



EXECUTE SUCCESS<sup>SM</sup>

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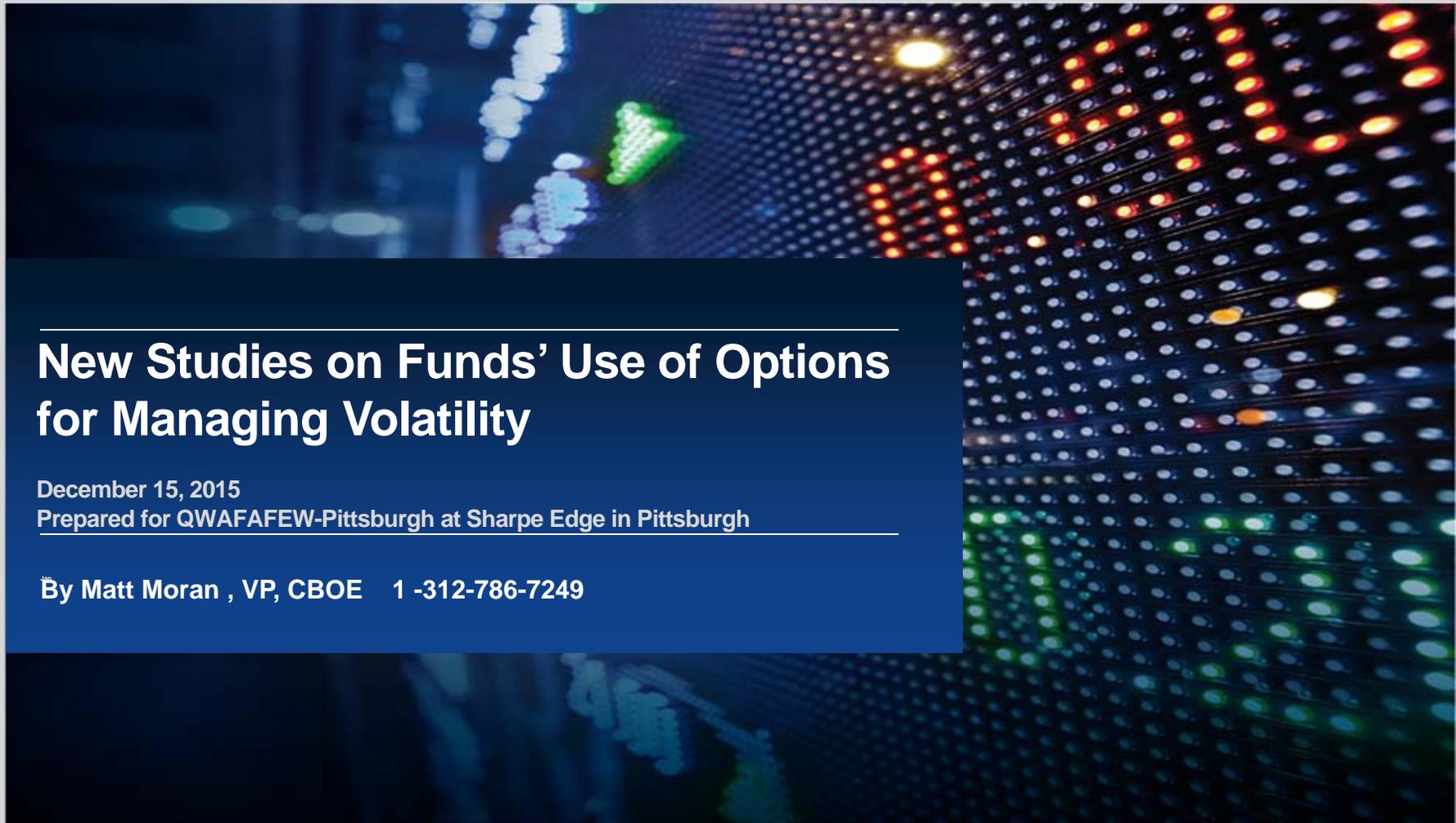
## New Studies on Funds' Use of Options for Managing Volatility

December 15, 2015

Prepared for QWAFEFW-Pittsburgh at Sharpe Edge in Pittsburgh

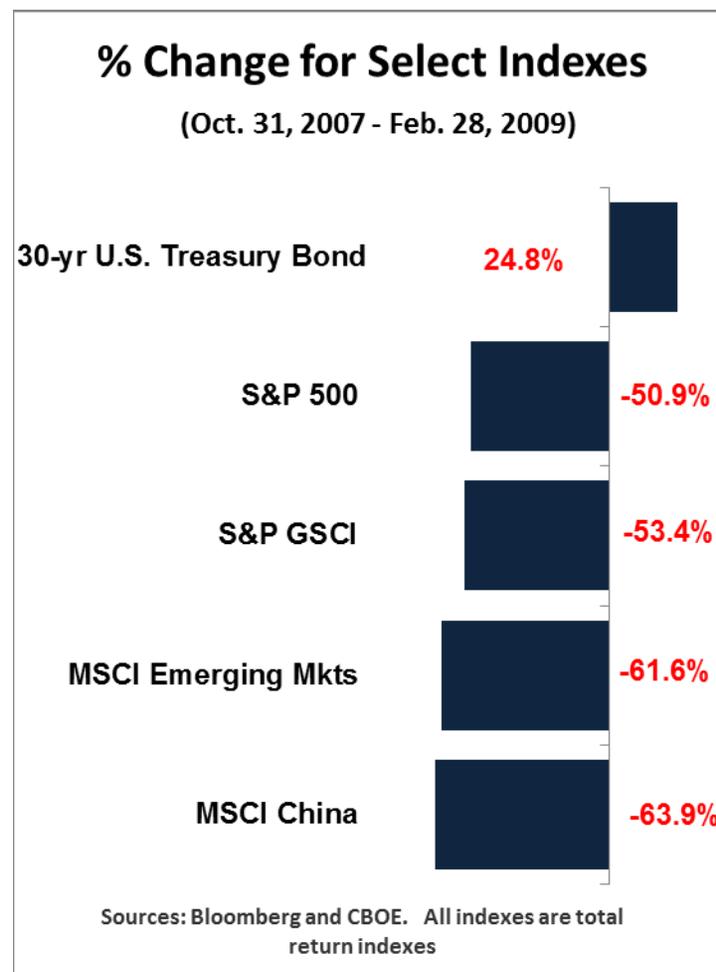
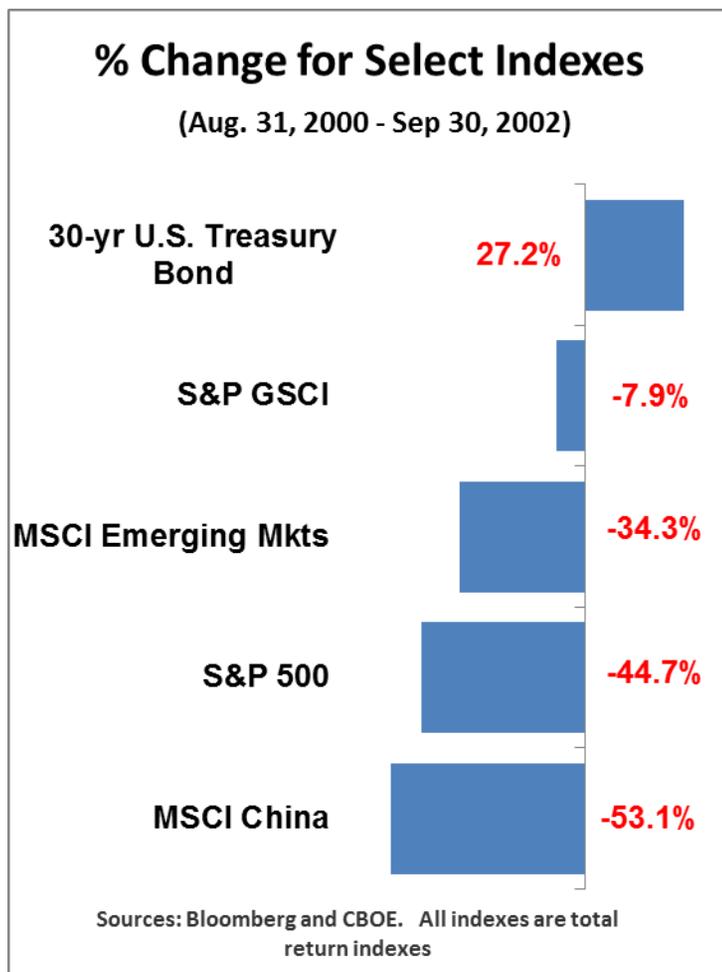
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By Matt Moran , VP, CBOE 1 -312-786-7249



# Tail Risk and Drawdowns

*Two periods during which many stock and commodity indexes experienced sharp drawdowns --*



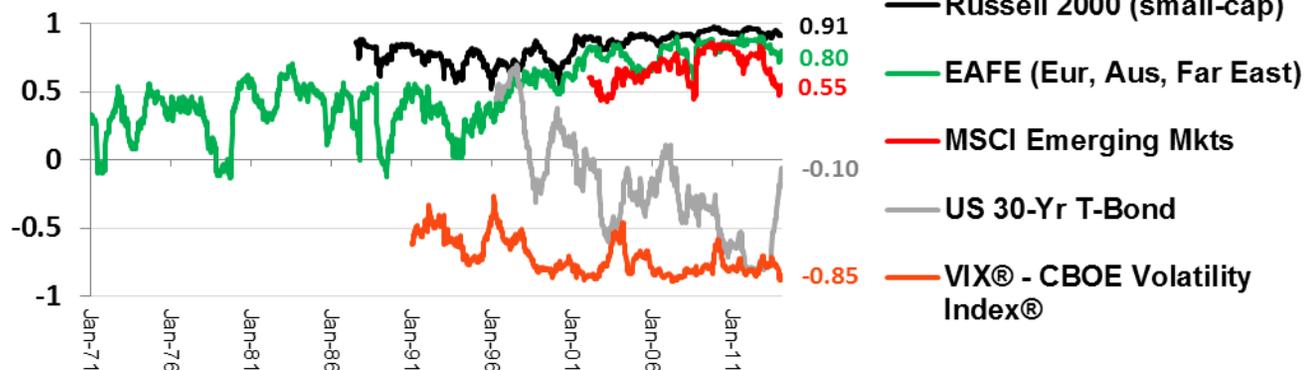
## Harry Markowitz and Modern Portfolio Theory (MPT) in 2009

“[in 2008] the S&P 500 fell approximately 38.5%; the higher-beta emerging-markets asset class fell much farther. Corporate bonds fell in value, but much less than equities, and government bonds went up. ... Generally, asset classes moved roughly in proportion to their historical betas. ... MPT never promised high return with low risk. ... [u]nless our portfolios are comprised entirely of short-term government bonds, we’ll be dealing with a level of risk for which MPT prescribes following an old and true adage: ‘Don’t put all your eggs in one basket.’”

The *Investment Professional* magazine (Spring 2009)

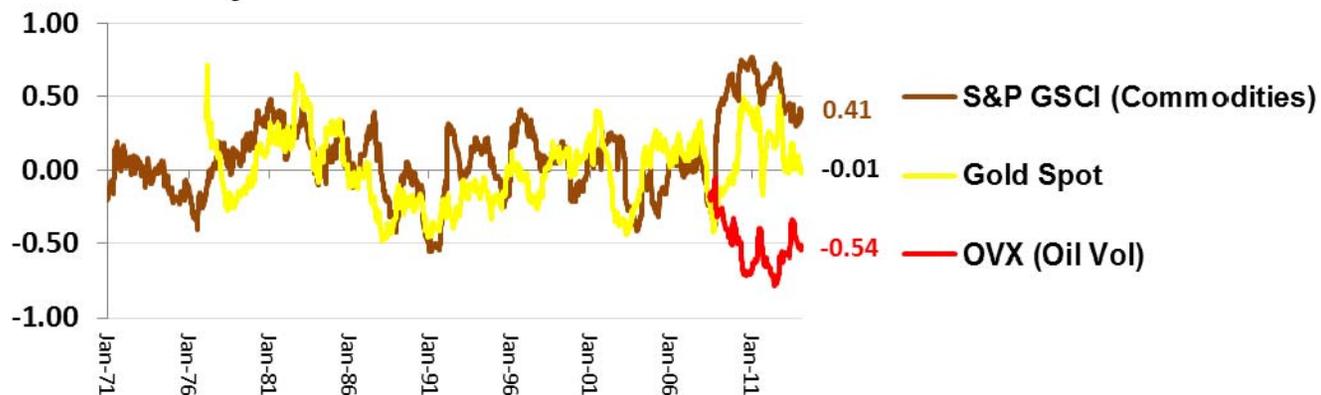
# Correlations Since 1971

**Rolling One-year Correlations of Weekly Returns to the S&P 500 Index**



(Jan. 8, 1971 - Jan. 31, 2014) Sources: Bloomberg and CBOE

**Rolling One-year Correlations of Weekly Returns to the S&P 500 Index**



(Jan. 8, 1971 - Jan. 31, 2013) Sources: Bloomberg and CBOE

*Correlations among many “traditional” assets rose through 2008, making diversification more challenging*

# Risky Outlook for U.S. Bonds and Funds?

Wall Street Journal March 22, 2012

**What Does the Prudent Investor Do Now?** In *The Wall Street Journal*, Princeton University economist Burton Malkiel writes that at a yield of 2.25%, the 10-year U.S. Treasury is a sure loser and stocks are a safer choice.

By Burton G. Malkiel ... Bonds are the worst asset class for investors. Usually thought of as the safest of investments, they are anything but safe today. At a yield of 2.25%, the 10-year U.S. Treasury note is a sure loser. Even if the overall inflation rate is only 2.25% over the next decade, an investor who holds a 10-year Treasury until maturity will realize a zero real (after-inflation) return. If the investor sells prior to maturity, it will likely be for less than the face value of the note if the inflation rate rises. Even if the inflation rate remains moderate, interest rates are likely to rise to more normal levels as the economy continues to recover. Investors with long memories should recall that over the entire period from the 1940s until 1980, bonds were a horrible place to be. Given the likely trends, U.S. Treasuries and high quality bonds are likely to be extremely poor investments and are very risky. ...

## Annual Total Returns in Five Years

	Long-term Corporate Bonds	Long-term Government Bonds	Inflation
1977	1.71%	-0.69%	6.8%
1978	-0.07%	-1.18%	9.0%
1979	-4.18%	-1.23%	13.3%
1980	-2.76%	-3.95%	12.4%
1981	-1.24%	1.86%	8.9%

Source: Ibbotson Assoc. SBBI Yearbook

# History of CBOE – Chicago Board Options Exchange

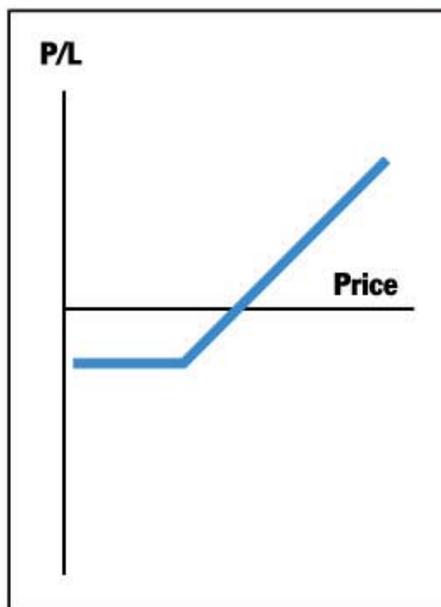
## Chronology – Key Dates

- 1973 - CBOE opens - single-stock call options
- 1977 – Single-stock puts
- 1983 – Stock index options
- 1993 – CBOE Volatility Index® (VIX®) (paper by Duke Univ.)
- 2002 – Performance Benchmark - CBOE S&P 500 BuyWrite Index (BXM)
- 2004, 2006 – Papers on BXM by Ibbotson and Callan
- 2004 - VIX futures – CFE (CFTC-regulated)
- 2006 - VIX options – CBOE (SEC-regulated)
- 2006 - 2008 – Benchmark indexes – BXY, PUT, CLL
- 2012 – 2014 – Papers on option-writing by Fund Evaluation Group, Aon Hewitt, Cambridge Associates, & Russell Investments
- 2015 - Paper by Black & Szado - # of '40 Act funds using options rose from 10 in 2000 to 119 in 2014
- 2015 – Ten benchmark indexes – BXMD, CMBO, PPUT, etc.

*U.S. exchange-listed security options are SEC-regulated and cleared by OCC*

# Simple Options Profit-and-Loss Diagrams

## Long Call



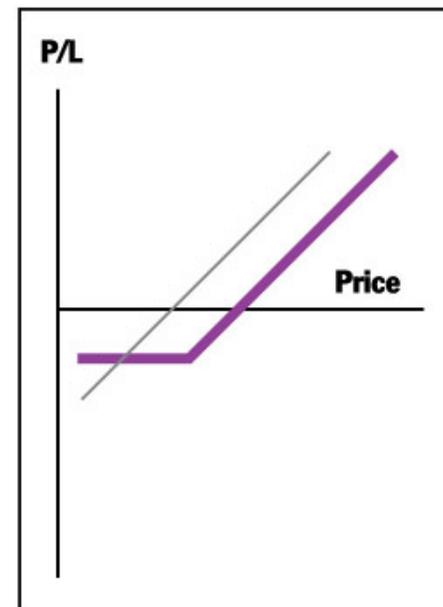
Long call gives the holder the right to buy the underlying security at a specified price for a certain, fixed period of time.

## Long Put



Long put gives the holder the right to sell the underlying security at a specified price for a certain, fixed period of time.

## Protective Put\*

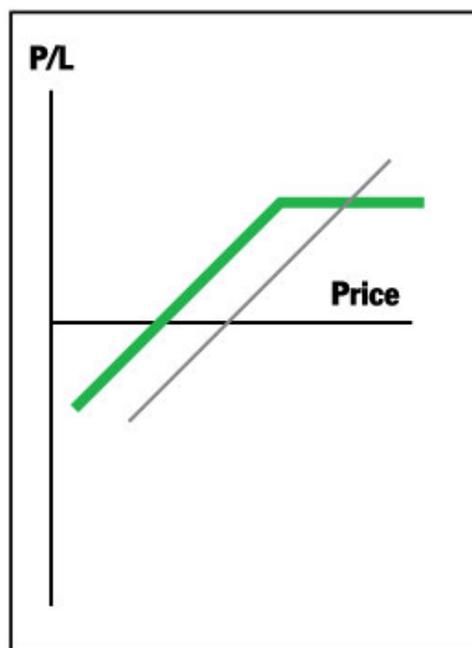


Protective put investor purchases a put (right to sell) while holding underlying security.

\* The colored line reflects a position with both options and stock at expiration, while the straight grey line reflects a long stock position.

# Simple Options Profit-and-Loss Diagrams

## Buy-write\*



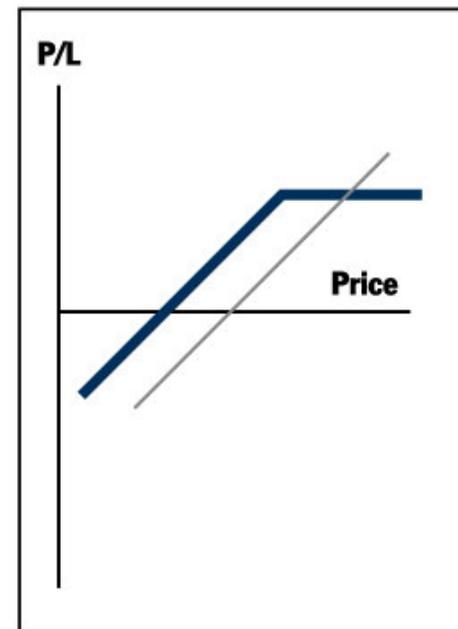
Buy-write investor buys a security and writes (sells) a covered call for income.

## Collar\*



A collar investor owns securities, buys protective put(s), and writes covered call(s) for income.

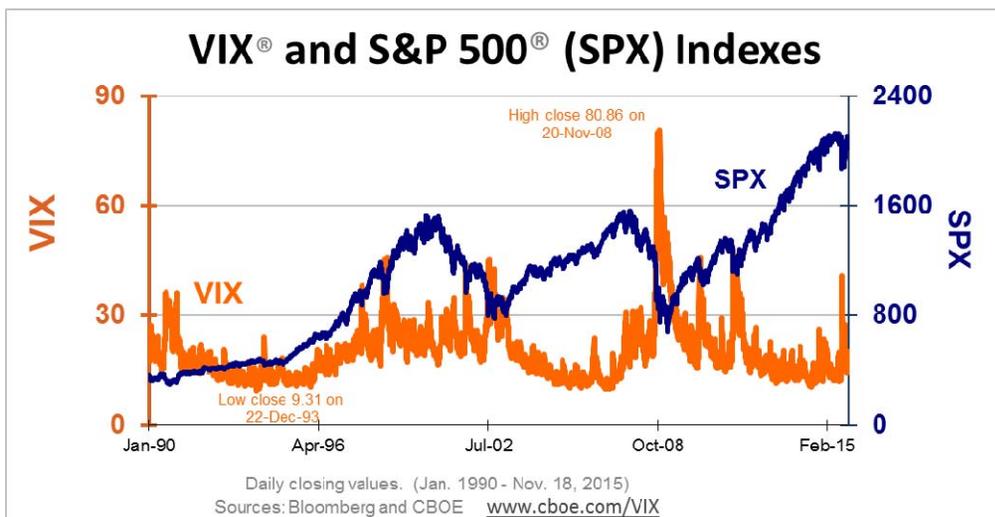
## Cash-secured Put-write\*



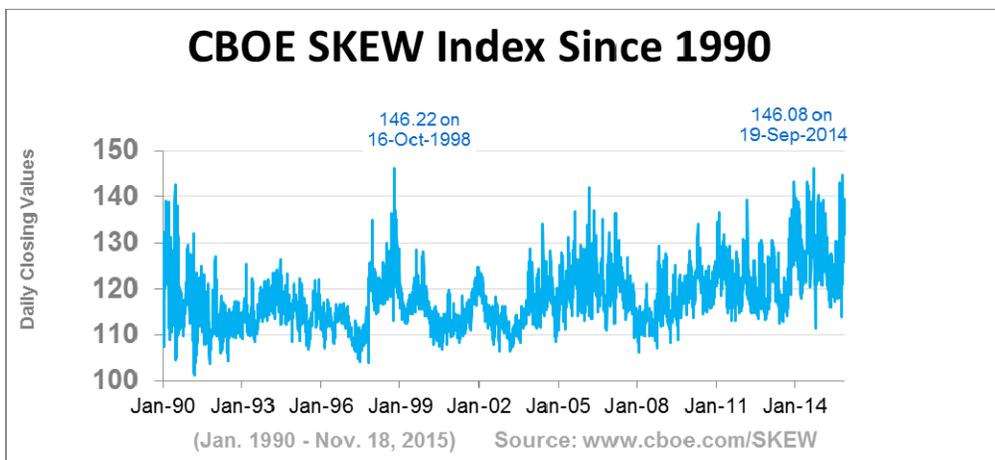
A cash-secured put involved writing a put option, and setting aside the full cash amount for a possible purchase of underlying securities.

\* The colored line reflects a position with both options and stock (or cash) at expiration, while the straight grey line reflects a long stock position.

# CBOE Volatility Index<sup>®</sup> (VIX<sup>®</sup>) and CBOE SKEW Index



The CBOE Volatility Index (VIX) is based on real-time prices of options on the S&P 500<sup>®</sup> Index (SPX) and is designed to reflect investors' consensus view of future 30-day expected stock market volatility. The VIX Index is not investable. [www.cboe.com/VIX](http://www.cboe.com/VIX)



CBOE SKEW Index values, which are calculated from weighted strips of out-of-the-money S&P 500 options, rise to higher levels as investors become more fearful of a “black swan” event — an unexpected event of large magnitude and consequence. If there were no tail risk expectations, SKEW would be equal to 100. [www.cboe.com/SKEW](http://www.cboe.com/SKEW)

*In 2014 the average daily close for the VIX Index was 14.2 (for the second year in a row), and the CBOE SKEW Index had its highest-ever average daily closing value of 129.8.*

*In 2015 (through Nov. 18) the avg. daily closing values were 16.6 for VIX Index and 126.5 for SKEW.*



## Four Options-based Benchmarks -- Descriptions

Index	Strategy	Year Introduced	Earliest Historical Price
CBOE S&P 500 Buy Write Index ( <b>BXM</b> )	Purchase stocks in the S&P 500 index, and each month sell at-the-money index call options	2002	June 30, 1986
CBOE S&P 500 2% OTM Buy Write Index ( <b>BXY</b> )	Purchase stocks in the S&P 500 index, and each month sell index call options 2% out-of-the-money	2006	June 1, 1988
CBOE S&P 500 PutWrite Index ( <b>PUT</b> )	Purchase Treasury bills and sell cash-secured put options on the S&P 500 index	2007	June 30, 1986
CBOE S&P 500 95-110 Collar Index ( <b>CLL</b> )	Purchase stocks in the S&P 500 index, and each month sell index call options at 110% of the index value, and each quarter purchase index put options at 95% of the index value	2008	June 30, 1986

*15 new benchmark indexes are being introduced in 2015*      [www.cboe.com/benchmarks](http://www.cboe.com/benchmarks)

Excerpted from --"Performance Analysis of Options-Based Equity Mutual Funds, CEFs, and ETFs" (January 2015) Please see the last slide for important disclosures.

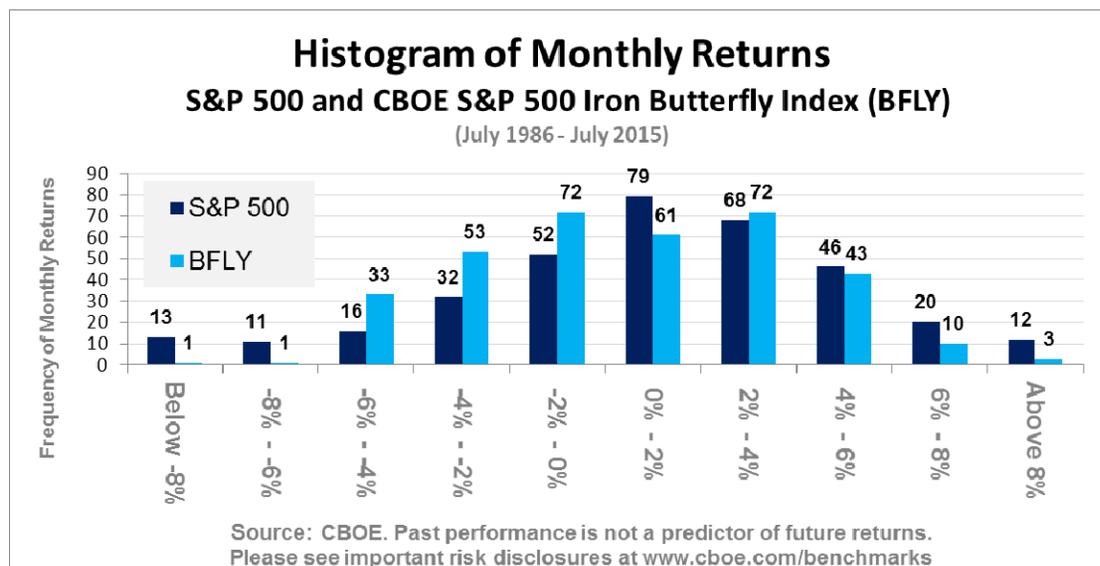
## Studies on Options-based Benchmark Indexes

- **Asset Consulting Group. Key Tools for Hedging and Tail Risk Management (February 2012)**
- **Asset Consulting Group. An Analysis of Index Option Writing for Liquid Enhanced Risk-Adjusted Returns (January 2012)**
- **Hewitt EnnisKnupp. The CBOE S&P 500 BuyWrite Index (BXM) - A Review of Performance (2012)**
- **Cambridge Associates, LLC. Highlights from the Benefits of Selling Volatility (2011)**
- **Russell Investments. Capturing the Volatility Premium through Call Overwriting. (December 2010)**
- **Ennis Knupp & Associates. Evaluating the Performance Characteristics of the CBOE S&P 500 PutWrite Index (Dec. 2008)**
- **Fund Evaluation Group. Study of BXD and VXD Indexes (2007)**
- **Callan Associates. An Historical Evaluation of the CBOE S&P 500 BuyWrite Index (BXM). (Oct. 2006).**
- **Goldman Sachs. "Finding Alpha via Covered Index Writing," Financial Analysts Journal. (September/October 2006).**
- **Ibbotson Associates. Feldman, Barry, and Dhruv Roy, "Passive Options-Based Investment Strategies: The Case of the CBOE S&P 500 BuyWrite Index." The Journal of Investing. (Summer 2005).**
- **Duke University. Whaley, Robert. "Risk and Return of the CBOE BuyWrite Monthly Index" The Journal of Derivatives (Winter 2002).**

**[www.cboe.com/benchmarks](http://www.cboe.com/benchmarks)**

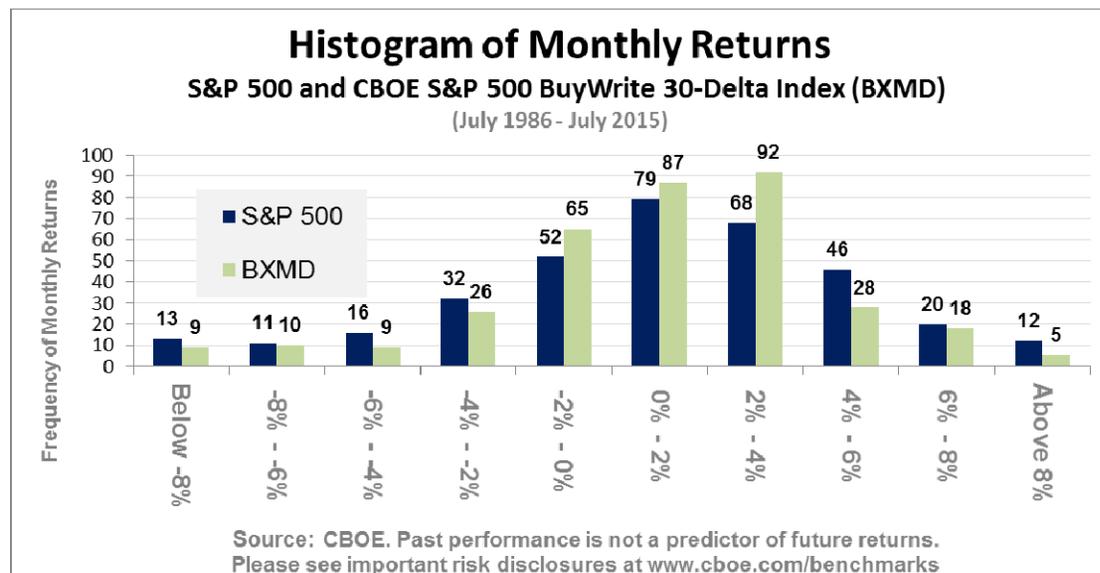
# Tail Risk and Different Options Strategies

*BFLY had only 2 months with losses worse than 6%*



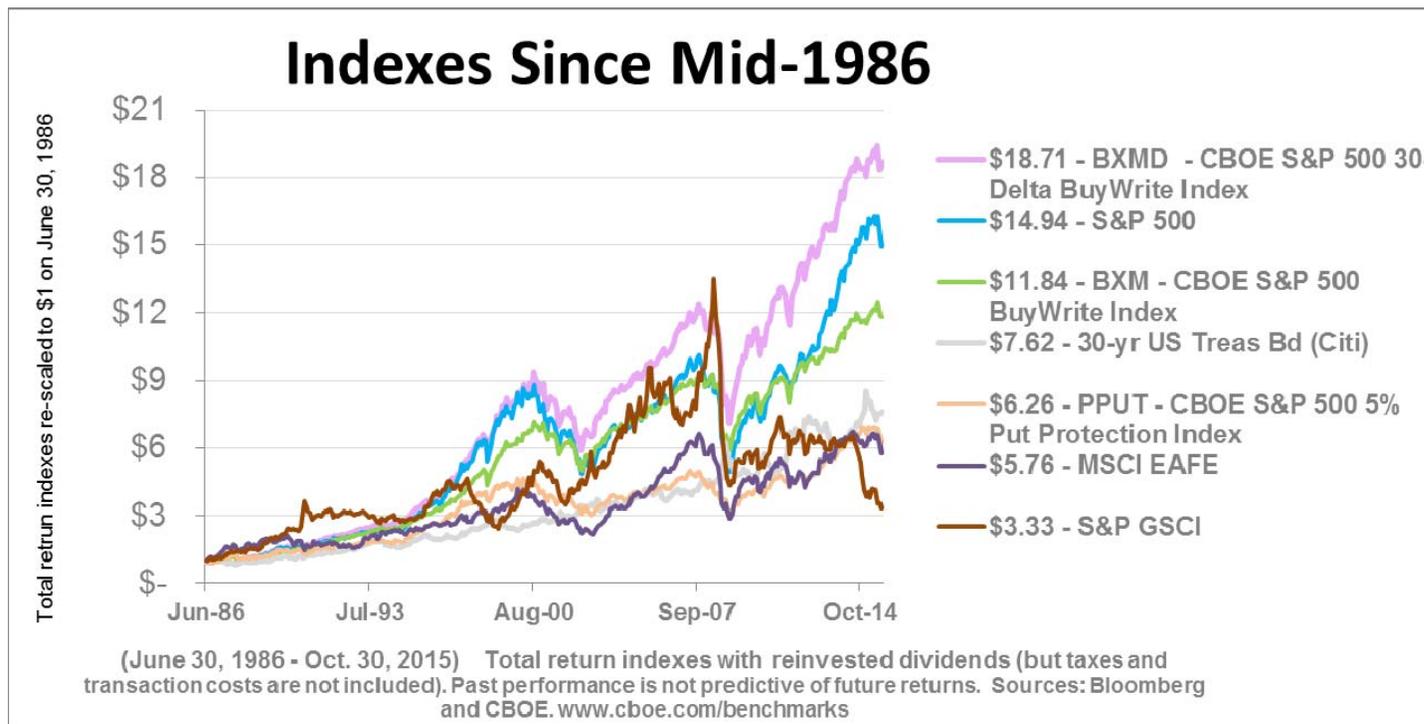
*BFLY had 13 months with gains greater than 6%*

*BXMD had 19 months with losses worse than 6%*



*BXMD had 23 months with gains greater than 6%*

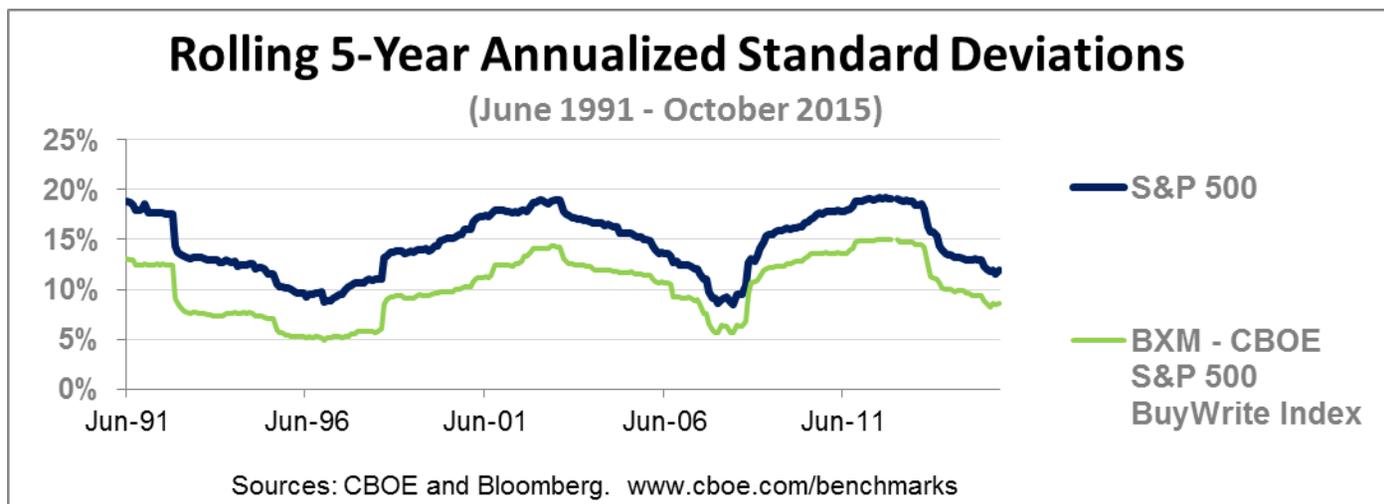
# 3 Benchmark Indexes That Use S&P 500<sup>®</sup> (SPX) Options - BXMD, BXM, & PPUT



Returns in Recent Years							
2008	2009	2010	2011	2012	2013	2014	
-31.3%	32.1%	11.2%	7.3%	11.0%	19.1%	6.2%	BXMD - CBOE S&P 500 30-Delta BuyWrite Index
-37.0%	26.5%	15.1%	2.5%	15.5%	32.4%	13.7%	S&P 500
-28.7%	25.9%	5.9%	5.7%	5.2%	13.3%	5.6%	BXM - CBOE S&P 500 BuyWrite Index
41.3%	-25.9%	8.7%	35.4%	2.4%	-15.0%	29.3%	30-yr U.S. Treasury Bond Index (Citi)
-20.1%	8.7%	11.7%	-1.4%	10.0%	27.1%	11.2%	PPUT - CBOE S&P 500 5% Put Protection Index

Past performance is not predictive of future returns. Please see the last slide for important disclosures.

# Rolling Returns and Volatility



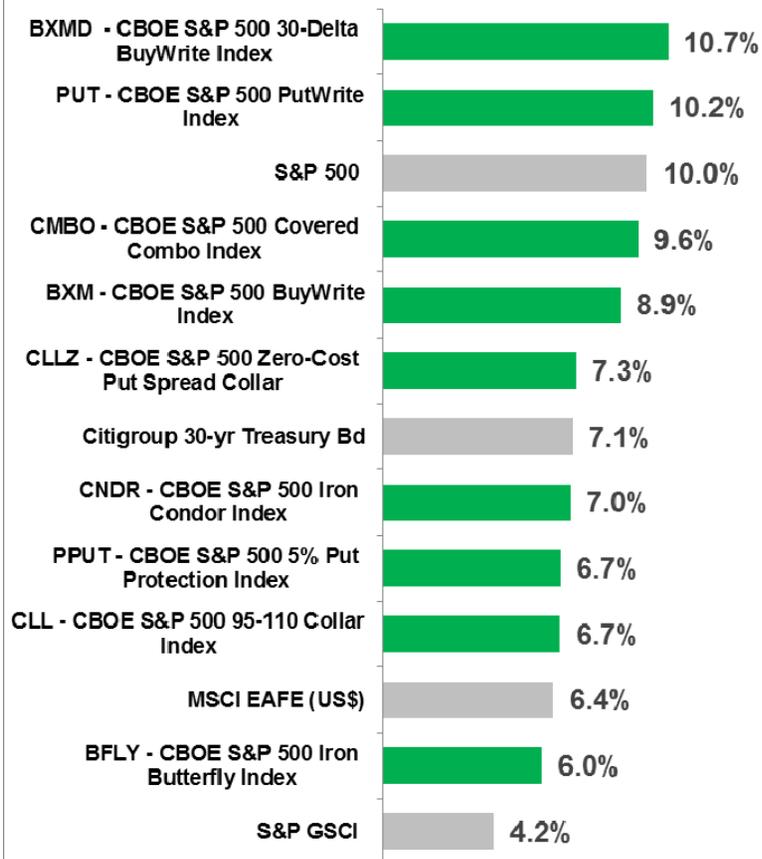
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# Returns and Volatility Since 1986

9 options-based indexes and 4 “traditional” indexes

## Annualized Returns

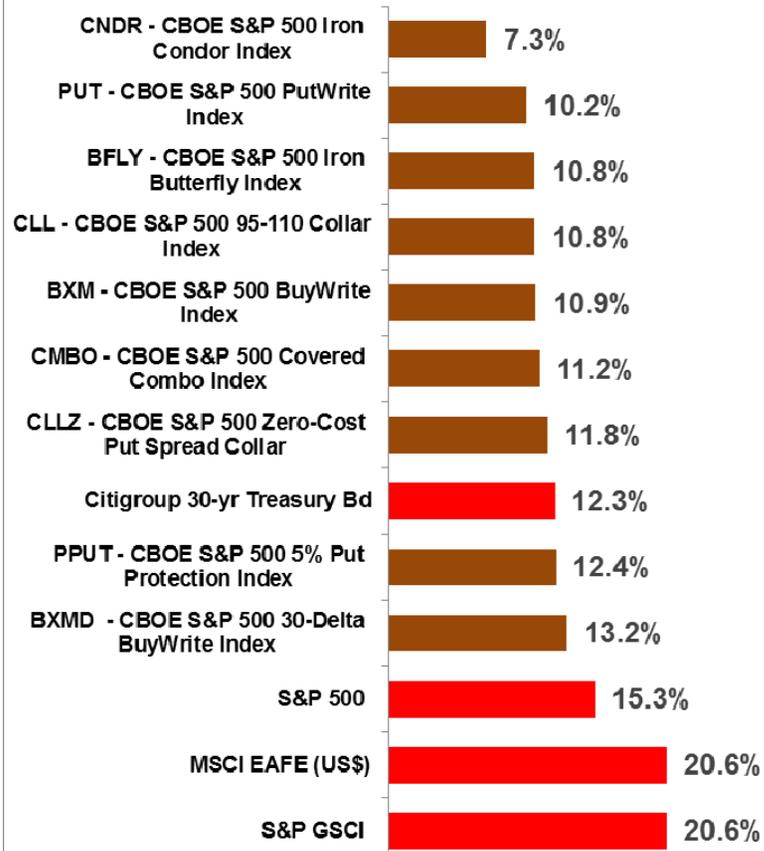
(June 30, 1986 - Oct. 31, 2015)



Total return indexes. Sources: Bloomberg and CBOE

## Standard Deviations (Annualized)

(June 30, 1986 - Oct. 31, 2015)



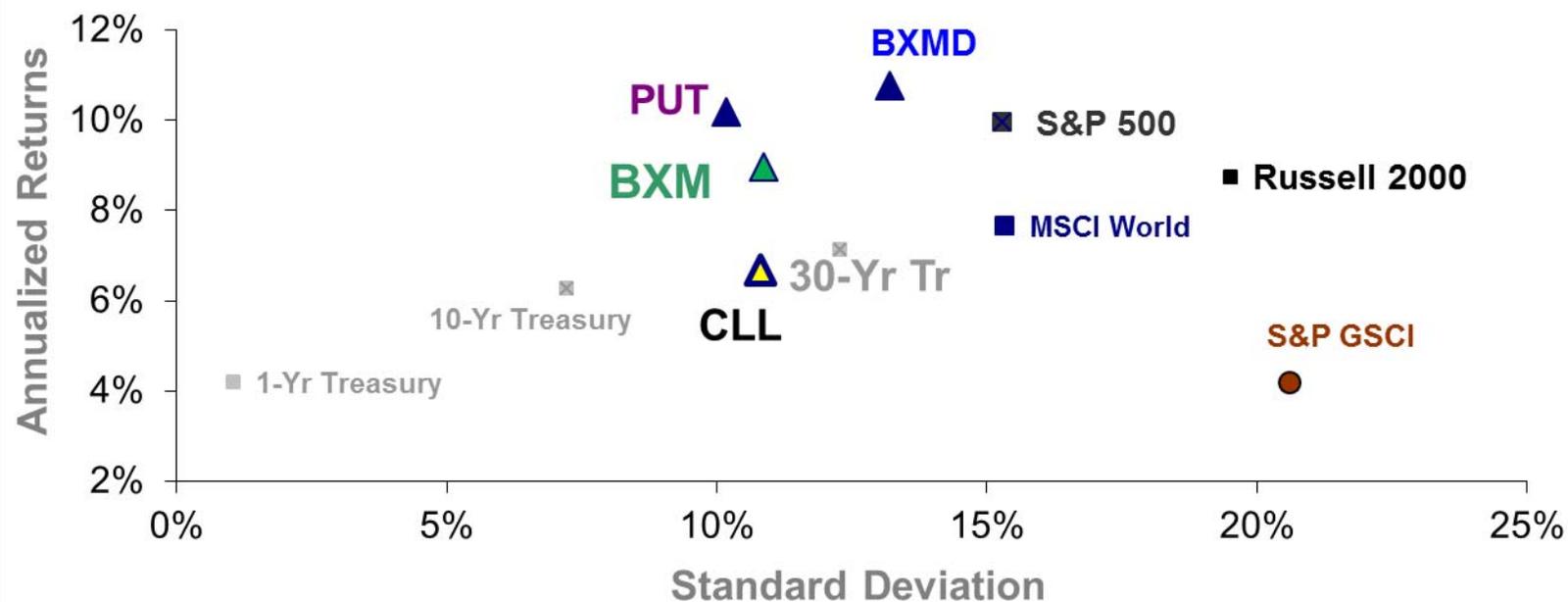
Total return indexes. Sources: Bloomberg and CBOE

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# Efficient Frontier

## Returns and Volatility Since Mid-1986

(June 30, 1986 - Oct. 31, 2015)



Sources: CBOE, Bloomberg, Citigroup Fixed Income Indexes  
Total return indexes [www.cboe.com/benchmarks](http://www.cboe.com/benchmarks)

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# Richly Priced Index Options

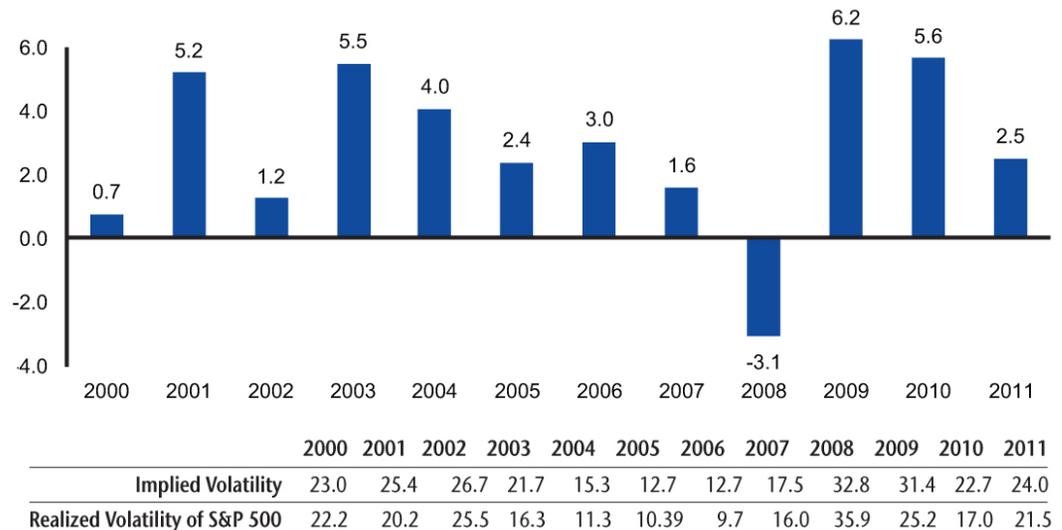
## Volatility Risk Premium

Wall Street Journal December 10, 2011

**Options for Nervous Investors** By Jack Hough “... Research suggests investors who use covered calls can turn the risk-reward trade-off in their favor by using a strategy based on stock indexes rather than individual stocks. ... One type of option might offer more opportunity than others, however. Some researchers say a quirk related to index options, like those written against the Standard & Poor's 500-stock index, offers investors a way to reduce risk without giving up much in return. At least nine research papers since 1990, from academia and Wall Street, have shown that index options are often overpriced—an opportunity for those who sell them. ... There is a good reason. Institutional investors have ravenous demand for index puts, since they offer cheap protection against a market crash, Mr. Parker says. All that buying pushes index put prices higher—and call prices, too, because the two move in tandem. That suggests an investor who writes index options is getting a better price than one who buys, on average. In 2001, Vanderbilt's Mr. Whaley developed an index to exploit the high price of index options. It is called the CBOE S&P 500 BuyWrite Index, or BXM, and it simulates owning the S&P 500 and writing covered calls each month. . . .”

*Exhibit 12 of a 2012 paper by Hewitt EnnisKnupp – “The CBOE S&P 500 BuyWrite Index (BXM) - A Review of Performance”*

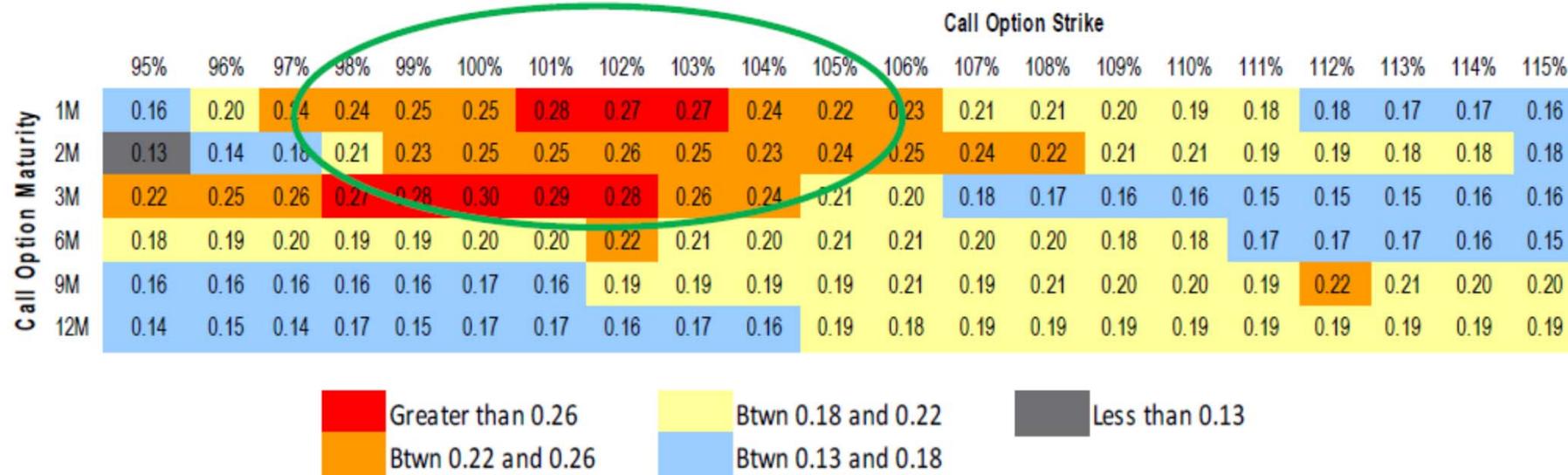
**Exhibit 12 - Implied Volatility (VIX) minus Subsequent S&P 500 Realized Volatility – Average Per Year (2000 - 2012)**



# Russell -- Sharpe Ratios at Different Strikes and Maturities

From paper by Russell Investments. *Capturing the Volatility Premium through Call Overwriting*. (July 2012) <http://bit.ly/Russell-Buy-Write>

**Exhibit 9: Sharpe ratios of systematic S&P 500 covered call strategies, Dec 20, 1996 to June 29, 2012. Sharpe ratio S&P 500 = 0.13**



Source: BofA Merrill Lynch Global Research. Long term history not available for weekly options. (Weekly options began trading in October 2005). For illustrative purposes only. Standard & Poor's Corporation is the owner of the trademarks, service marks, and copyrights related to its indexes. Indexes are unmanaged and cannot be invested directly.

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# North American Pension Funds and Use of Options

- In July 2013 CalSTRS (California State Teachers Retirement System, with \$140 billion in AUM) issued a request to investment managers for -- "Risk-Managed Equity - Low Volatility Equity and Covered Call Strategies. ... CalSTRS will consider both active and passive covered call strategies benchmarked to the **CBOE S&P 500 BuyWrite Index (BXM)**."
- "CalSTRS Putting in Place Low Vol Covered Call Program", EQ Deriv., March 25, 2015.
- In addition, The **Santa Barbara County** Employees Retirement System, the **Hawaii Employees Retirement** System, the **Los Angeles Department** of Water and Power Employees Retirement Plan, the **Seattle City** Employee Retirement System and the **Alaska Retirement** Management Board are all in various stages of adopting buy-write strategies benchmarked against the **Chicago Board Options Exchange's BXM index**.
- Large public pension funds in **Texas**, **Wisconsin** and **Canada** also are reported to use options-based strategies.

# Funds and Use of Options or Volatility

**Goldman Sachs - Mutual Fund Use of Options (2012 and 2014)**

**Univ. of Augsburg - The Benefits of Option Use by Mutual Funds (2015)**

**Keith Black and Edward Szado. Performance Analysis of Options-Based Equity Mutual Funds, CEFs, and ETFs (2015) (with list of names and tickers for 119 funds)**

**[www.cboe.com/funds](http://www.cboe.com/funds)**

# Goldman Sachs - Papers on Mutual Fund Use of Options (2012 and 2014) - Below are highlights from 2014 paper by John Marshall

- **FUND FAMILIES.** Five of the top 15 fund families now have funds that use options.
- **FUNDS.** At least 196 funds use options, and these 196 funds had more than \$480 billion in assets under management at the end of 2013.
- **STRATEGIES.** The % of positions held by mutual funds in each options strategy – 64% in short calls, 22% in short puts, 8% in long puts, and 6% in long calls.
- **MATURITIES.** About 47% of short-options positions had a maturity of 30 days or less, while about 40% of long-options positions had a maturity of 30 days or less.
- **TYPES OF OPTIONS.** Over the past two years, fund usage of both single-stock options and index options has grown, while fund usage of ETF options has decreased.
- **GROWTH IN ASSETS.** Over the past 5 years, assets under management for the option-using funds have grown 160%, versus 110% growth for their peer funds that do not use options.
- **STRONGER PERFORMANCE.** Over the 5-year period ending March 4, 2014, the funds that used options had higher returns, lower volatility, and higher risk-adjusted returns than their peer funds that do not use options.

Past performance is not predictive of future returns.  
Please see the last slide for important disclosures.

# Univ. of Augsburg – Paper on The Benefits of Option Use by Mutual Funds (2015)

- Use of options by mutual funds yields higher risk-adjusted performance compared with nonuser funds.
- Option user funds show significantly lower systematic risk because they use options mainly for hedging strategies and not for speculation.
- We base our analysis on a large, comprehensive and previously unused sample of the SEC's mandatory N-SAR filings.
- Consistent with covered call strategies for income generation, we show that mutual funds' short positions are the main drivers of the performance-enhancing effect.
- On the other hand, consistent with protective put strategies for hedging, long option positions are the predominant contributors to the risk-reducing effect of options.
- Authors - Markus Natter, Martin Rohleder, Dominik Schulte, and Marco Wilkens

<http://bit.ly/Augs-MutFd-Opt>

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## Exhibit 1 - Number of Option-Based Funds in Sample (Dec. 31, 2000 to Dec 31, 2014)

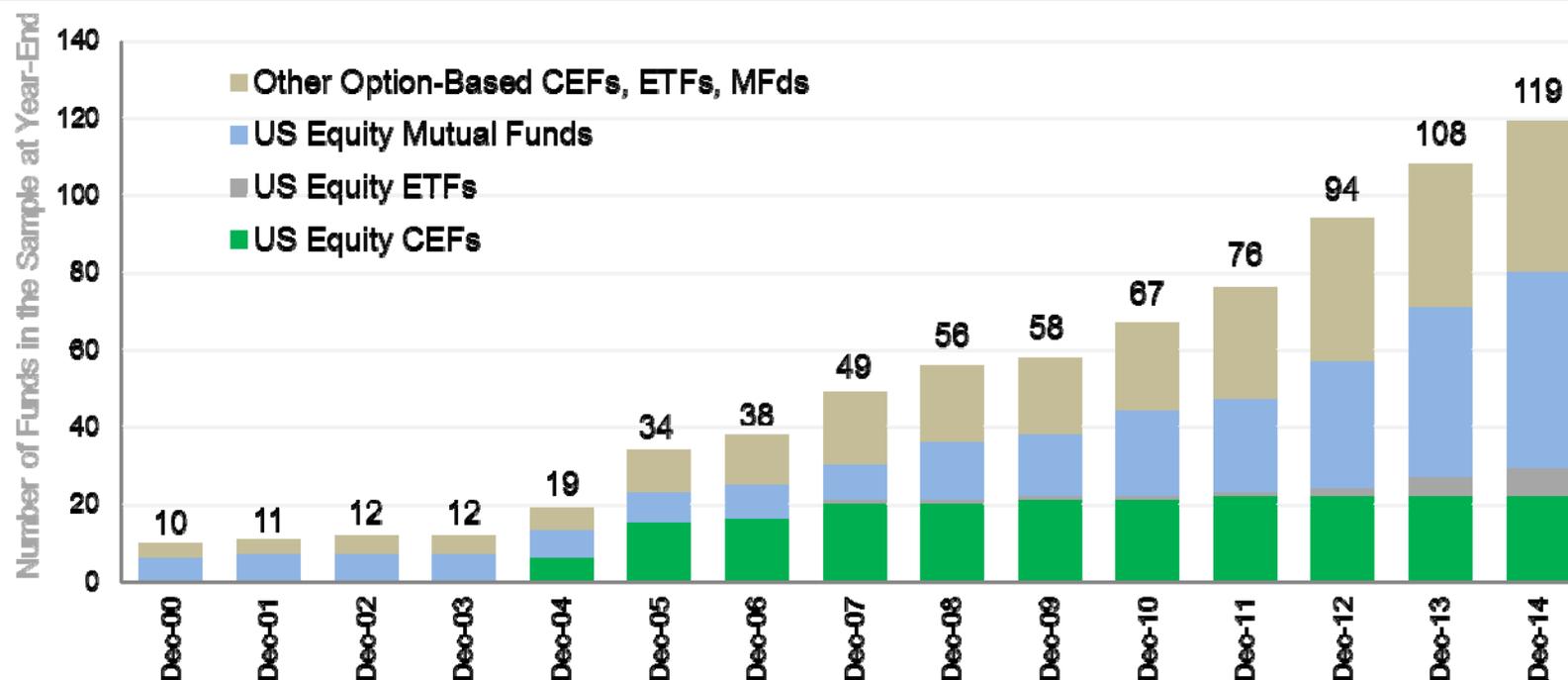


Exhibit 1: Number of option-based funds included in the sample at year-end. Option-based funds benchmarked to a broad US equity index are included in the analysis. The "Other" category includes option-based closed-end, exchange traded and mutual funds which are excluded from the analysis since they have objectives other than broad-based US equities. These include fixed income, currencies, commodities, international and global equity, narrow sector funds (such as master limited partnerships), and futures based products (such as the VIX index). While CEF growth peaked in 2007, option-based mutual funds have been growing significantly in number since late-2008, and more recently, option-based ETFs have exhibited strong growth. While the exhibit only shows growth since 2000, the fund with the earliest inception date included in the study dates back to 1977.

Sources: Morningstar and Bloomberg.

**From: paper by Keith Black and Ed Szado "Performance Analysis of Options-Based Equity Mutual Funds, CEFs, and ETFs" (January 2015)**

[www.cboe.com/funds](http://www.cboe.com/funds)

Please see the last slide for important disclosures.

# Options-Based Funds and Stock Indices – Cumulative Growth of \$100

(Jan. 1, 2000 to Dec. 31, 2014)

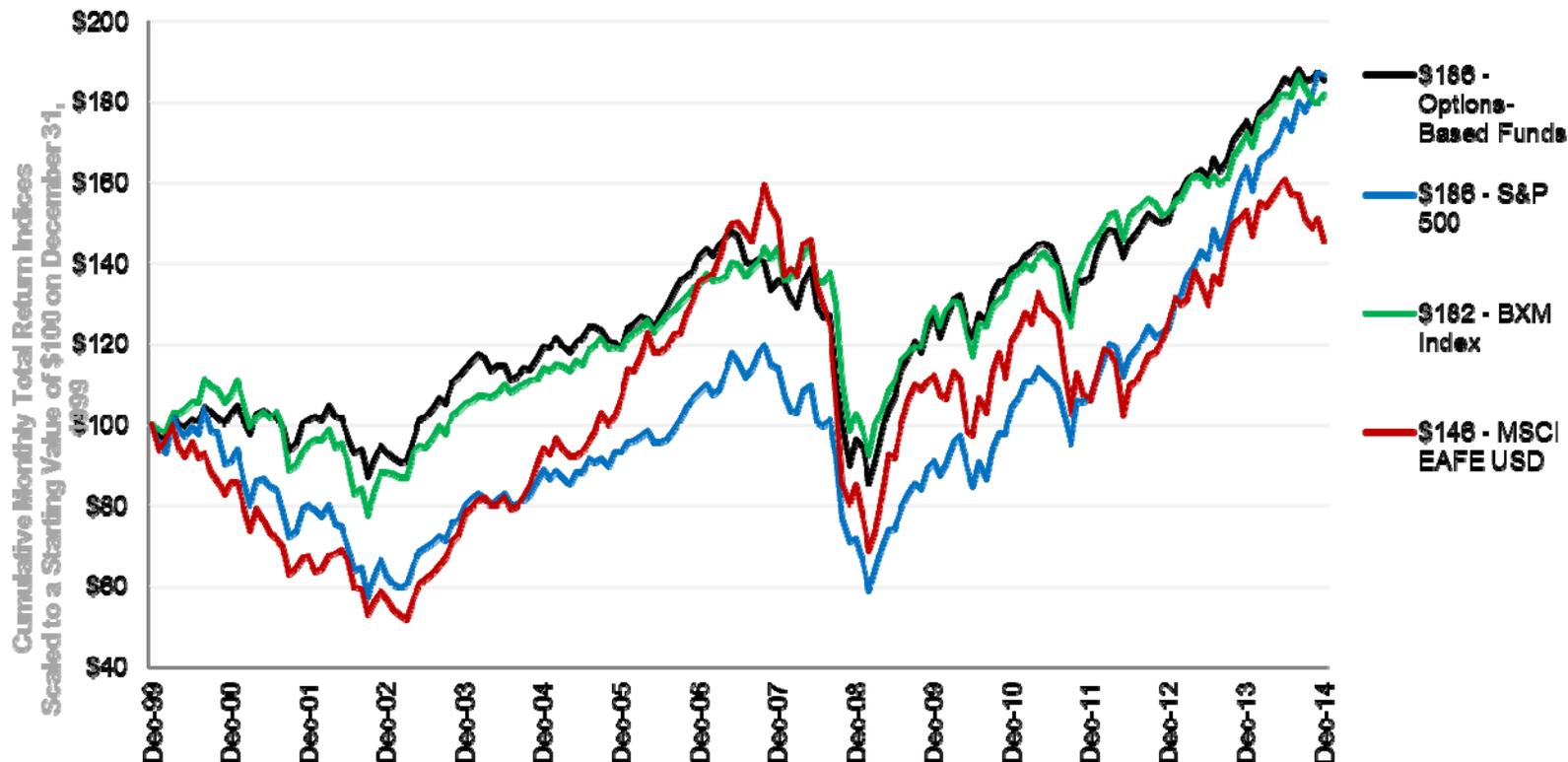


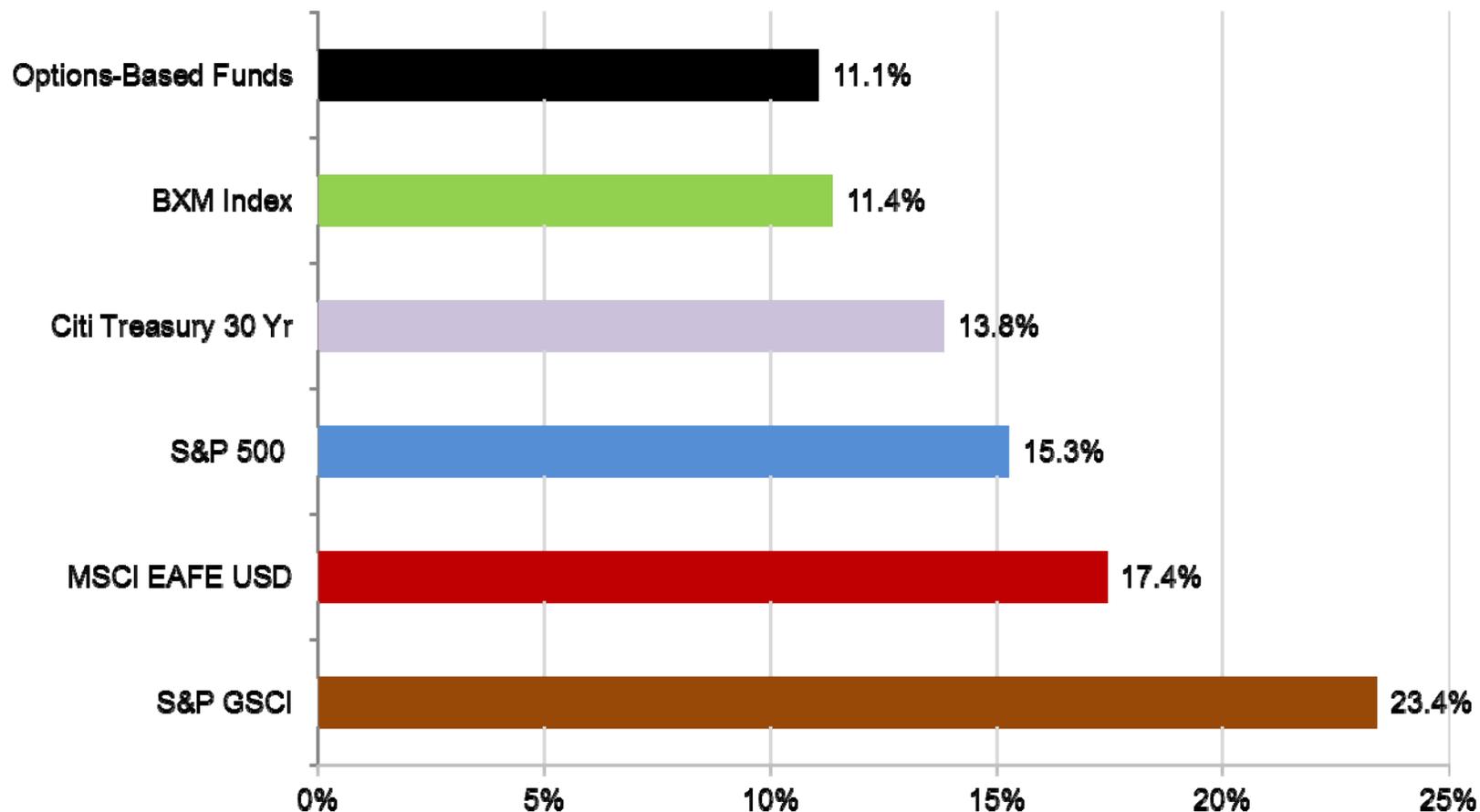
Exhibit 2: Cumulative monthly total return since January 1, 2000 for a monthly rebalanced equally weighted portfolio of Options-Based Funds, the BXM index and various traditional indices. Performance is scaled to represent a starting value of \$100 at the market close on December 31, 1999 for all indices. Performance of the Equally Weighted Option-Based Fund Portfolio closely tracks the BXM index. The Equally Weighted Option-Based Fund Portfolio returns are calculated by averaging the returns across all constituents in the sample available at each month-end. The number of funds included in the calculation grows monthly as new funds enter the sample.

Sources: Bloomberg and Morningstar

"Performance Analysis of Options-Based Equity Mutual Funds, CEFs, and ETFs" (January 2015) Please see the last slide for important disclosures.

## Exhibit 4 - Annualized Standard Deviation - Options-Based Funds and Benchmark Indices

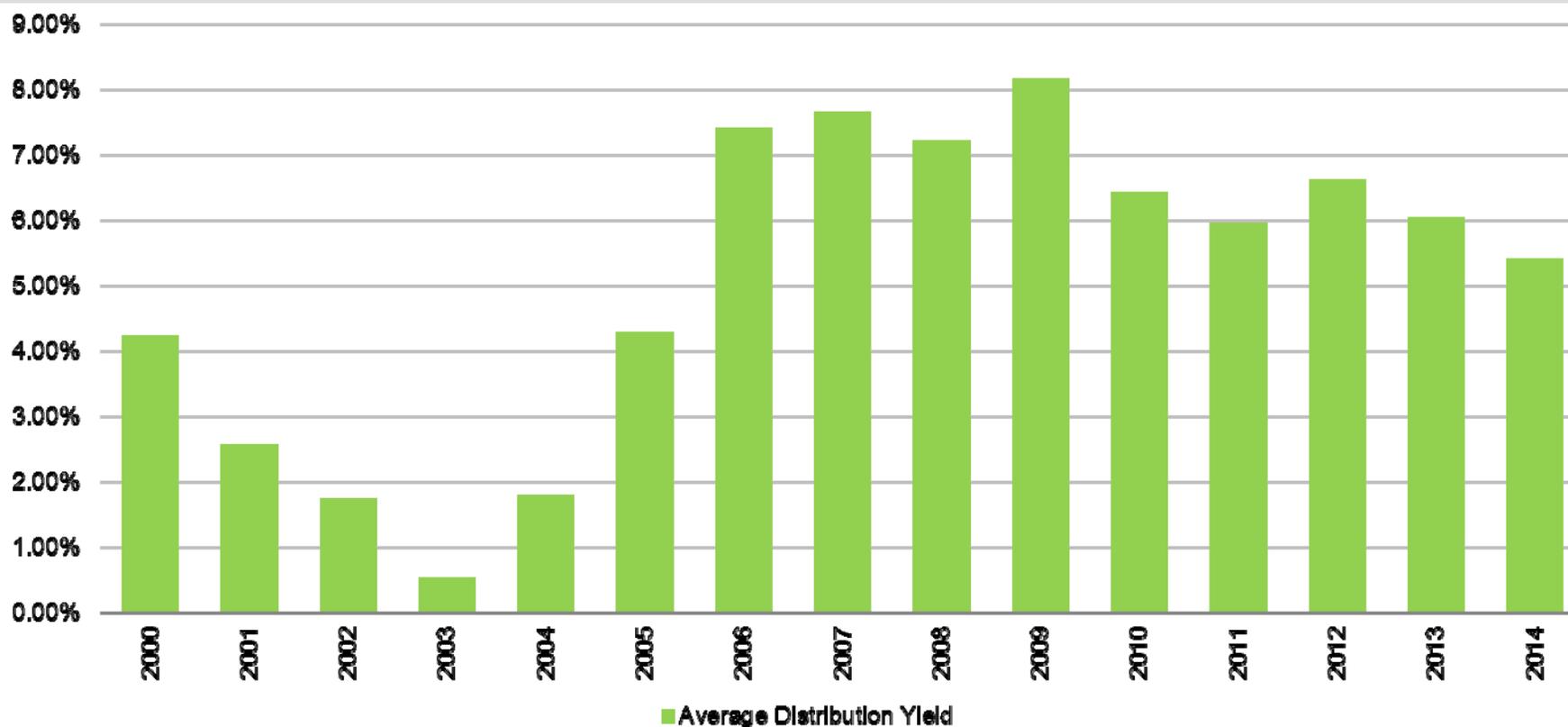
(Jan. 1, 2000 to Dec. 31, 2014)



- Exhibit 4: In addition, Options-Based Funds had a lower standard deviation than the S&P 500 Index
- Sources: Morningstar and Bloomberg.

"Performance Analysis of Options-Based Equity Mutual Funds, CEFs, and ETFs" (January 2015) Please see the last slide for important disclosures.

## Exhibit 12 - Options-Based Funds Annual Distribution Yield (Jan. 1, 2000 to Dec. 31, 2014)



- Exhibit 12: The exhibit provides the annual average distribution yield calculated as the total distributions for each fund over a calendar year divided by the ending price of the fund for the previous year, and averaged across all funds in the Options-Based Funds index.
- Sources: Morningstar and Bloomberg.

"Performance Analysis of Options-Based Equity Mutual Funds, CEFs, and ETFs" (January 2015) Please see the last slide for important disclosures.

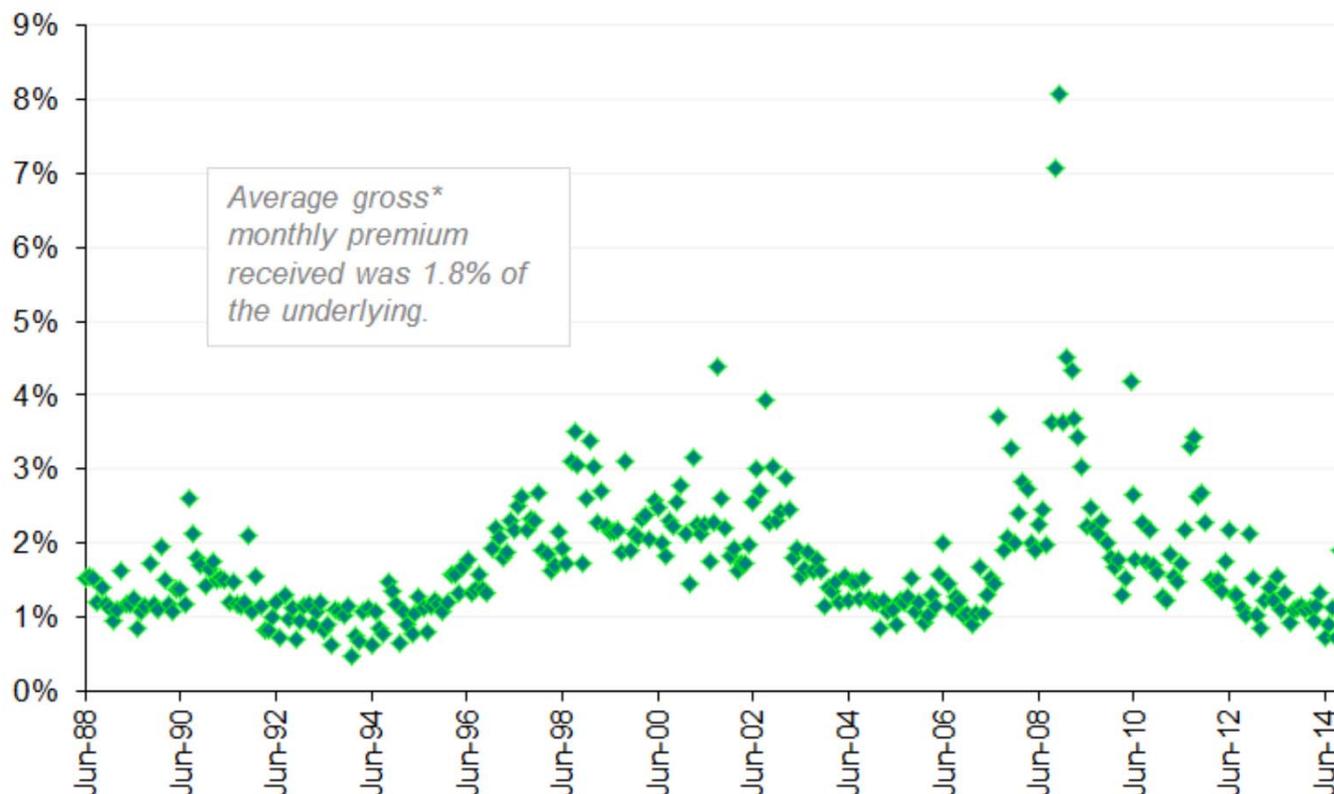
## Summary Statistics Table Since Mid-1988 – Benchmark Indices (Jul. 1, 1988 - Dec. 31, 2014)

Jul. 1, 1988 to Dec. 31, 2014	BXM - CBOE S&P 500 BuyWrite	PUT - CBOE S&P 500 PutWrite Index	BXY - CBOE S&P 500 2% OTM BuyWrite	CLL - CBOE S&P 500 95-110 Collar Index	S&P 500	S&P GSCI	Citi Treasury 30 Yr
<b>Annualized Return</b>	<b>9.25%</b>	<b>10.97%</b>	<b>10.80%</b>	<b>8.88%</b>	<b>10.55%</b>	<b>1.67%</b>	<b>6.17%</b>
<b>Standard Deviation</b>	<b>10.26%</b>	<b>9.76%</b>	<b>12.09%</b>	<b>10.49%</b>	<b>14.49%</b>	<b>20.90%</b>	<b>12.19%</b>
<b>Semi-Standard Deviation Below Mean</b>	<b>13.25%</b>	<b>12.63%</b>	<b>14.57%</b>	<b>11.06%</b>	<b>18.61%</b>	<b>21.55%</b>	<b>12.20%</b>
<b>Average Monthly Return</b>	<b>0.76%</b>	<b>0.91%</b>	<b>0.90%</b>	<b>0.74%</b>	<b>0.88%</b>	<b>0.14%</b>	<b>0.51%</b>
Skew	-1.30	-1.99	-0.91	-0.17	-0.61	-0.18	0.23
Kurtosis	4.86	9.51	2.75	-0.22	1.27	2.09	3.20
Auto-correlation	0.08	0.12	0.05	0.03	0.04	0.20	0.07
<b>Beta to S&amp;P 500</b>	<b>0.82</b>	<b>0.99</b>	<b>0.78</b>	<b>0.88</b>	<b>1.00</b>	<b>0.24</b>	<b>-0.07</b>
<b>Correlation with S&amp;P 500</b>	<b>0.68</b>	<b>0.82</b>	<b>0.93</b>	<b>0.92</b>	<b>1.00</b>	<b>0.17</b>	<b>-0.09</b>
Maximum Drawdown	-35.81%	-32.66%	-40.31%	-35.47%	-50.95%	-69.38%	-25.96%
Annual Sharpe Ratio	0.61	0.76	0.64	0.39	0.54	0.14	0.45
Stutzer Index	0.59	0.71	0.62	0.39	0.53	0.14	0.45
Sortino Ratio	0.47	0.58	0.54	0.37	0.47	0.13	0.45
Treynor Ratio	0.10	0.13	0.10	0.06	0.08	0.12	-0.74
<b>Jensen's Annual Alpha</b>	<b>1.44%</b>	<b>3.15%</b>	<b>1.88%</b>	<b>-1.10%</b>	<b>0.00%</b>	<b>0.96%</b>	<b>6.03%</b>
<b>Leland's Annual Alpha</b>	<b>1.25%</b>	<b>2.89%</b>	<b>1.94%</b>	<b>-0.68%</b>	<b>0.00%</b>	<b>0.55%</b>	<b>5.99%</b>
<b>Al-Squared</b>	<b>11.99%</b>	<b>14.17%</b>	<b>12.42%</b>	<b>6.75%</b>	<b>10.95%</b>	<b>9.15%</b>	<b>9.67%</b>

- Exhibit 18: BXM, PUT, and BXY had a positive alpha and a lower standard deviation of returns than the S&P 500 Index.
- Sources: Morningstar and Bloomberg.

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# Monthly Options Premiums (Gross) Received by BXM Index (Jun. 17, 1988 – Dec. 19, 2014)



**Exhibit 19:** The BXM, BXY, and PUT strategies regularly sell S&P 500 Index options. The premium earned varies over time, but has averaged 1.8% per month for BXM. Premiums earned can support a high income yield for Options-Based Funds. Since mid-1988 the SPX call options monthly premium received per the hypothetical BXM strategy averaged 1.8% of the value of the stock position held.

- \* Please note that while these gross amounts are positive values, a buy-write strategy can have negative net returns if the value of the stocks held declines. *Source: [www.cboe.com/buywrite](http://www.cboe.com/buywrite).*

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## Annual Returns - Options-Based Funds and Benchmark Indices (1987 - 2014)

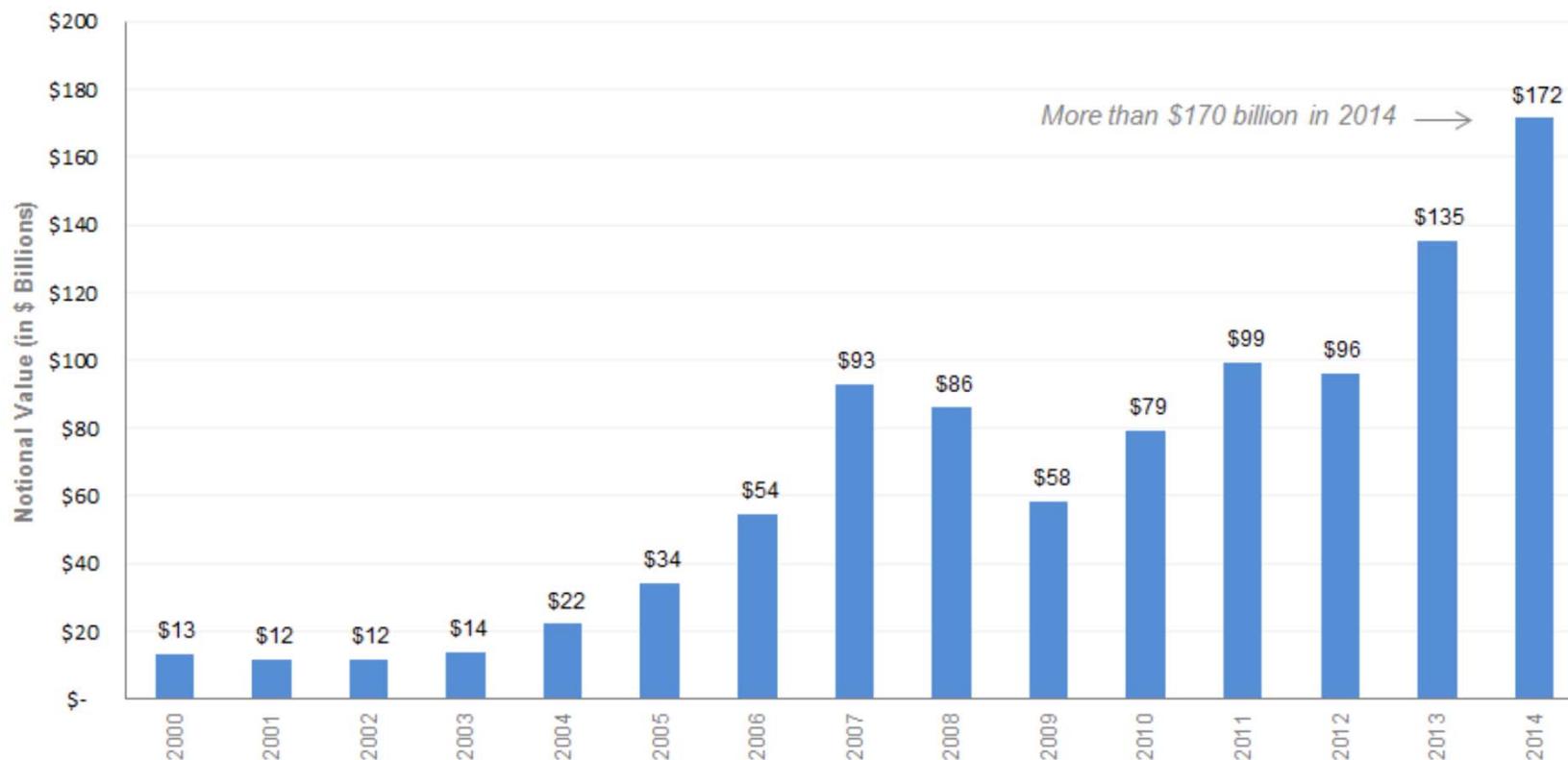
	BXM	Options-Based Funds	PUT	BXY	CLL	S&P 500	GSCI	30 Yr TBond	EAFE
1987	-3.0%		-2.8%		12.4%	6.3%	23.6%	-6.0%	24.8%
1988	21.0%		19.7%		8.1%	18.8%	27.9%	8.1%	28.3%
1989	25.0%		24.6%	32.6%	26.0%	31.7%	36.3%	20.3%	10.6%
1990	4.0%		6.9%	1.9%	-0.1%	-3.1%	29.1%	4.6%	-23.4%
1991	24.4%		21.3%	22.9%	13.6%	30.6%	-8.1%	17.3%	12.1%
1992	11.5%		13.6%	11.0%	4.3%	7.8%	4.4%	6.6%	-12.2%
1993	14.1%		14.1%	11.0%	8.2%	10.1%	-12.3%	18.3%	32.8%
1994	4.6%		7.1%	4.6%	-2.0%	1.3%	6.3%	-11.6%	7.6%
1995	21.0%		16.9%	33.2%	34.4%	37.6%	20.3%	33.6%	11.2%
1996	16.6%		18.4%	18.6%	16.6%	23.0%	33.9%	-4.4%	6.0%
1997	26.6%		27.7%	29.7%	23.9%	33.4%	-14.1%	16.4%	1.6%
1998	16.9%		16.6%	21.2%	16.6%	28.8%	-36.7%	18.6%	20.0%
1999	21.2%		21.0%	19.7%	9.0%	21.0%	40.8%	-14.9%	27.0%
2000	7.4%	2.9%	13.1%	2.0%	-9.1%	-9.1%	49.7%	20.0%	-14.2%
2001	-10.9%	-1.6%	-10.6%	-11.4%	3.6%	-11.9%	-31.9%	3.4%	-21.4%
2002	-7.5%	-8.0%	-6.8%	-12.3%	-11.1%	-22.1%	32.1%	18.2%	-15.9%
2003	19.4%	22.6%	21.6%	24.9%	17.9%	28.7%	20.7%	0.6%	38.8%
2004	6.3%	4.8%	9.6%	9.7%	4.9%	10.8%	17.3%	6.7%	20.2%
2005	4.2%	-0.6%	6.7%	4.4%	2.0%	4.9%	26.6%	6.8%	13.6%
2006	13.3%	19.4%	15.2%	17.1%	11.7%	15.6%	-16.1%	-1.1%	26.3%
2007	6.6%	-4.3%	9.6%	6.1%	0.9%	6.6%	32.7%	10.2%	11.2%
2008	-26.7%	-29.1%	-23.6%	-31.2%	-23.6%	-37.0%	-48.6%	41.3%	-43.4%
2009	26.9%	32.6%	31.6%	32.1%	17.6%	26.6%	13.6%	-26.9%	31.6%
2010	6.9%	8.7%	9.0%	9.8%	4.1%	16.1%	9.0%	6.7%	7.6%
2011	6.7%	-1.6%	6.2%	7.2%	-6.6%	2.1%	-1.2%	36.4%	-12.1%
2012	5.2%	10.4%	6.1%	10.2%	6.6%	18.0%	0.1%	2.4%	17.3%
2013	13.3%	18.3%	12.3%	20.6%	23.6%	32.4%	-1.2%	-16.0%	22.6%
2014	6.6%	6.6%	6.4%	6.6%	9.2%	13.7%	-33.1%	29.3%	-4.6%

- Exhibit 22: Annual Returns for each year since 1987 of Options-Based Funds, options-based indices and traditional indices.

- Sources: Morningstar and Bloomberg.

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## Notional Value of Average Daily Volume in S&P 500 (SPX) Options (in \$ Billions) (2000-2014)



**Exhibit 21:** Fund managers examine trading liquidity and capacity when considering investment vehicles. The approximate daily notional value of trading in SPX options in 2014 can be estimated by multiplying the average daily volume (888,089 contracts) times the value of the S&P 500 Index (average of 1931) times the \$100 options contract multiplier, for a value of more than \$170 billion per day. Some investors use a delta-weighting multiplier to develop a more conservative estimate for notional value of options trading.  
Sources: Bloomberg and CBOE.

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# Appendix pg. 1 – Descriptions for Select Benchmark Indexes

[www.cboe.com/benchmarks](http://www.cboe.com/benchmarks)

Ticker	Benchmark Index
1 <b>BFLY</b>	<b>BFLY</b> - CBOE S&P 500 Iron Butterfly Index - track the performance of a hypothetical option trading strategy that 1) sells a rolling monthly at-the-money (ATM) S&P 500 Index (SPX) put and call option; 2) buys a rolling monthly 5% out-of-the-money (OTM) SPX put and call option to reduce risk; and 3) holds a money market account invested in one-month Treasury bills, which is rebalanced on the option roll day and is designed to limit the downside return of the index
2 <b>BXM</b>	<b>BXM</b> - CBOE S&P 500 Buy Write Index - purchase stocks in the S&P 500 index, and each month sell at-the-money SPX index call options
3 <b>BXMC</b>	<b>BXMC</b> - CBOE S&P 500 Conditional BuyWrite Index - covered call strategy that holds a long position indexed to the S&P 500 Index and sells a monthly at-the-money (ATM) S&P 500 Index (SPX) call option. The written number of ATM call options will be either ½ unit or 1 unit and will be determined by the level of the CBOE Volatility Index (VIX Index) when the call option is written on the roll date. The BXMC Index rolls on a monthly basis, typically every third Friday of the month
4 <b>BXMW</b>	<b>BXMW</b> - CBOE S&P 500 Multi-Week BuyWrite Index - track the performance of a hypothetical weekly covered call strategy with staggered short positions in call options expiring in consecutive four week options. The BXMW Index is constructed as a combined portfolio of four mini BuyWrite indexes. Expirations are staggered so that the BXMW Index sells four-week options on a rolling weekly basis.
5 <b>BXRC</b>	<b>BXRC</b> - CBOE Russell 2000 Conditional BuyWrite Index is designed to track the performance of a hypothetical covered call strategy that holds a long position indexed to the Russell 2000 Index and sells a monthly at-the-money (ATM) Russell 2000 Index call option. The written number of ATM call options will be either ½ unit or one unit and will be determined by the level of the CBOE Russell Volatility Index (RVX Index) when the call option is written on the Roll Date. The BXRC Index rolls on a monthly basis, typically every third Friday of the month
6 <b>BXRD</b>	<b>BXRD</b> - CBOE Russell 2000 30-Delta BuyWrite Index is designed to track the performance of a hypothetical covered call strategy that holds a long position indexed to the Russell 2000 Index and sells a monthly out of the money (OTM) Russell 2000 Index call option. The call option written is the strike nearest to the 30 Delta at 10:00 a.m. CT on the Roll Date. The BXRD Index rolls on a monthly basis, typically every third Friday of the month.
7 <b>BXY</b>	<b>BXY</b> - CBOE S&P 500 2% OTM Buy Write Index - purchase stocks in the S&P 500 index, and each month sell SPX index call options that are 2% out-of-the-money

# Appendix pg. 2 – Descriptions for Select Benchmark Indexes

[www.cboe.com/benchmarks](http://www.cboe.com/benchmarks)

Ticker	Benchmark Index
8	<p><b>CLL</b> - CBOE S&amp;P 500 95-110 Collar Index - purchase stocks in the S&amp;P 500 index, and each month sell SPX call options at 110% of the index value, and each quarter purchase SPX put options at 95% of the index value</p>
9	<p><b>CLLR</b> - CBOE Russell 2000 Zero-Cost Put Spread Collar Index is designed to track the performance of a hypothetical option trading strategy that 1) holds a long position indexed to the Russell 2000 Index; 2) on a monthly basis buys a 2.5 percent to 5 percent Russell 2000 Index put option spread; and 3) sells a monthly out-of-the-money (OTM) Russell 2000 call option to cover the cost of the put spread. The CLLR Index rolls on a monthly basis, typically every third Friday of the month.</p>
10	<p><b>CLLZ</b> - CBOE S&amp;P 500 Zero-Cost Put Spread Collar Index - track the performance of a hypothetical option trading strategy that 1) holds a long position indexed to the S&amp;P 500 Index; 2) on a monthly basis buys a 2.5% - 5% S&amp;P 500 Index (SPX) put option spread; and 3) sells a monthly out-of-the-money (OTM) SPX call option to cover the cost of the put spread</p>
11	<p><b>CMBO</b> - CBOE S&amp;P 500 Covered Combo Index - track a short strangle strategy collateralized by a portfolio holding a long position indexed to the S&amp;P 500 Index and a fixed income account. The CMBO Index sells a monthly at-the-money (ATM) S&amp;P 500 Index (SPX) put option and a monthly 2% out-of-the-money (OTM) SPX call option. The short SPX put position is collateralized by a money market account invested in one-month Treasury bills and the 2% OTM SPX call is collateralized by the long S&amp;P 500 Index position.</p>
12	<p><b>CNDR</b> - CBOE S&amp;P 500 Iron Condor Index - track the performance of a hypothetical option trading strategy that 1) sells a rolling monthly out-of-the-money (OTM) S&amp;P 500 Index (SPX) put option (delta <math>\approx</math> - 0.2) and a rolling monthly out-of-the-money (OTM) SPX call option (delta <math>\approx</math> 0.2); 2) buys a rolling monthly OTM SPX put option (delta <math>\approx</math> - 0.05) and a rolling monthly OTM SPX call option (delta <math>\approx</math> 0.05) to reduce risk; and 3) holds a money market account invested in one-month Treasury bills, which is rebalanced on option roll days and is designed to limit the downside return of the index.</p>
13	<p><b>LOVOL</b> - CBOE Low Volatility Index - is a 40% / 60% blend of the popular CBOE S&amp;P 500 BuyWrite Index (BXM) and CBOE VIX Tail Hedge Index (VXTH); the portfolio overlays long VIX calls and short S&amp;P 500 calls over an investment in S&amp;P 500 stocks</p>
14	<p><b>PPUT</b> - CBOE S&amp;P 500 5% Put Protection Index - strategy that holds a long position indexed to the S&amp;P 500 Index and buys a monthly 5% out-of-the-money (OTM) S&amp;P 500 Index (SPX) put option as a hedge</p>

# Appendix pg. 3 – Descriptions for Select Benchmark Indexes

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Ticker	Benchmark Index
15	<b>PUT</b> PUT - CBOE S&P 500 PutWrite Index - purchase Treasury bills and sell cash-secured at-the-money put options on the S&P 500 index
16	<b>PUTR</b> PUTR - CBOE Russell 2000 PutWrite Index is designed to track the performance of a hypothetical strategy that sells a monthly at-the-money (ATM) Russell 2000 Index put option. The written Russell 2000 put option is collateralized by a money market account invested in one-month Treasury bills. The PUTR Index rolls on a monthly basis, typically every third Friday of the month.
17	<b>VPD</b> VPD - CBOE VIX Premium Strategy Index - overlays a sequence of short one-month VIX futures on a money market account; the short VIX futures positions are held until expiration and new VIX futures are then sold
18	<b>VPN</b> VPN - CBOE Capped VIX Premium Strategy Index - tracks the performance of a strategy that systematically sells 1-month VIX futures, capped by the purchase of a VIX call option; the short VIX futures position is capped with long VIX calls struck about 25 points higher than the VIX futures price
19	<b>VSTG</b> VSTG - CBOE VIX Strangle Index - a premium capture index that overlays short VIX call and put options with a capped long VIX call option position. The position is collateralized by fixing the number of strangles such that 80% of capital is reserved.
20	<b>VXTH</b> VXTH - CBOE VIX Tail Hedge Index - buys and holds S&P 500 stocks, and also often buys 30-delta call options on the VIX Index
21	<b>WPTR</b> WPTR - CBOE Russell 2000 One-Week PutWrite Index is designed to track the performance of a hypothetical strategy that sells an ATM Russell 2000 Index put option on a weekly basis. The maturity of the written Russell 2000 put option is one week to expiry. The written Russell 2000 put option is collateralized by a money market account invested in one-month Treasury bills. The WPTR Index rolls on a weekly basis, typically every Friday.
22	<b>WPUT</b> WPUT - CBOE S&P 500 One-Week PutWrite Index - track the performance of a hypothetical strategy that sells an at-the-money (ATM) S&P 500 Index (SPX) put option on a weekly basis. The maturity of the written SPX put option is always one week to expiry. The written SPX put option is collateralized by a money market account invested in one-month Treasury bills.

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