Sources of CBOE *BuyWrite* Index Returns

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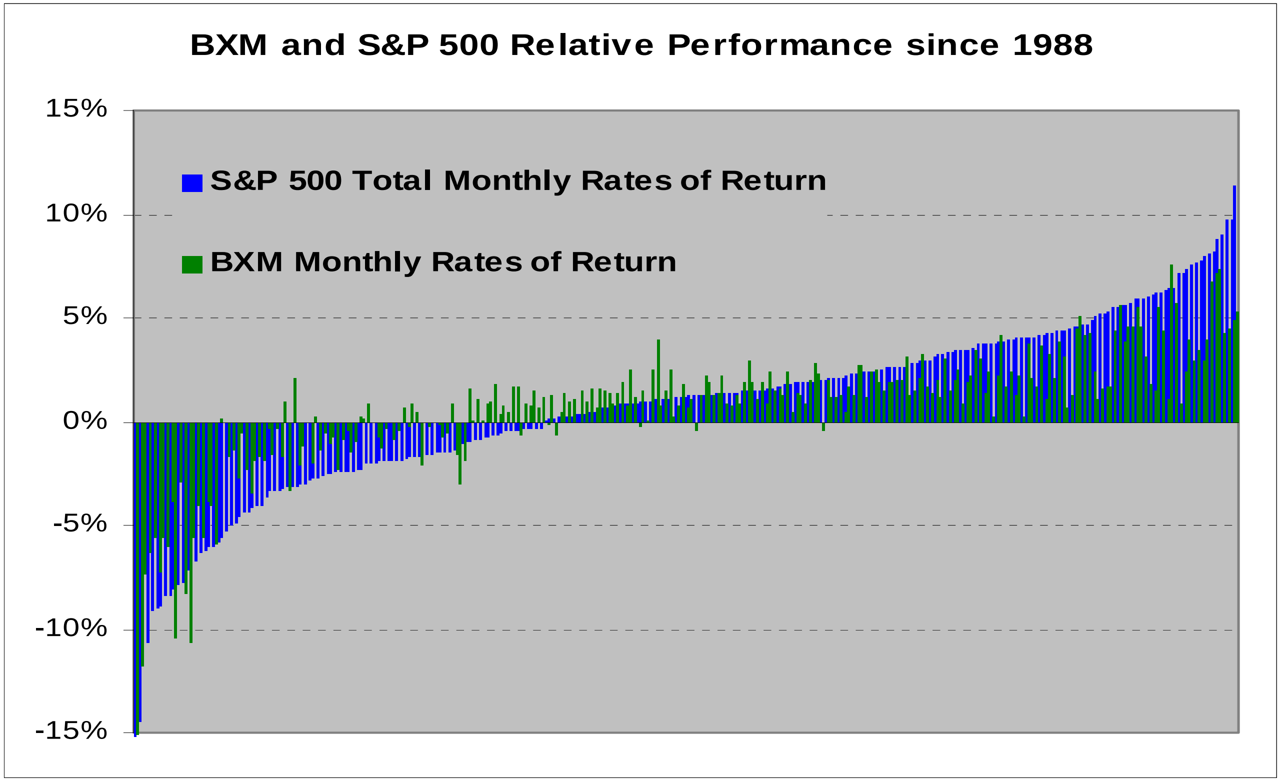
I. Introduction

- CBOE’s BuyWrite Index suite (BXM, BXD, BXN, BXR) applies the covered call strategy to stock indexes (S&P 500, DJIA, Nasdaq 100, Russell 2000), selling monthly at-the-money stock index calls over a stock index.
- This document outlines the distinctive features of CBOE’s BuyWrite Indexes and decomposes their rates of return over a roll cycle into their difference sources: (a) the return of the underlying index, (b) the leverage of the call, (c) the call option return, and the return from compounding daily dividends.
- The components of the BXM return are posted monthly after the roll at http://www.cboe.com/micro/bxm

I. Overview of BuyWrite Index



Sources: Bloomberg, CBOE Research

I. Overview of BuyWrite Index

- The portfolio of a BuyWrite Index is long a stock index, and short an at-the-money index call. The call is sold every 3rd Friday of the month ("roll date")
- The chart above illustrates the essence of a BuyWrite Index which is to cushion downside index moves in exchange for a limited return for upside index moves. The cushion is generated by the leverage exerted by the call premium and by its positive weighted return in down markets.
- To better understand the rate of return over a roll cycle, let's review BuyWrite mechanics on a roll date.

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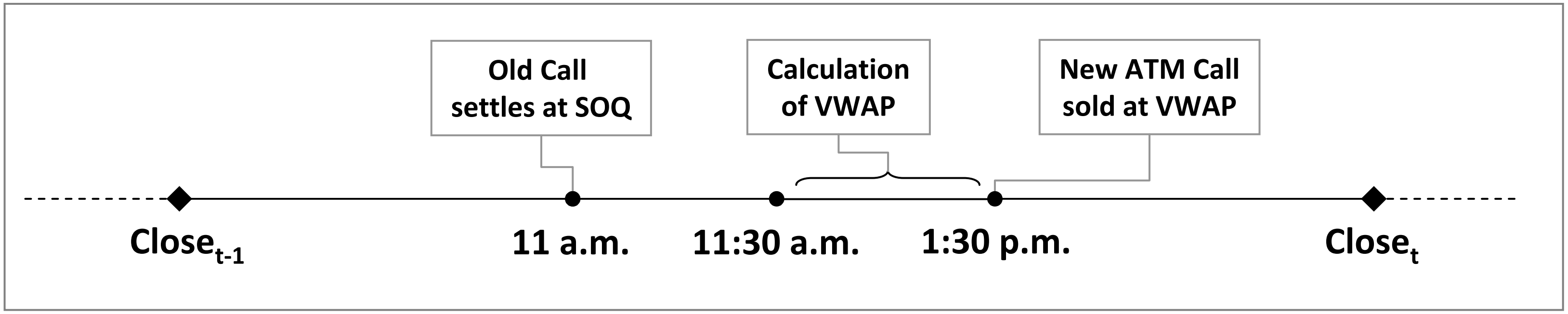
II. What Makes a Roll Date Different from Other Dates?

- The expiring call is deemed settled at 11:00 a.m. ET to a Special Opening Quotation (SOQ) of the index.

- A new ATM call at strike K is sold at 1:30 p.m. at its volume-weighted-average price (C_{VWAP}). The VWAP covers the period from 11:30 a.m. to 1:30 p.m. Similarly, the index is bought at 1:30 p.m. at its VWAP (I_{VWAP})

- Note that the index is uncovered from 11 a.m. to 1:30 p.m.



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III. Rate of Return of BuyWrite Index over a Roll Cycle

- The natural period to analyze a BuyWrite index return is the roll cycle: 1:30 p.m. ET on a roll date when a new call is sold to 1:30 p.m. on the next roll date, before the next call is sold.
- If dividends are excluded, the chain of compounded daily returns over the roll cycle reduces to a product of two terms:

$$\frac{SOQ - Call_{Settle}}{I_{VWAP_0} - Call_{VWAP}} * \frac{I_{VWAP_1}}{SOQ}$$

- The first term is the gross rate of return from 1:30 p.m. ET to 11:00 a.m on the next roll date, when the call is settled. This period, period I, is called the settlement leg.
- The second term is the gross rate of return from 11:00 a.m. to 1:30 pm, period II, called the VWAP leg.
- The settlement leg rate is expected to dominate as the VWAP leg is much shorter.

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III. Rate of Return of a BuyWrite Index over a Roll Cycle

- Over its settlement leg, a BuyWrite Index is a portfolio of the stock index and the call. Thus its rate of return is equal to the weighted sum of the rates of returns of the index and the call. In the case of the BXM, this can be written as

$$R^{I}_{BXM} = L * \frac{SOQ}{I_{VWAP0}} + (1-L) * R_{Call}, \qquad L = \frac{I_{VWAP\ 0}}{I_{VWAP\ 0} - C_{VWAP}}$$

- L is the weight of the S&P 500. Since the portfolio is short the call, L is greater than 1 and measures the leverage exerted by the call

- R_{Call} is the unweighted rate of return of the call option, (1-L) is its negative weight.

- Note: The weighted return of the call can be positive even when the call expires in the money because its unweighted rate of return can be negative if the degree of moneyness is small.

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III. Rate of Return of a BuyWrite Index over a Roll Cycle

- The rate of return of the BXM over the VWAP leg is the S&P 500 rate of return.

$$R_{BXM}^{II} = R_{S\&P\,500}^{II}$$

- Now compounding BXM returns over the settlement and VWAP legs and adding back compounded dividends, the rate of return over the roll cycle is :

$$R_{BXM} = (1 + R_{BXM}^{I}) * (1 + R_{S\&P500}^{II}) + Div - 1$$

- The next slide illustrates this decomposition for returns from January 2008 to August 2009. See http://www.cboe.com/micro/BuyWrite/BXMRollInfo.xls for periodic updates of this slide

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Illustration

Roll Date	S&P 500 Rate of Return Settlement Leg	Leverage of ExpiringCall L $=I_{VWAP0}/(I_{VWAP0}-C_{vwap})$	Levered S&P 500 Rate of Return Settlement Leg	Call Settlement Status	Weighted Call Rate of Return Settlement Leg	BXM Rate of Return ex-Dividends Settlement Leg	BXM/S&P 500 Rate of Return VWAP Leg	Compounded BXM Return Ex Dividends	Total BXM Return with compounded dividends
1/18/2008	-9.69%	1.020	-9.89%		2.05%	-7.84%	-0.95%	-8.72%	-8.61%
2/15/2008	1.97%	1.025	2.01%	ITM	1.90%	3.92%	-0.51%	3.39%	3.57%
3/20/2008	-2.81%	1.029	-2.89%		2.92%	0.03%	0.59%	0.61%	0.85%
4/18/2008	6.17%	1.028	6.34%	ITM	-3.16%	3.18%	-0.04%	3.14%	3.28%
5/16/2008	2.52%	1.021	2.58%	ITM	-0.56%	2.01%	-0.64%	1.36%	1.55%
6/20/2008	-5.46%	1.019	-5.57%		1.95%	-3.62%	-0.81%	-4.40%	-4.20%
7/18/2008	-4.84%	1.023	-4.95%		2.31%	-2.64%	-0.42%	-3.06%	-2.92%
8/15/2008	2.84%	1.025	2.91%	ITM	-0.31%	2.60%	0.22%	2.83%	3.02%
9/19/2008	-1.39%	1.021	-1.42%		2.09%	0.67%	-2.33%	-1.68%	-1.45%
10/17/2008	-26.15%	1.038	-27.14%		3.77%	-23.36%	2.28%	-21.62%	-21.51%
11/21/2008	-19.10%	1.076	-20.56%		7.61%	-12.95%	-0.78%	-13.62%	-13.32%
12/19/2008	17.46%	1.088	18.99%	ITM	-11.28%	7.72%	0.52%	8.27%	8.54%
1/16/2009	-3.91%	1.038	-4.06%		3.78%	-0.28%	-1.89%	-2.17%	-1.94%
2/20/2009	-8.88%	1.047	-9.30%		4.72%	-4.59%	-0.55%	-5.11%	-4.74%
3/20/2009	3.32%	1.045	3.48%	ITM	1.88%	5.35%	-0.99%	4.31%	4.52%
4/17/2009	11.39%	1.038	11.83%	ITM	-6.87%	4.96%	-0.46%	4.47%	4.66%
5/15/2009	2.82%	1.036	2.93%	ITM	0.44%	3.37%	-0.26%	3.10%	3.34%
6/19/2009	4.20%	1.031	4.34%	ITM	-0.50%	3.84%	-0.24%	3.59%	3.84%
7/17/2009	1.74%	1.023	1.78%	ITM	1.17%	2.95%	-0.41%	2.53%	2.68%
8/21/2009	9.04%	1.026	9.27%	ITM	-7.29%	1.98%	0.35%	2.34%	3.60%

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