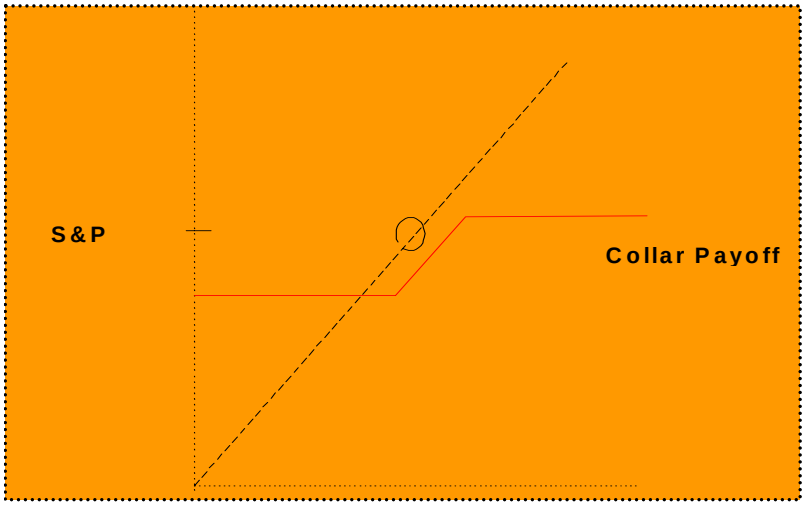
CBOE® S&P 500 95-110 Collar Index (CLL)

I. Description of CBOE® S&P 500 Collar Index Index Design

The CBOE S&P 500 Collar Index measures the total return of the CBOE S&P 500 Collar Strategy. This is a passive strategy which consists of (a) holding the S&P 500 portfolio and collecting dividends, (b) buying 5% out-of-the-money SPX puts that expire in the March quarterly cycle, and (c) selling 10% out-of-the-money SPX calls on a monthly basis. The options are "rolled " at SPX expirations, usually on the third Friday of the month.



Roll Procedure

The put purchased on a third Friday of a quarterly month is usually held to the open of the third Friday in the next quarter (e.g. March to June, September to December) when

SPX options expire, and it is settled to the Special Opening Quotation (SOQ) of the S&P 500. A new three-month put is then purchased at the volume weighted average ask price from 11:30 to 12:00 ET. The strike price of the new put is equal to 95% of the value of the S&P 500 reported just before 11:00 AM ET. If this strike is not listed, the closest strike below is selected.

The call sold monthly is held to the next monthly SPX expiration and is also settled to the SOQ. A new call expiring in the next month is then purchased at the volume weighted average price (VWAP) ask price from 11:30 to 12:00 ET. The strike price of the new call is equal to 110% of the value of the S&P 500 reported just before 11:00 AM ET. If this strike is not listed, the closest strike above is selected.

If the strike of the call is smaller than the strike of the standing put on a non-quarterly roll date, that put is sold and replaced by a new 5% OTM put with the same quarterly expiration. Such roll dates are called "cross-roll" dates.

The CBOE S&P 500 Collar Index portfolio is first assembled on June 20, 1986, the first quarterly roll date, and the index value is rescaled to 100 as of June 30, 1986. This date is set earlier than the base date of the BXM (June 1, 1988) to see how the Collar Strategy would have performed in October 1987. It requires estimation of daily dividends from June 20, 1988 to June 1, 1988, when Standard and Poor's first started to disseminate these.

Subsequent values of the index are calculated by chaining daily returns, i.e. the index value at the close of a day is equal to its value at the previous close times the gross daily return. Equivalently, the index value is equal to 100 times the compounded daily returns since inception.

$$I_t = I_{t-1}\,(1+R_t) = 100 * \Pi\,(1+R_s)\ s= 1, \ldots,t$$

where I_t is the value of the index at the close of date t, and $1+ R_t$ is its gross daily return

Calculation of Daily Returns

The calculation of daily returns compounded to obtain the CBOE S&P 500 Collar Index is similar to the calculation of BXM daily returns :

On all but roll dates, the gross daily return of the CBOE Collar Index is equal to the ratio of the index portfolio at the current and previous closes:

$$1 + R_t = (S_t + Div_t + P_t - C_t\,)/(S_{t-1} + P_{t-1} - C_{t-1})$$

where S_t is the value of the index at the close of date t, Div_t is the aggregate value of ordinary cash dividends payable on index component stocks that trade "ex-dividend" at

date t expressed in index points, and P_t and C_t are the arithmetic averages of the last bid and ask prices of the put and call options reported before 4:00 p.m. ET at date t.

On roll dates, the gross daily return is compounded from three returns: (1) the return from the previous close to 11:00 a.m. ET, after the final settlement of expiring options, (2) the return from 11:00 a.m. ET to 12:00 a.m. ET when the CBOE completes the calculation of half-hour volume-weighted prices for the new call sold, the new put bought, if a quarterly roll, and the stock index, and (3) the return from 12:00 a.m. to the close of trading.

$$1 + R_t = (1 + R_a) \times (1 + R_b) \times (1 + R_c)$$

where:

Case 1: Non Quarterly Call Roll Dates

$$1 + R_a = (SOQ + Div_t + P_{11} - C_{Settle}) / (S_{t-1} + P_{t-1} - C_{t-1}),$$

$$1 + R_b = (S_{VWAP} + P_{12}) / (SOQ + P_{11}), \text{ and}$$

$$1 + R_c = (S_t + P_t - C_t) / (S_{VWAP} + P_{12} - C_{VWAP})$$

Case 2: Quarterly Roll Dates

$$1 + R_a = (SOQ + Div_t + P_{Settle} - C_{Settle}) / (S_{t-1} + P_{t-1} - C_{t-1}),$$

$$1 + R_b = (S_{VWAP}) / (SOQ), \text{ and}$$

$$1 + R_c = (S_t + P_t - C_t) / (S_{VWAP} + P_{VWAP} - C_{VWAP})$$

Case 3: Cross Roll Dates

$$1 + R_a = (SOQ + Div_t + P_{11} - C_{Settle}) / (S_{t-1} + P_{t-1} - C_{t-1}),$$

$$1 + R_b = (S_{VWAP} + P^{old}_{VWAP}) / (SOQ + P_{11}), \text{ and}$$

$$1 + R_c = (S_t + P_t - C_t) / (S_{VWAP} + P^{new}_{VWAP} - C_{VWAP})$$

where SOQ is the Special Opening Quotation of the S&P 500 used as Final Settlement Price of SPX options, P_{11} and P_{12} are the average of the last bids and asks of the put before 11:00 a.m. and 12:p.m ET, P^{old}_{VWAP} and P^{new}_{VWAP} are the prices at which the old put is sold and the new put bought on cross-roll dates, $C_{Settle} = \max[0, SOQ - K_c]$ where K_c is the strike price of the expiring call, and S_{VWAP}, $P_{Settle} = \max[0, K_p - SOQ]$ where K_p is

the strike price of the expiring put, and S_{VWAP}, C_{VWAP} and P_{VWAP} are the volume-weighted average values of the S&P 500, call and put respectively.

Notes

(1) The calculation used to generate a historical series of the index differs slightly from the procedure above because historical intra-day volume data are not available and because SPX options were settled at the close before November 20, 1992.

(2) The price of the stock index and index dividends are obtained from Bloomberg, index option prices are obtained from CBOE's time and sales data which are publicly disseminated through the Option Price and Reporting System. Daily dividends from June 20, 1986 to June 1, 1988 are estimated from monthly dividends available over this period.

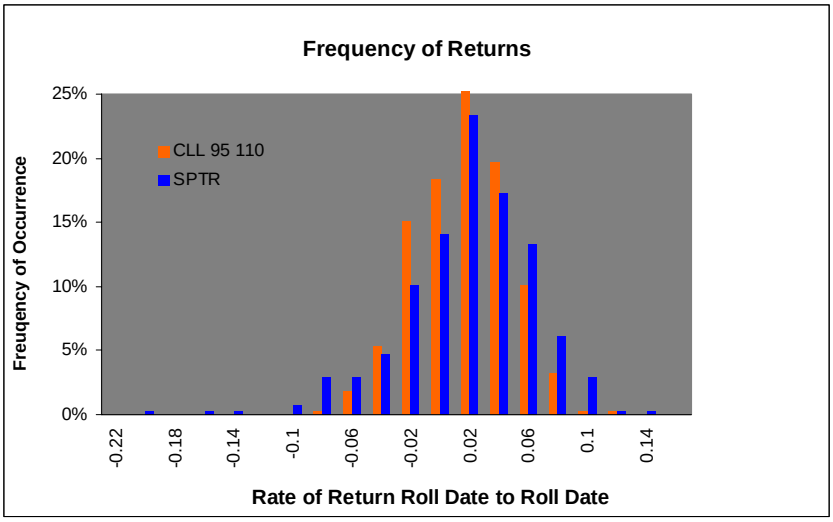
II. Impact of CLL on S&P 500 Portfolio

Portfolio managers looking for ways to collar market risk will find CBOE®s S&P 500 95 -110 Collar Index (CLL) a convenient benchmark. This collar overlays an SPX bear spread (long put and short call) on the S&P 500, the accepted proxy for U.S. stock market performance. The SPX put protects an investor from market declines and the SPX call helps finance the put. As seen in Table 1 and Chart 1, a collar trades a ceiling on S&P 500 gains for a floor on S&P 500 losses. The terms of this exchange vary with the parameters of the collar, but the result is always a more compact distribution of returns with shorter left and right tails, in other words, less risk and less return.

Table 1. Five Worst and Five Best S&P 500 Total Returns (SPTR)
Month-End Returns, June 1986 – September 2009

	SPTR	BXM	CLL
10/30/1987	-21.61%	-17.42%	-8.57%
10/31/2008	-16.79%	-15.13%	-3.82%
8/31/1998	-14.46%	-11.83%	-7.73%
9/30/2002	-10.87%	-7.35%	-3.41%
2/27/2009	-10.65%	-6.34%	-5.42%
	SPTR	**BXM**	**CLL**
4/30/2009	9.57%	3.77%	5.57%
5/31/1990	9.75%	4.53%	8.27%
3/31/2000	9.78%	4.88%	7.87%
12/31/1991	11.44%	5.29%	6.70%
1/30/1987	13.39%	5.15%	10.03%

Chart 1. Frequency Distributions of Returns



The degree of protection offered by a collar and its cost in terms of foregone return depend on several factors, the moneyness of the options, their time to expiration, and their relative richness. For example, lowering the strike of the call provides more cushioning on the downside because the call garners more premium. The tradeoff is more truncation of upside returns. Similarly, increasing the strike of the put raises the floor but costs more, as does buying the put on a monthly as opposed to a quarterly basis.

Analyzing these different tradeoffs, one finds there is no unique "best" collar, simply because investors have different comfort zones in risk-return space. This said, a collar benchmark calls for some intermediate level between the characteristics of investments in Treasury bills and the S&P 500, and it also calls for preservation of a reasonable chunk of the upside potential, which even fairly risk averse investors are reluctant to give up. Amidst the countless possible combinations, a collar index that fits this description is the collar based on buying 5% out-of-the-money puts on a quarterly basis, and selling 10% out-of-the-money calls on a monthly basis. The CLL is therefore based on this combination.

III. Historical Performance of CBOE® S&P 500 Collar Index

Since 1986, the CBOE S&P 500 Collar Index has protected investors from several large market downturns while delivering a solid overall performance. In rapidly rising market, its monthly rate of return has been intermediate between the BXM and S&P 500 rates of return. As expected, the CBOE S&P 500 Collar Index has outperformed both the S&P 500 and BXM in bearish markets. In bullish markets, it has done slightly better than the BXM and worse than the S&P 500. In between, an S&P 500 range of –5% to 0, it has underperformed the S&P 500 and BXM.

Chart 2 Performance of CLL June 1986 – September 2009

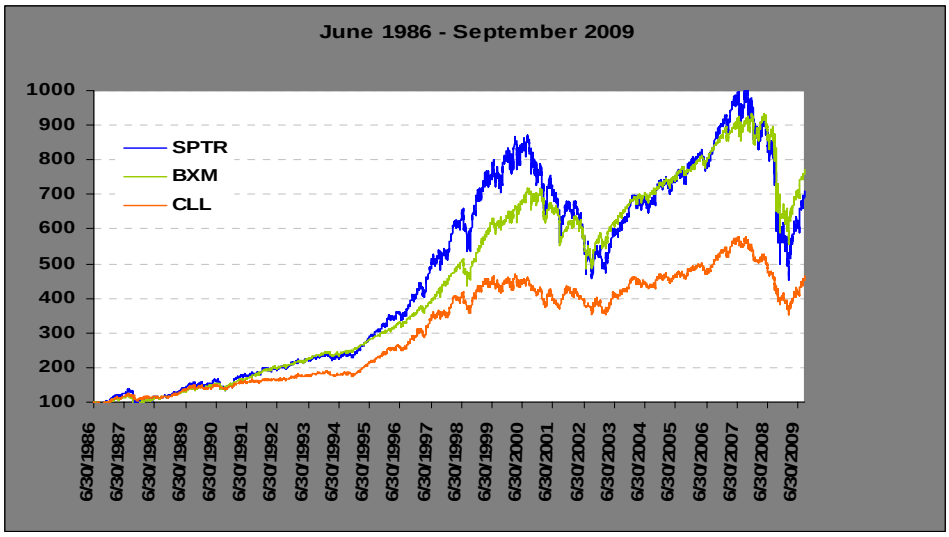
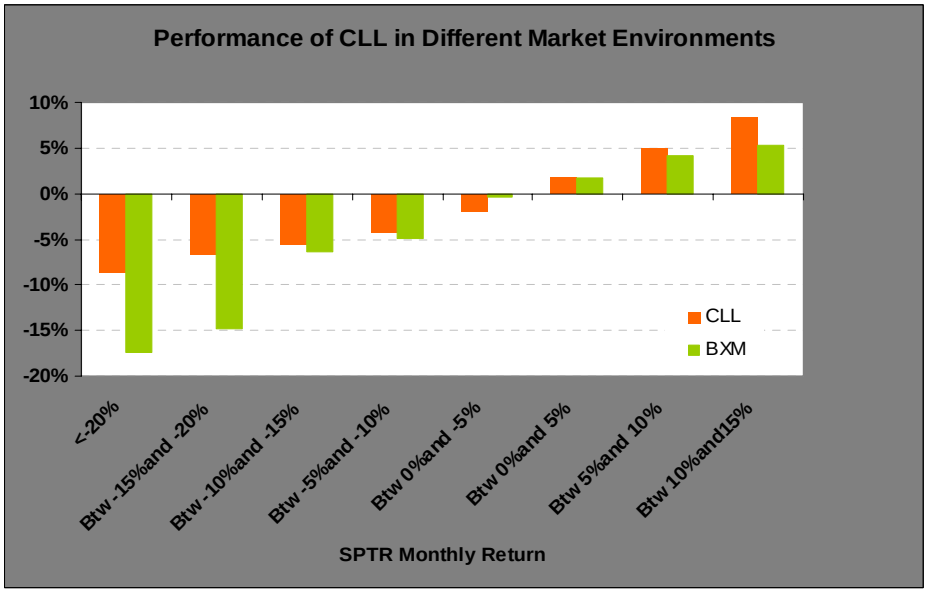
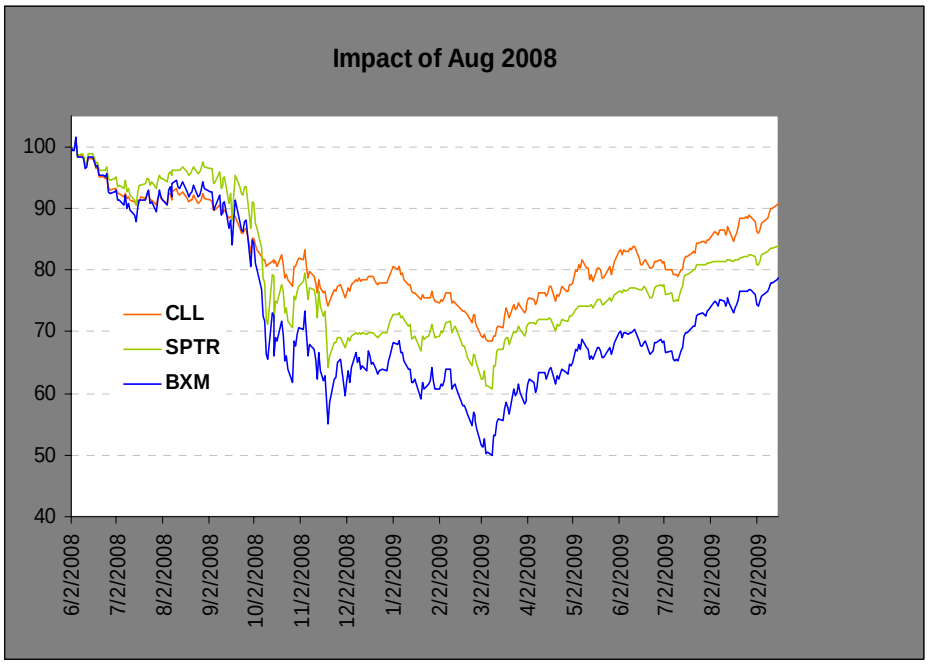


Chart 3 Performance of CLL in Different Market Environments



Charts 4a and 4b CLL Performance During Market Crises


Impact of Aug 2008
100
90
80
70
60
50
40
CLL
SPTR
BXM
6/2/2008
7/2/2008
8/2/2008
9/2/2008
10/2/2008
11/2/2008
12/2/2008
1/2/2009
2/2/2009
3/2/2009
4/2/2009
5/2/2009
6/2/2009
7/2/2009
8/2/2009
9/2/2009

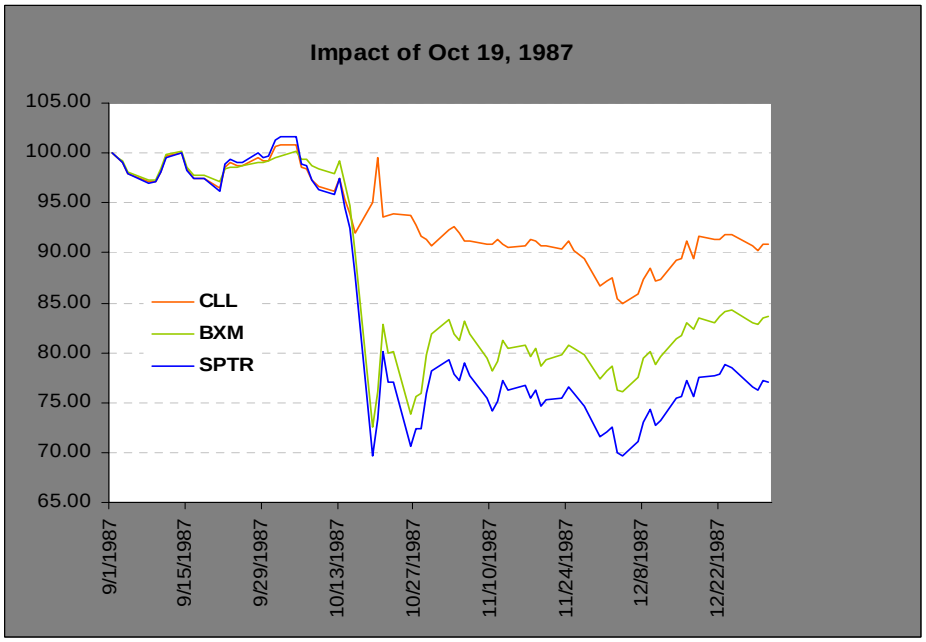

Impact of Oct 19, 1987
105.00
100.00
95.00
90.00
85.00
80.00
75.00
70.00
65.00
CLL
BXM
SPTR
9/1/1987
9/15/1987
9/29/1987
10/13/1987
10/27/1987
11/10/1987
11/24/1987
12/8/1987
12/22/1987

Table 2 Descriptive Statistics

Monthly Return Descriptive Statistics June 1986 - September 2009	1 month T-Bill Rate	CLL	BXM	SPTR
Min	0.00%	-8.57%	-17.42%	-21.61%
Max	0.72%	10.03%	8.17%	13.39%
Arithmetic Avge	**0.34%**	0.62%	0.79%	0.81%
Geometric Avge (Anualized)	0.34%	7.00%	9.17%	8.82%
Median	0.37%	0.75%	1.29%	1.29%
Std. Dev.		3.20%	3.24%	4.58%
Negative Semi-Deviation		1.88%	3.49%	3.62%
Positive Semi-Deviation		1.95%	1.63%	2.53%
Skew		-0.14	-1.78	-0.87
Kurtosis		-0.05	6.68	2.56
Sharpe Ratio		0.09	0.14	0.10
Semi-Sharpe Ratio		0.15	0.13	0.13

In Table 2, the CLL's arithmetic mean rate of return is seen to be approximately midway between the T-Bill and SPTR rates; its geometric mean is about 75% the SPTR rate. The CLL significantly decreases the negative skew of the SPTR, from -.87 to -.14. This suggests not to overrely on the standard deviation to compare risks, or on the Sharpe ratios to measure risk-adjusted performance. The semi-Sharpe ratio, based on the standard deviation of negative returns is a better measure of risk-adjusted performance in this context. By this criterion, the differences between the different benchmards do not look significant. Each serves a different clientele of investors, with certain preferences for risk and return. The CLL is targeted at investors seeking an intermediate exposure between the S&P 500 and a riskless investment.

http://www.cboe.com/CLL