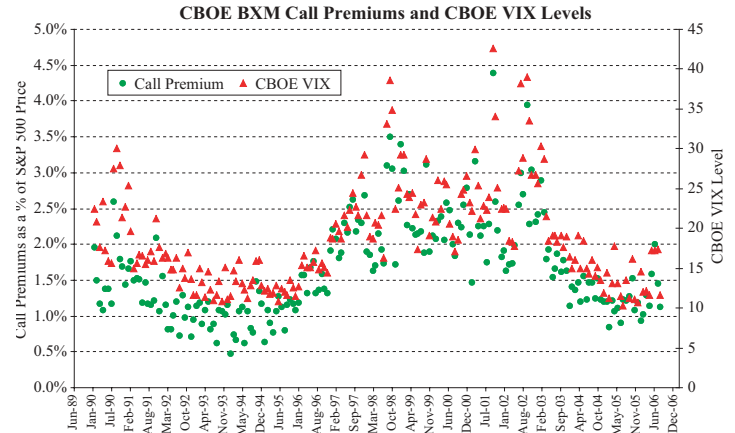


The annualized returns for the CBOE BXM and the S&P 500 since June 1, 1988, divided into periods of rising and declining equity markets, and cast against a peer group of active large cap core mutual funds. Note that the performance of the mutual fund peer group is net of fees. The gray bars represent the range of active manager performance from 5th to 95th percentile. The numbers in parentheses represent the percentile rankings of each index's performance. The BXM underperformed the S&P 500 and the median manager during most rising equity markets but consistently outperformed both the S&P 500 and most active managers in all periods of declining equity markets, demonstrating the return cushion provided by income from writing the calls. These results suggest that the BXM offers the benefit of diversification to both the S&P 500 and to active management.

## Call Premiums as a Source of Return

Selling index options 12 times per year produces significant income. Whaley (2002) and Feldman and Roy (2005) demonstrated that implied volatility reflected in the price of S&P 500 options is often higher than realized volatility, suggesting that calls trade at a persistent premium to their fair value.

**Exhibit 14**



The CBOE BXM call premiums earned as a percentage of underlying value, January 1, 1990 to August 31, 2006, plotted against the CBOE Volatility Index (VIX), a measure of expected stock market volatility (the VIX debuted in January 1990). The average monthly premium since January 1, 1988 is 1.64%, an annualized rate of 21.49%. Premium levels are closely tied to volatility expectations; premiums rose sharply with volatility in the bull market of the late 1990s and through the sharp market decline in 2000–02. Both premiums and expected volatility have since subsided to the levels of the early 1990s.

## Benefit of Adding BXM to a Portfolio

This study evaluates the impact of adding the BXM to typical diversified investor portfolios, substituting the BXM for a portion of the large cap equity allocation. In addition to generating the superior risk adjusted return over the historical period examined above, the BXM is less than perfectly correlated with the S&P

500, as the return pattern is modified by the income stream from the call writing and the truncated returns on the upside. The buy-write feature of the BXM reduces correlation with the domestic (and international) equity markets and offers the potential for diversification benefit.

**Exhibit 15**

	Impact of Adding 10% Allocation to CBOE BXM Strategy to Typical Efficient Asset Portfolios					
	Conservative	Conservative + BXM	Moderate	Moderate + BXM	Aggressive	Aggressive + BXM
Returns	8.82%	8.79%	9.57%	9.57%	9.80%	9.81%
Standard Deviation	5.22%	4.75%	8.43%	7.89%	10.92%	10.39%
Downside Risk (relative to Zero)	2.65%	2.38%	5.06%	4.76%	6.95%	6.64%
Sharpe Ratio	0.80	0.87	0.58	0.62	0.47	0.50

Measuring the impact of adding CBOE BXM to diversified portfolios. Calculated with monthly rebalancing over the period June 1, 1988 to August 31, 2006. BXM substituted for 10% of large cap equity exposure in each asset mix.

The addition of the BXM to a diversified investor portfolio would have generated significant improvement in risk-adjusted performance over the past 18 years. In all three portfolios, return is essentially unchanged while risk is reduced, improving the risk adjusted return as measured by the Sharpe ratio. Downside risk is also reduced. (Downside risk differentiates between "good" risk (upside volatility) and "bad" risk (downside volatility). Downside risk measures only the standard deviation of returns that are below a target (in this case zero).

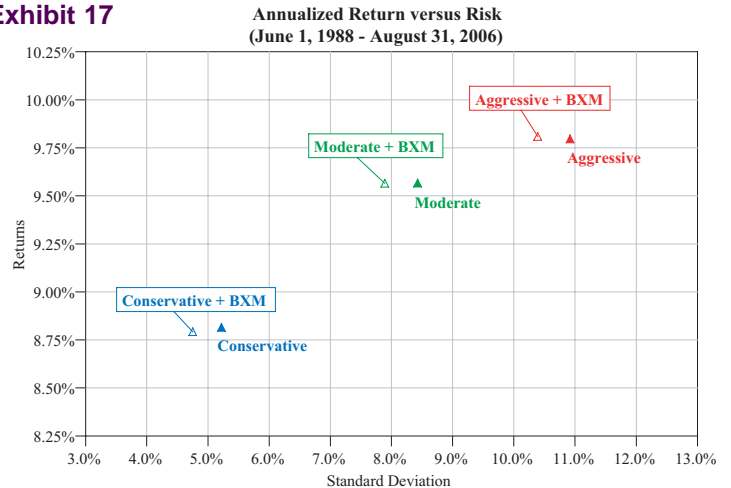
**Exhibit 16**

Typical Efficient Asset Portfolios			
Asset Class	Conservative	Moderate	Aggressive
Large Cap US Equity	20%	35%	40%
Small Cap US Equity	5%	10%	15%
International Equity	5%	15%	25%
Fixed Income	70%	40%	20%

# An Historical Evaluation of the CBOE S&P 500 BuyWrite Index Strategy

Measuring the impact of adding CBOE BXM to diversified portfolios. Calculated with monthly rebalancing over the period June 1, 1988 to August 31, 2006. BXM substituted for 10% of large cap equity exposure in each asset mix. In all cases, return is essentially unchanged while risk is reduced, improving the risk-adjusted return as measured by the Sharpe Ratio.

**Exhibit 17**



## Gaining Exposure to the BXM Index Through Investment Products and Futures

Since 2003 several firms have been licensed to offer BXM investment products, and more than \$20 billion has been raised for buy-write investment products (not all indexed to the BXM) that are designed primarily for individual investors. The CBOE has announced October 2, 2006, as launch date for index futures contracts on the BXM Index. BXM futures will allow investors to gain exposure to the passive buy-write strategy

embodied in the BXM Index. Investors could go long BXM futures to gain exposure to the BXM Index, and could go short BXM futures to hedge current exposure to a buy-write strategy. Index futures have been used by investors as efficient tools for hedging, asset allocation and risk management, and it will be interesting to see if BXM futures will develop the depth and liquidity to become an efficient portfolio management tool.

## References

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