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Seeking Income: Cash Flow Distribution Analysis of S&P 500[®] Buy-Write Strategies

EXECUTIVE SUMMARY

In recent years, income-seeking market participants have shown increased interest in buy-write strategies that exchange upside potential for upfront option premium. Our empirical study investigated popular buy-write benchmarks, as well as other alternative strategies with varied strike selection, option maturity, and underlying equity instruments, and made the following observations in terms of distribution capabilities.

- Although the CBOE S&P 500 BuyWrite Index (BXM), the leading buy-write benchmark, writes at-the-money (ATM) monthly options, a market participant may be better off selling out-of-the-money (OTM) options and allowing the equity portfolio to grow. Equity growth serves as another source of distribution if the option premium does not meet the distribution target, and it prevents the equity portfolio from being liquidated too quickly due to cash settlement of the expiring options.
- Given a predetermined distribution goal, a market participant may consider an option based on its premium rather than its moneyness. This alternative approach tends to generate a more steady income stream, thus reducing trading cost. However, just as with the traditional approach that chooses options by moneyness, a high target premium may suffocate equity growth and result in either less income or quick equity depletion.
- Compared with monthly standard options, selling quarterly options may reduce the loss from the cash settlement of expiring calls, while selling weekly options could incur more loss.
- Selling [S&P 500](#) options against other income-generating indices may improve a portfolio's distribution capability and terminal value.

I. INTRODUCTION

Buy-write strategies, also known as covered calls, are a staple offering for income-seeking market participants willing to forgo some upside potentials in exchange for option premium.

There are multiple benchmarks for these strategies and a sizeable body of literature surrounding their risk/return profiles. Most of these benchmarks assume that the option premium is reinvested in the portfolio. In this paper, however, we focus on the income aspect of buy-write strategies based on the [S&P 500](#) by exploring the premium distribution feature of a suite of strategies that periodically distribute the option premium to market participants.

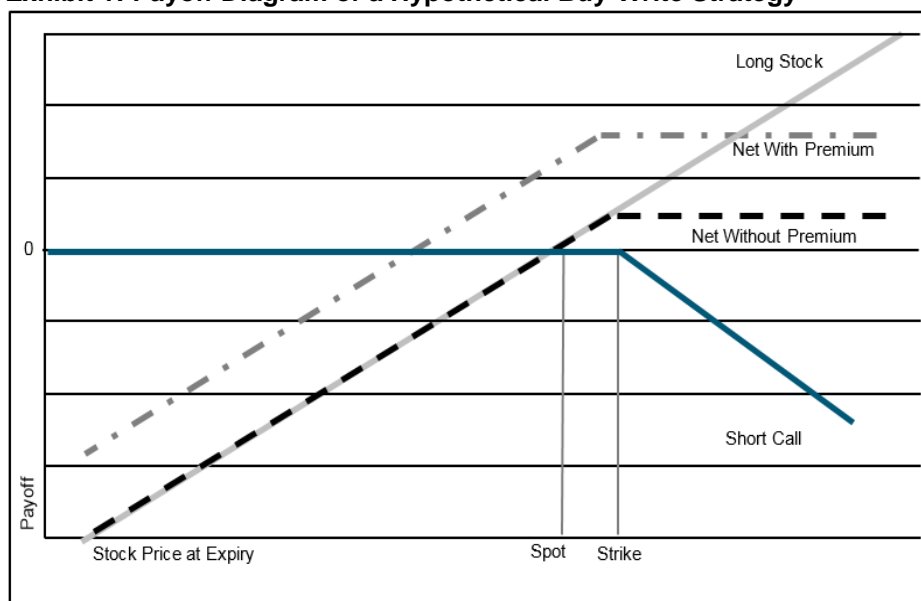
II. BUY-WRITE 101

A buy-write, or covered call, is an income-generating strategy in which a market participant can sell, or “write” call options against shares of an asset that is already owned. It is often used when a market participant has a short-term, neutral view on an asset and holds that asset long, while simultaneously having a short position via the option in order to generate income from the option premium. It also serves as a short-term small hedge on a long position, because the option premium may provide a small cushion to the downside risk of the asset. However, the market participant forfeits the potential of the asset’s increase and is obligated to sell it to the buyer of the option if it is exercised.

The maximum profit of a buy-write strategy equals the strike price of the short call option less the purchase price of the underlying asset plus the premium received.

The maximum profit of a buy-write strategy equals the strike price of the short call option less the purchase price of the underlying asset plus the premium received. Conversely, the maximum loss equals the purchase price of the underlying asset minus the premium received. Exhibit 1 illustrates the profit and loss of a hypothetical buy-write strategy.

Exhibit 1: Payoff Diagram of a Hypothetical Buy-Write Strategy



Source: S&P Dow Jones Indices LLC. Chart is provided for illustrative purposes.

III. BUY-WRITE INDICES

Since 2002, CBOE has launched a suite of buy-write indices that cover all major U.S. equity benchmarks. Exhibit 2 shows the buy-write indices based on the S&P 500.

Exhibit 2: Buy-Write Indices Based on the S&P 500

TICKER	INDEX	OPTION MATURITY	MONEYNESS	NOTE
BXM	CBOE S&P 500 BuyWrite Index	Monthly	ATM	-
BXY	CBOE S&P 500 2% OTM BuyWrite Index	Monthly	2% OTM	-
BXMC	CBOE S&P 500 Conditional BuyWrite Index	Monthly	ATM	Sells 0.5 or 1 unit of options based on VIX® level
BXMD	CBOE S&P 500 30-Delta BuyWrite Index	Monthly	30-Delta OTM	-
BXMW	CBOE S&P 500 Multi-Week BuyWrite Index	Four Week	ATM	Consists of four mini indices with staggered expirations

Source: CBOE. Table is provided for illustrative purposes.

The BXM and other buy-write indices have been covered extensively in investment reasearch. Ibbotson Associates (2004) concluded that, compared with the S&P 500, the BXM had a relatively good risk-adjusted return, a slightly higher annualized return, and about two-thirds of the volatility between June 1, 1998, and March 31, 2004. Asset Consulting Group (2012) investigated the risk/return statistics of option-writing strategies between June 30, 1986, and Dec. 31, 2011. It concluded that overlaying options on appreciated stock can provide the opportunity to reduce risk without generating realized gains. Wilshire (2016) analyzed the performance of five option-based indices between June 30, 1986, and June 30, 2016. It found that option-writing strategies demonstrated lower volatility, lower maximum drawdown, and better Sharpe and Sortino ratios than the U.S. equity market. Their study, which was based on actual pension plan asset allocations, indicated that plan sponsors would have benefited from the addition of index-based, buy-write option strategies. In these three studies, estimates of the monthly gross premiums received in the BXM ranged between 1.67% and 1.80%.

Option-writing strategies demonstrated lower volatility, lower maximum drawdown, and better Sharpe and Sortino ratios than the U.S. equity market.

IV. OUR APPROACH FOCUSES ON THE DISTRIBUTION ASPECT

Since most studies have investigated the risk/return profile of buy-write strategies, this paper focuses instead on the distribution aspect of these strategies. We believe this is an underaddressed issue that income-seeking market participants may want to be aware of. To build an efficient income-generating portfolio, it could be best to look beyond the dividends and option premiums received and consider the speed at which the equity portion grows or the principal is diminished. The following steps describe our methodology.

The BXM is considered the benchmark index for buy-write strategies.

1. We first downloaded the monthly roll data of the BXM and BXY from the CBOE website and isolated the dividend and option premium returns from the indices' monthly returns. Then we calculated the index values with various annual distribution goals.
2. We recognized that moneyness was not the only method to select option contracts, and thus we explored several strategies that select call option strikes based on a specific target premium.
3. We then compared the BXM with buy-write strategies that had quarterly and weekly rolls to illustrate the impact of option maturity.
4. Finally, we considered buy-write strategies over income-oriented underlying equity indices that are highly correlated with the broad equity market.

V. EMPIRICAL RESULTS

The BXM: The Benchmark

The BXM is considered the benchmark index for buy-write strategies.¹ It writes standard monthly ATM call options based on the S&P 500 and holds the options to maturity before they are cash settled. All dividend and option premiums are fully reinvested in the index.

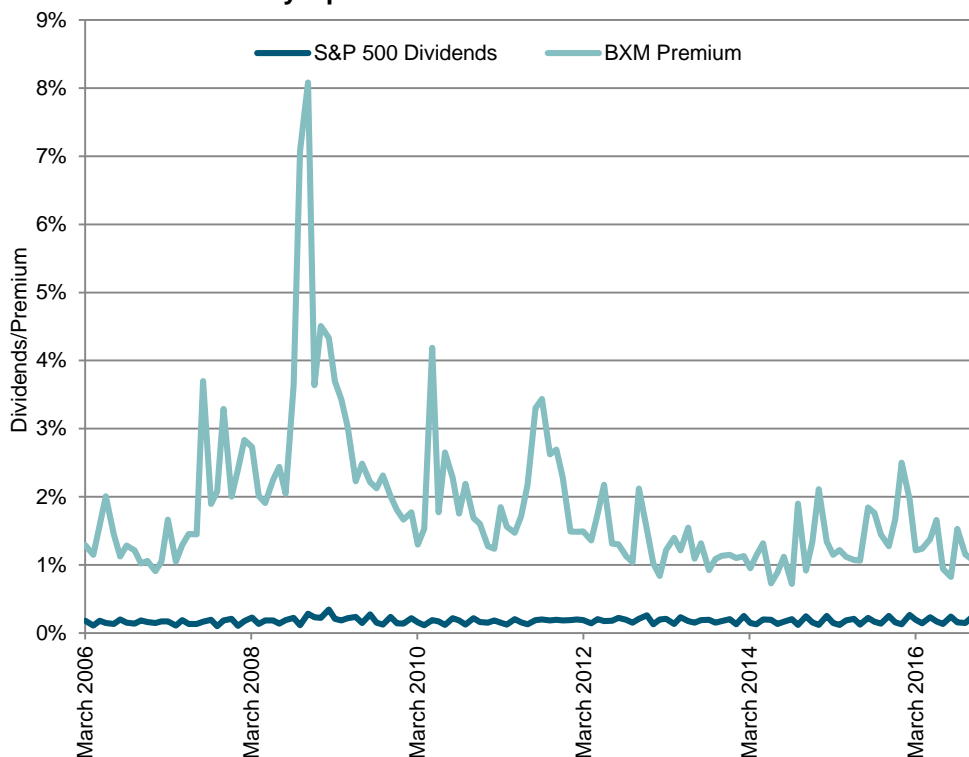
Returns from the BXM come from the following sources.

- The S&P 500 price return.
- Dividends received from S&P 500 stocks.
- Option premium received from the short call position.
- Potential loss from the cash settlement of the expiring short call position.

According to the roll data published by CBOE, between March 17, 2006, and Dec. 16, 2016, the short call position went in-the-money (ITM) and was exercised in 85 out of 130 months (65.38%). This implies that any gain from the S&P 500 was offset by the short call cash settlement in almost two out of three months, and that in the other months, the S&P 500 decreased or was unchanged. Based on this data, the growth in the BXM mainly came from the reinvestment of the stock dividend and the call option premium. In the same time period, the monthly premium ranged between 0.72% and 8.08%, with a mean of 1.84% and a median of 1.53%. The dividends for the S&P 500 fluctuated between 0.10% and 0.35%, with a mean of 0.18% (see Exhibit 3).

¹ <http://www.cboe.com/products/strategy-benchmark-indexes/buywrite-indexes/cboe-s-p-500-buywrite-index-bxm>

Exhibit 3: BXM Monthly Option Premium and Stock Dividend



Source: CBOE and S&P Dow Jones Indices LLC. Data from March 17, 2006, to Dec. 16, 2016. Chart is provided for illustrative purposes. Past performance is no guarantee of future results.

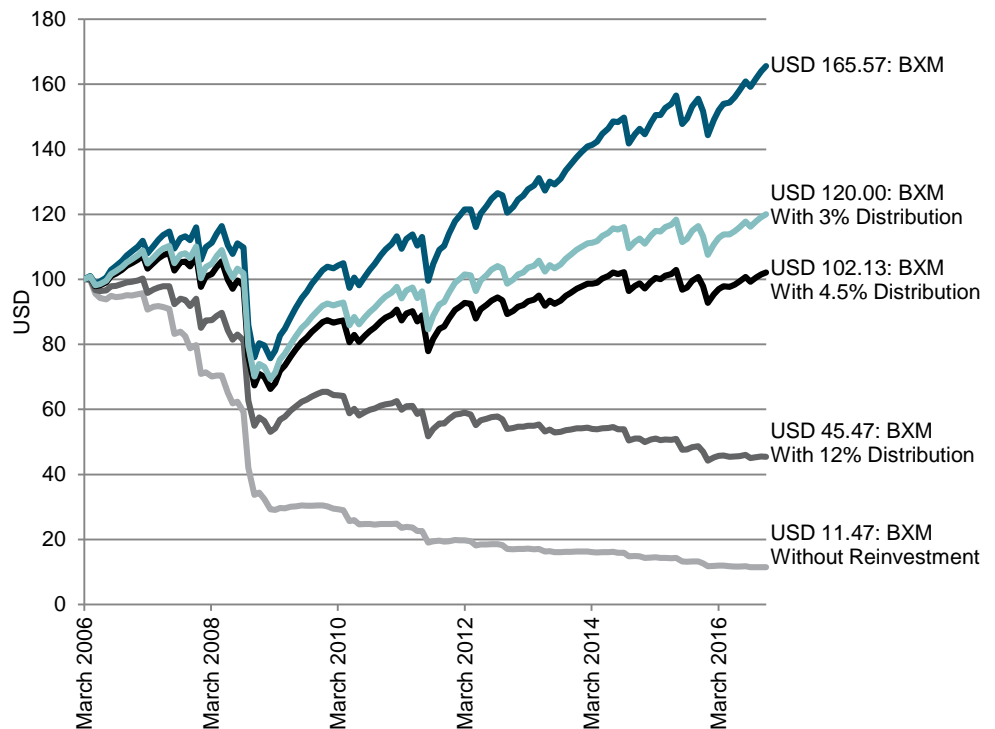
It may not be desirable to withdraw all the dividends and premiums collected from writing calls every month if one does not want to see a portfolio be depleted too quickly.

How should an income-seeking market participant interpret this? This means that it may not be desirable to withdraw all the dividends and premiums collected from writing calls every month if one does not want to see a portfolio be depleted too quickly.

Taking the monthly roll data published by CBOE, we tested several distribution plans based on the BXM (see Exhibit 4). Assuming we invested USD 100 in the BXM on March 17, 2006, on Dec. 16, 2016, we would end up with USD 165.57 if all dividends and premiums were reinvested, but only USD 11.47 if all dividends and premiums were immediately distributed every month. With an annual distribution² of 4.5%, we would end up with USD 102.13, almost at par with the initial portfolio value. Although the option premium seemed high at 1.84% per month, distributing 1% monthly (or 12% annually) would have reduced the portfolio value by one-half in these 130 months.

² Given a target annual distribution of x%, we assume that the index distributes x/12% at every roll day. If the premium and dividend are higher than x/12%, the remainder will be reinvested in the S&P 500; otherwise, part of the equity position is liquidated to meet the distribution target.

Exhibit 4: The BXM With Different Distributions



Source: CBOE and S&P Dow Jones Indices LLC. Data from March 17, 2006, to Dec. 16, 2016. Chart is provided for illustrative purposes. Past performance is no guarantee of future results.

The BXY: The Impact of Moneyness

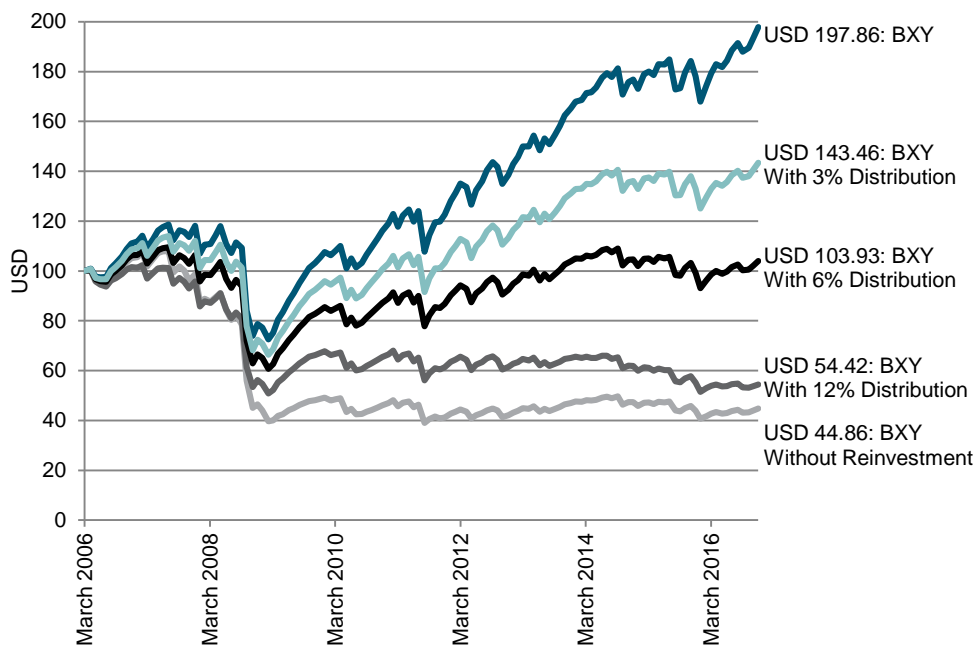
The BXY is another popular buy-write index, which writes 2% OTM call options based on the S&P 500 every month.

The BXY is another popular buy-write index, which writes 2% OTM call options based on the S&P 500 every month. It allows the equity to grow up to 2% between monthly rolls but takes in a lower call premium as a tradeoff.

To illustrate the impact of the moneyness of options on distribution of cash flows, we ran a similar test on the BXY (see Exhibit 5). For the same time period, USD 100 invested in the BXY grew into USD 197.86 and USD 44.86 if all dividends and premiums were distributed immediately. The portfolio ended up almost at par (USD 103.93) if the index distributed 6% annually.

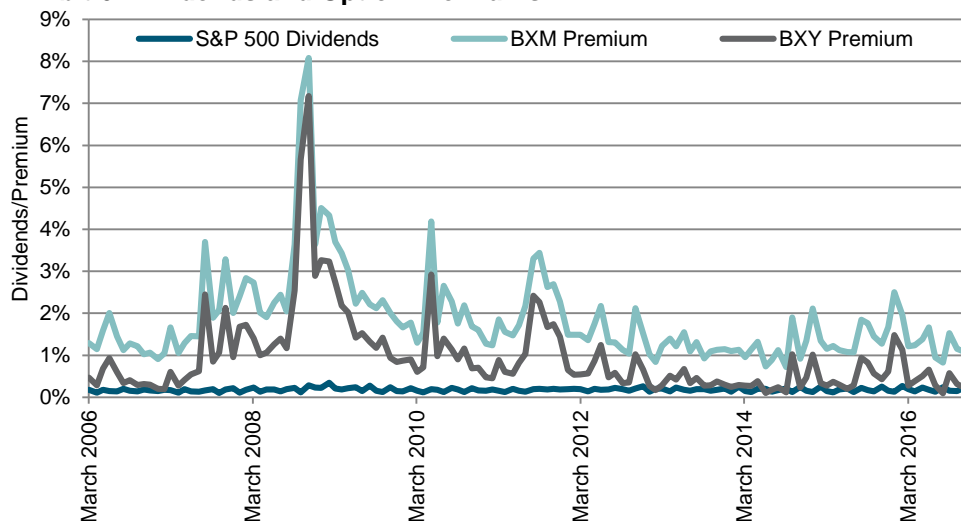
As shown in Exhibits 6 and 7, OTM calls are sold at a lower premium than the ATM calls. However, equity growth has helped BXY to beat BXM in terms of both long-term return and distribution capability.

Exhibit 5: The BXY With Different Distributions



Source: CBOE and S&P Dow Jones Indices LLC. Data from March 17, 2006, to Dec. 16, 2016. Chart is provided for illustrative purposes. Past performance is no guarantee of future results.

Exhibit 6: Dividends and Option Premiums



Source: CBOE and S&P Dow Jones Indices LLC. Data from March 17, 2006, to Dec. 16, 2016. Chart is provided for illustrative purposes. Past performance is no guarantee of future results.

Exhibit 7: Dividend and Option Premium Statistics

STATISTIC	DIVIDEND (%)	BXM OPTION PREMIUM (%)	BXY OPTION PREMIUM (%)
Maximum	0.35	8.08	7.46
Mean	0.18	1.84	1.12
Median	0.18	1.53	0.77
Minimum	0.10	0.72	0.30

Source: CBOE and S&P Dow Jones Indices LLC. Data from March 17, 2006, to Dec. 16, 2016. Table is provided for illustrative purposes. Past performance is no guarantee of future results.

Targeted Premium: An Alternative Approach to Select Option Strikes

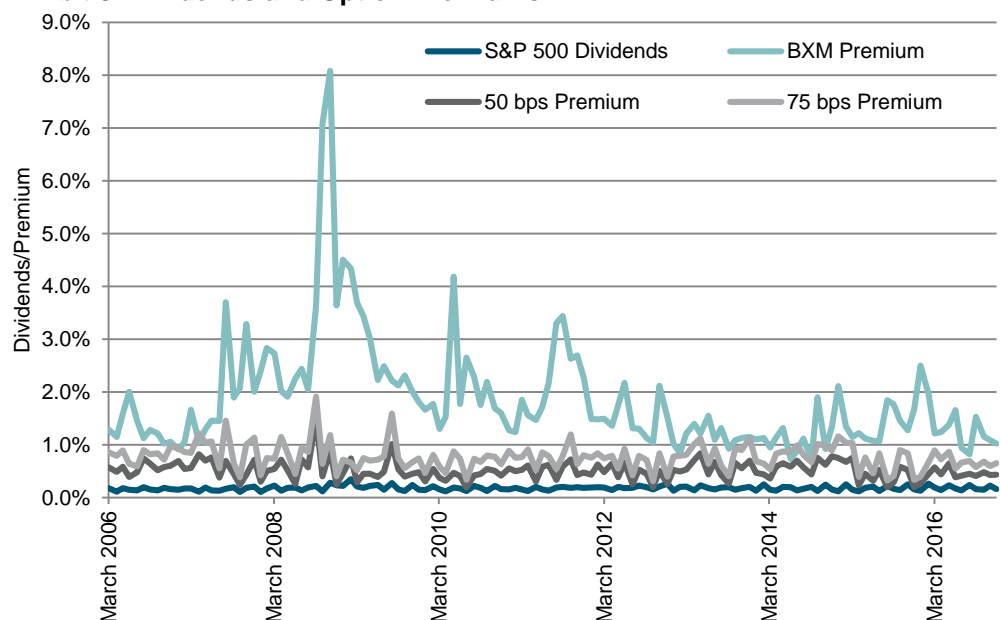
Exhibit 6 shows that option premiums fluctuate in different market environments. While the high option premium observed during the 2008 financial crisis may seem desirable from a risk-management perspective, those seeking income may prefer a steadier stream over the years.

While the high option premium observed during the 2008 financial crisis may seem desirable from a risk-management perspective, those seeking income may prefer a steadier stream over the years.

With that in mind, we tested several buy-write strategies in which options were selected based on target premiums instead of strikes. For example, instead of selecting a 2% OTM option, our simulated strategies looked for call options with the highest strike that can provide at least X bps in terms of option premium. To simulate actual trading, the option strike is determined on the trading day immediately prior to the option expiration, based on the closing price of the S&P 500 and the last bid price of the call options. Just as in the BXM and BXY, these buy-write strategies sell options monthly and hold them until the option expiration day, when the call options are cash settled.

We expected these buy-write strategies to generate a more steady option premium stream when compared with traditional buy-write strategies, such as the BXM and BXY. The results from our testing period, summarized in Exhibits 8 and 9, confirmed our expectations. Although the option strikes were selected based on the t-1 index close, the actual premiums received, calculated as the product of the option’s last bid price and number of options, fluctuated around the target premium, as expected.

Exhibit 8: Dividends and Option Premiums



Source: CBOE and S&P Dow Jones Indices LLC. Data from March 17, 2006, to Dec. 16, 2016. Chart is provided for illustrative purposes. Past performance is no guarantee of future results.

Exhibit 9: Option Premium Statistics

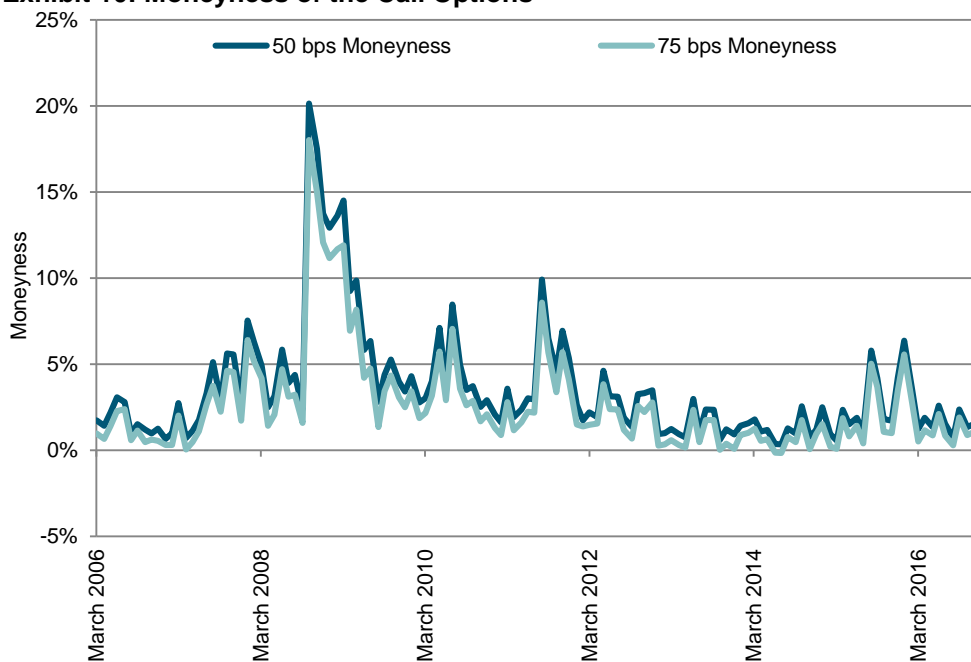
STATISTIC	WRITING 50 BPS OPTION (%)	WRITING 75 BPS OPTION (%)
Maximum	1.50%	1.91%
Mean	0.52%	0.77%
Median	0.50%	0.77%
Minimum	0.19%	0.31%

Source: S&P Dow Jones Indices LLC. Data from March 17, 2006, to Dec. 16, 2016. Table is provided for illustrative purposes. Past performance is no guarantee of future results.

The actual moneyness of the call options selected can vary based on the market environment (see Exhibit 10). In a more volatile market, such as in 2008, the call options are rich in volatility and the buy-write strategies write call options further away from the spot to get the target premium. In a bull market, however, the buy-write strategies have to sell options closer to the spot. In the period studied, if the monthly target premium was 50 bps, the strike was 3.50% above the spot level on average; if the target premium was 75 bps, the strike was 2.65% above the spot level on average.

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Exhibit 10: Moneyness of the Call Options



Source: S&P Dow Jones Indices LLC. Data from March 17, 2006, to Dec. 16, 2016. Chart is provided for illustrative purposes. Past performance is no guarantee of future results.

Exhibit 11 shows the results of a hypothetical buy-write strategy that sells monthly call options that generate at least 50 bps every month. USD100 invested in this hypothetical portfolio on March 17, 2006, grew into USD 192.84 on Dec. 16, 2016, if all option premiums and dividends were reinvested and USD 78.79 if all option premiums and dividends were immediately distributed on the roll day. As the strategy targeted a 6% annual distribution, the portfolio remained almost at par (USD 101.26) after

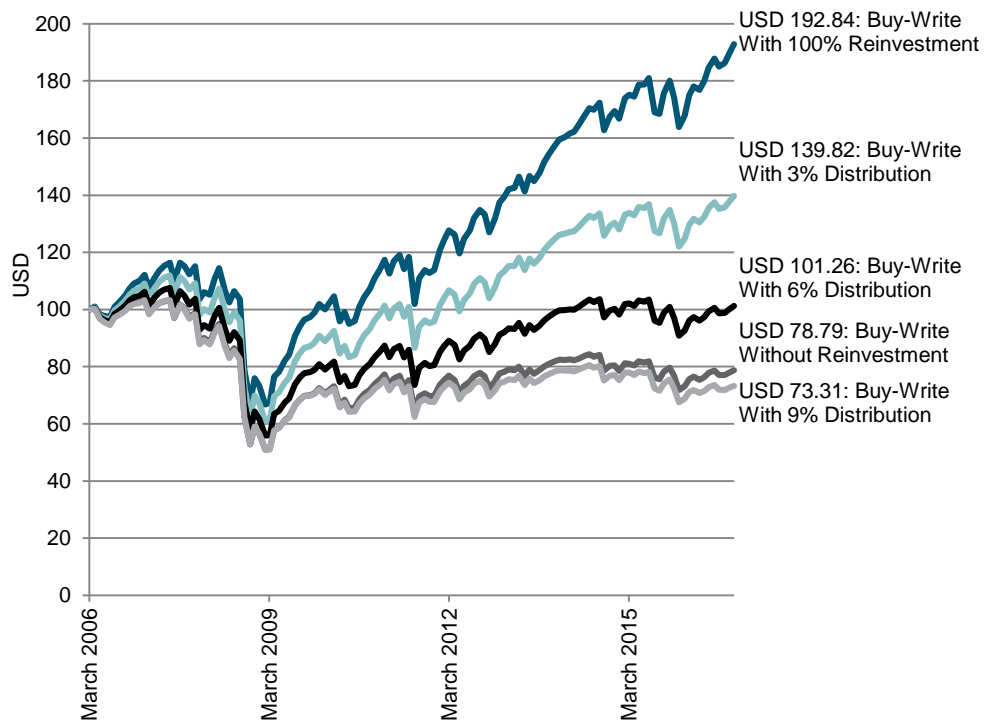
these 130 months if 50 bps were distributed monthly, regardless of the actual premium collected each month.

Similarly, Exhibit 12 shows the results of the buy-write strategy that sold the monthly call options that generated at least 75 bps every month. Compared with the buy-write strategy illustrated in Exhibit 11, this strategy had to sell options slightly closer to the spot, usually at about 2.7% higher than the spot. As a result, the strategy fell below USD 100 if the target 9% annual distribution was split into 12 monthly payments.

It is interesting to compare the above two buy-write strategies with a target annual distribution of 6%. In the same time period, the 50 bps strategy ended at a higher value than the 75 bps buy-write strategy, although the latter is designed to generate 9% annually from option premium alone. The 50 bps strategy has benefitted from the higher option strike and the additional equity growth has helped to generate desired income stream. This again demonstrates that equity growth is a factor that income-seeking market participants should consider when they choose a buy-write strategy.

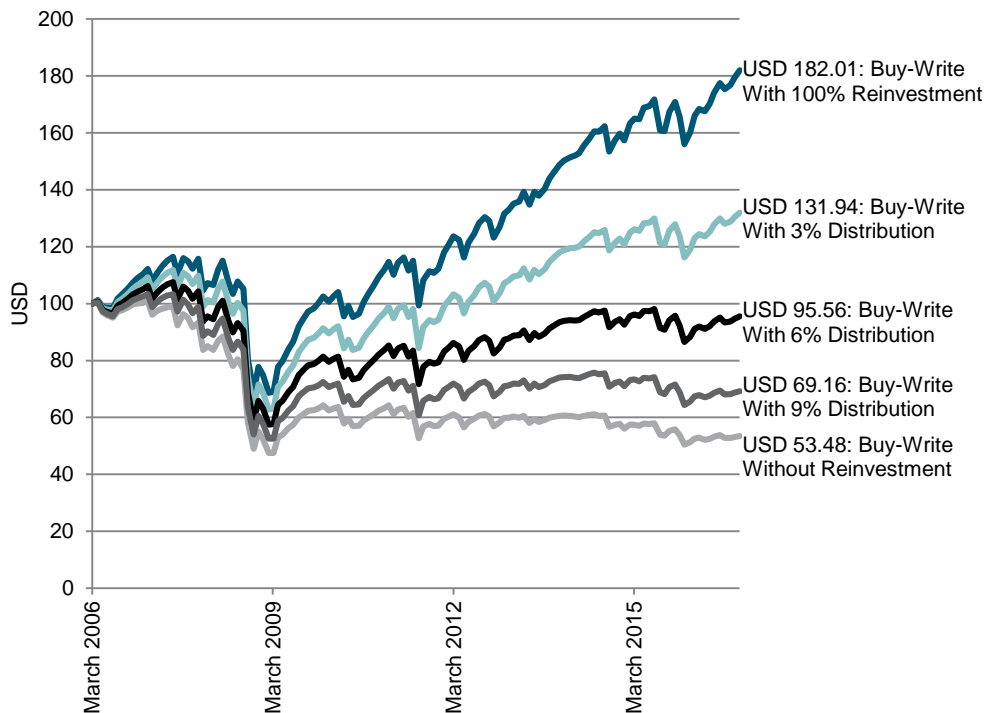
Equity growth is a factor that income-seeking market participants should consider when they choose a buy-write strategy.

Exhibit 11: Writing 50 bps Monthly Calls With Different Distributions



Source: S&P Dow Jones Indices. Data from March 17, 2006, to Dec. 16, 2016. Chart is provided for illustrative purposes. Past performance is no guarantee of future results.

Exhibit 12: Writing 75 bps Monthly Calls With Different Distributions



Source: S&P Dow Jones Indices LLC. Data from March 17, 2006, to Dec. 16, 2016. Chart is provided for illustrative purposes. Past performance is no guarantee of future results.

Income-seeking market participants may want to consider equity growth in addition to pure income generated from selling options.

As previously alluded, income-seeking market participants may want to consider equity growth in addition to pure income generated from selling options for at least two reasons. First, some may not intend to deplete their equity portfolios too quickly. Selling options close to the spot usually generates higher option premiums, but it also sells off the upside potential of the equity growth. If the equity does not have enough room to appreciate, it will eventually diminish to zero, because some of the portfolio has to be liquidated when the call options go ITM. Second, equity growth can serve as another source of income if the option premium does not meet the distribution target.

From an income-generating perspective, writing options at a fixed premium level provides two main advantages. First, it provides a more steady income stream, as we demonstrated earlier. Second, it reduces the trading cost of a buy-write strategy. Given a predetermined annual distribution, market participants have to reinvest the excess of the option premium in the equity and liquidate part of the equity portfolio to make up for any distribution short falls. A more steady income stream effectively reduces the trading activities to maintain the distribution.

Compared with writing options at a fixed premium level, writing options at a fixed moneyness is usually more effective at volatility reduction, in that a fixed portion of the equity upside is truncated consistently. Furthermore, in

a bear market when volatility is rich, writing calls at a fixed moneyness yields a higher option premium than usual and provides a larger-than-normal cushion that further reduces the downside risk. In this case, writing options at a fixed premium level usually results in options being sold further away from the spot when the extra growth room may not be needed. However, the increase in realized volatilities tends to be marginal. In our testing period, BXY monthly returns had a volatility of 14.09%, while the 75 bps buy-write strategy, with a comparable moneyness on average, posted a volatility of 15.23%.

Weekly and Quarterly: Impact of Option Maturity

Like other option-selling strategies, buy-write strategies are essentially selling implied volatilities, and the profit or loss is determined by the difference between implied and realized volatility. The short call positions profit only when the premium is higher than the cash settlement if the call options ever go ITM.

Option-implied volatilities vary by maturity. In general, longer-dated options tend to have higher implied volatility and generate a higher option premium. However, implied volatility tends to drop faster as options get closer to maturity.

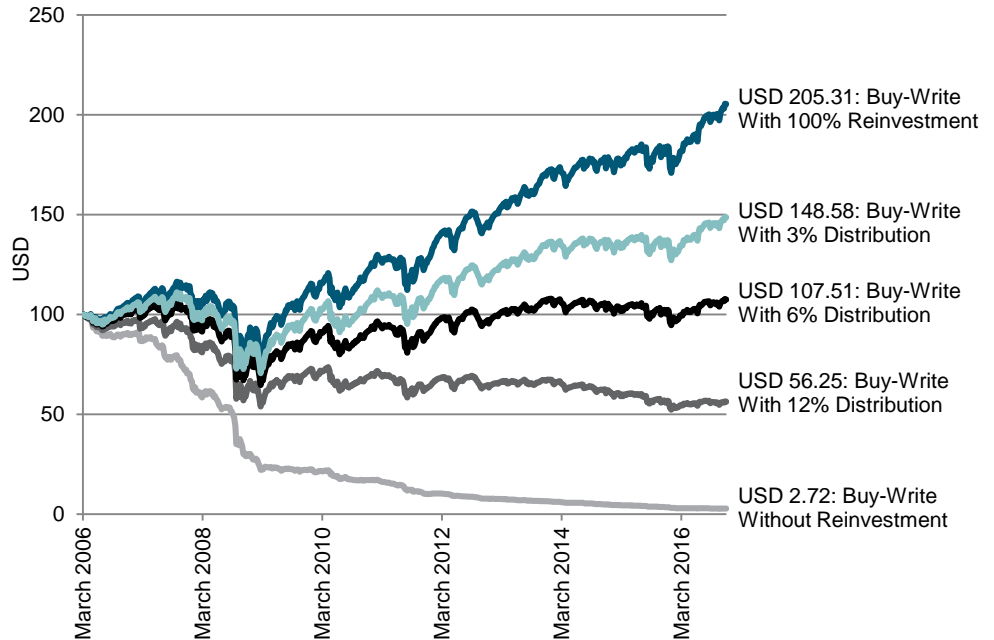
To investigate the impact of option maturity, we tested several buy-write strategies using different roll schedules.

Exhibits 13 and 14 show the results of ATM buy-write strategies that roll weekly and quarterly, respectively. Compared with the BXM results shown in Exhibit 4, we can make the following observations.

- If no dividends or option premiums are reinvested, selling longer-dated options resulted in a higher portfolio value. For an option seller, cash settlement of the expiring call options was either zero in a down or flat market or a loss in an up market. If the market has zigzagged on its path upward, which happens more often than not, settling four weekly short calls resulted in a higher loss than settling one monthly short call. In our testing period, weekly calls and monthly calls went ITM about 66% of the time, but the weekly ATM buy-write strategy lost almost all of its initial value if no reinvestment was made. The quarterly options, on the other hand, went ITM more often (about 73% of the time), which did not decrease the portfolio terminal value as much, mainly because the call options were settled far fewer times than the monthly or weekly ones.
- Selling weekly and quarterly calls tended to outperform the benchmark index if dividends and premiums were reinvested. The portfolio terminal value also tended to be higher with various distribution plans. This indicates that weekly and quarterly calls are rich in premium compared with monthly standard options.

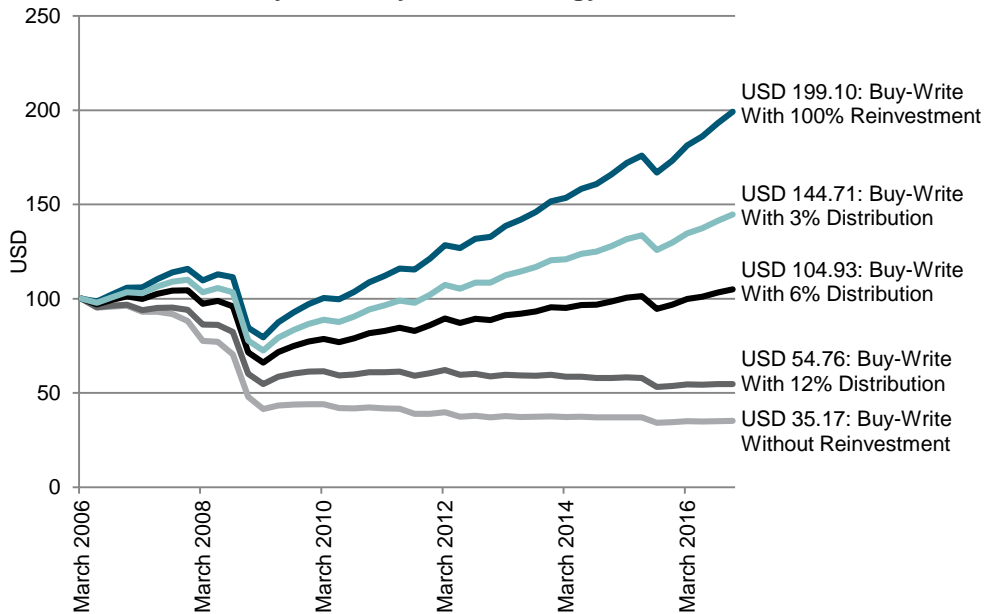
Weekly and quarterly calls are rich in premium compared with monthly standard options.

Exhibit 13: A Weekly ATM Buy-Write Strategy With Different Distributions



Source: S&P Dow Jones Indices LLC. Data from March 17, 2006, to Dec. 16, 2016. Chart is provided for illustrative purposes. Past performance is no guarantee of future results.

Exhibit 14: A Quarterly ATM Buy-Write Strategy With Different Distributions



Source: S&P Dow Jones Indices LLC. Data from March 17, 2006, to Dec. 16, 2016. Chart is provided for illustrative purposes. Past performance is no guarantee of future results.

The other variable an income-seeking market participant may want to consider is the underlying security.

The Impact of Underlying Equity

So far, our discussions have focused on selecting appropriate options to meet distribution goals. The other variable an income-seeking market participant may want to consider is the underlying security.

A typical buy-write strategy sells options against the asset the market participants already own. It is natural that income-seekers may choose to write calls on an income-generating equity portfolio they already own instead of the S&P 500. The problem that has to be faced is the availability or the liquidity of these calls. One way to address this issue is to sell the S&P 500 calls as a proxy and adjust the notional value of the call options to match the equity portfolio. Compared with standard buy-write strategies, using liquid S&P 500 options may bear some basis risk, which should be theoretically manageable as long as the underlying equity instrument is highly correlated with the broad equity market and the options are cash settled.

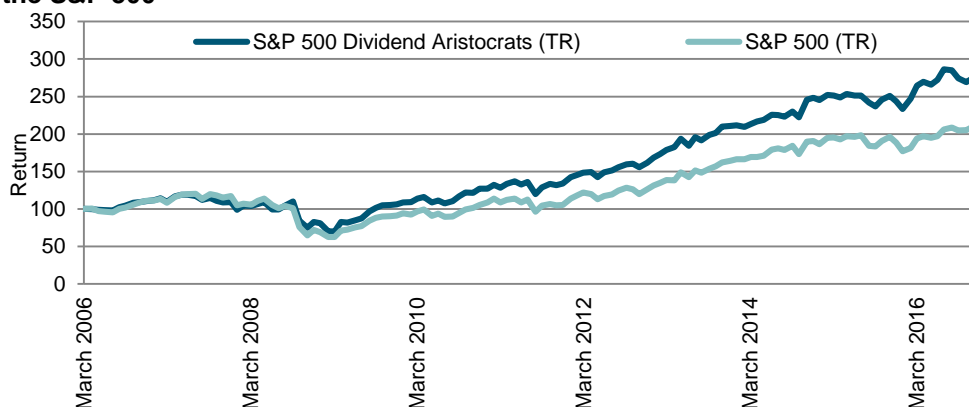
To demonstrate that, we tested a buy-write strategy based on the [S&P 500 Dividend Aristocrats®](#). The S&P 500 Dividend Aristocrats consists of a basket of equally weighted S&P 500 stocks that have increased dividends every year for the past 25 consecutive years. We tested a buy-write strategy that holds a long position in the S&P 500 Dividend Aristocrats and a short S&P 500 call position that matches the notional value.

The S&P 500 Dividend Aristocrats consists of a basket of equally weighted S&P 500 stocks that have increased dividends every year for the past 25 consecutive years.

The strategy holds the monthly ATM calls to the maturity day, when they are cash settled. The strike of the call options is determined by the closing price of the S&P 500 on t-1, and the number of options is determined by the closing price of the S&P 500 Dividend Aristocrats on t-1.

As a subset of the S&P 500, the S&P 500 Dividend Aristocrats has historically been highly correlated with the broad equity market. In our testing period, the monthly total return of the S&P 500 Dividend Aristocrats was 93.8% correlated with the S&P 500 monthly total return (see Exhibit 15).

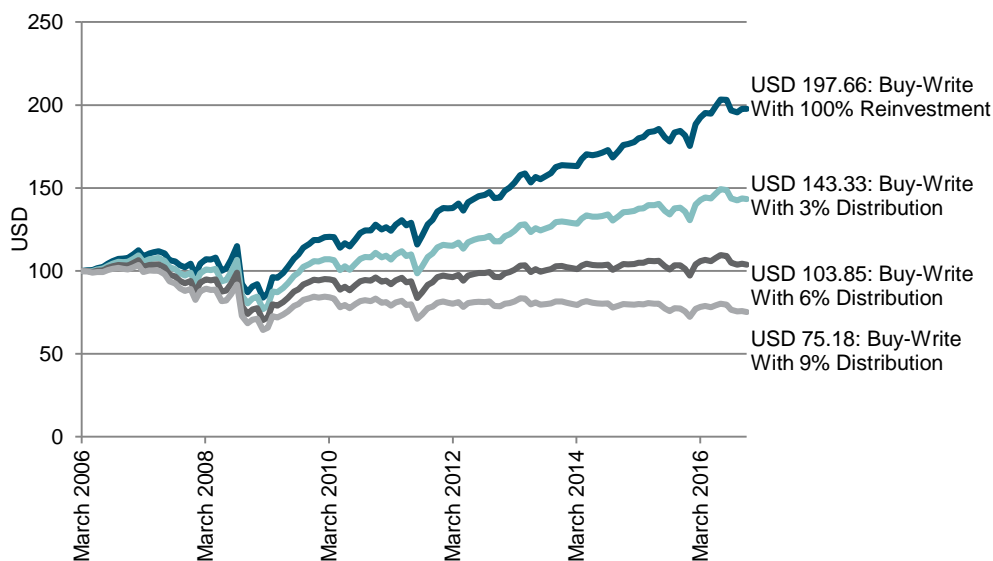
Exhibit 15: Historical Performance of the S&P 500 Dividend Aristocrats and the S&P 500



Source: S&P Dow Jones Indices LLC. Data from March 17, 2006, to Dec. 16, 2016. Chart is provided for illustrative purposes. Past performance is no guarantee of future results.

Compared to the BXM (see Exhibit 4), this buy-write strategy was able to generate the same distribution with a higher terminal index value (see Exhibit 16).

Exhibit 16: Buy-Write Strategy Based on S&P 500 Dividend Aristocrats With Different Distributions



Source: S&P Dow Jones Indices LLC. Data from March 17, 2006, to Dec, 16, 2016. Chart is provided for illustrative purposes. Past performance is no guarantee of future results.

VI. CONCLUSIONS

Buy-write strategies have been widely used by market participants seeking to generate income and improve risk-adjusted returns. Our analysis shows that there are multiple parameters to consider to implement an effective buy-write portfolio.

Buy-write strategies have been widely used by market participants seeking to generate income and improve risk-adjusted returns.

- **Balance between equity growth and option premium:** A buy-write strategy essentially trades part of equity growth for an upfront option premium. As the option strike gets closer to the spot, the market participant usually collects higher option premiums and gives up more upside of the underlying equity. Given a predetermined distribution goal, the equity needs enough room to grow to prevent the portfolio from depleting too quickly.
- **Steady income stream:** Although one can always liquidate part of the equity portfolio to make the predetermined distribution goal, a steady income stream from option premium and stock dividends may be desirable for those seeking income. For this purpose, a market participant may consider selling options based on the option premium rather than moneyness, as traditional buy-write portfolios do. The tradeoff is that the overall portfolio usually ends up with slightly higher volatility due to the fluctuation of option strikes.
- **Effective underlying equity:** A market participant may also want to consider selling S&P 500 options against other income-generating indices to improve the portfolio’s distribution capability and terminal value. If the index is highly correlated with the broad equity market and if the options are cash settled, the basis risk should theoretically be manageable.

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