



EXECUTE SUCCESSSM

Funds' Use of Options and Volatility Instruments

New Studies and Benchmark Indexes

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

Funds and Use of Options or Volatility

- 1. Goldman Sachs - Mutual Fund Use of Options (2012 and 2014)**
- 2. Univ. of Augsburg - The Benefits of Option Use by Mutual Funds (2015)**
- 3. Keith Black and Edward Szado. Performance Analysis of Options-Based Equity Mutual Funds, CEFs, and ETFs (2015) www.cboe.com/funds**
- 4. Four New CBOE Eurekahedge Volatility Indexes that measure the performance of hedge funds that employ volatility-based investment strategies (2015). www.cboe.com/EH**

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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Please see the last slide for important disclosures.

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

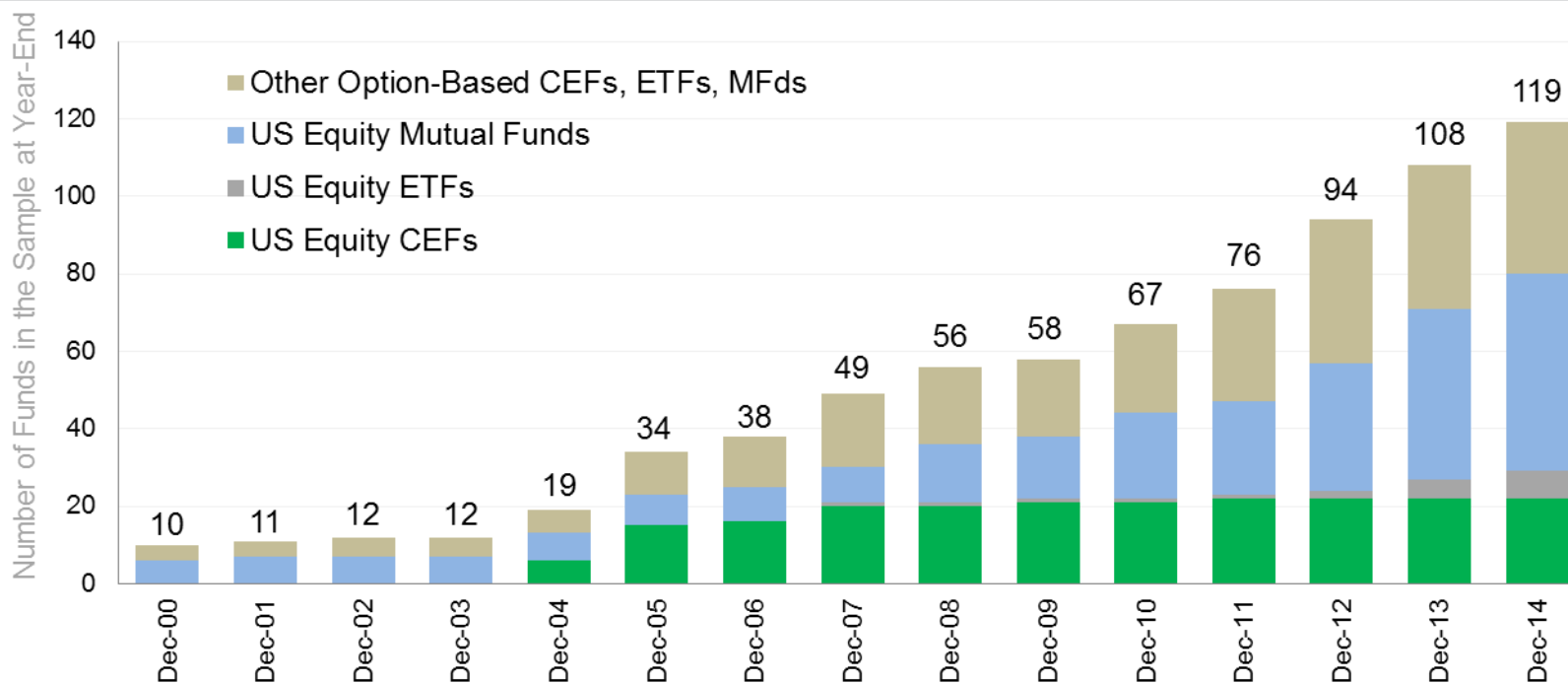


Exhibit 1: Number of option-based funds included in the sample at year-end. Option-based funds benchmarked to a broad US equity index are included in the analysis. The "Other" category includes option-based closed-end, exchange traded and mutual funds which are excluded from the analysis since they have 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. Past performance is not predictive of future returns. 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

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

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

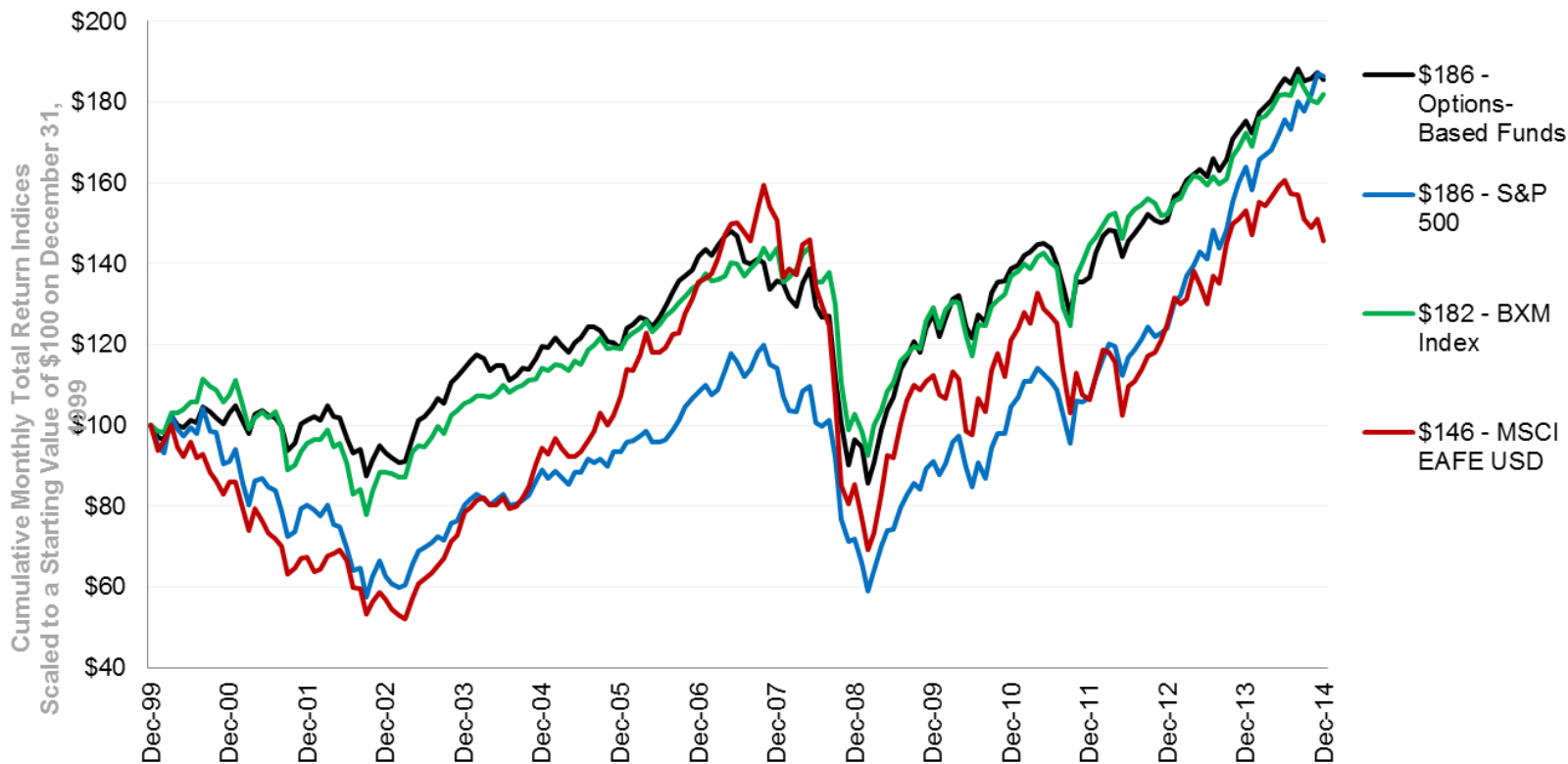
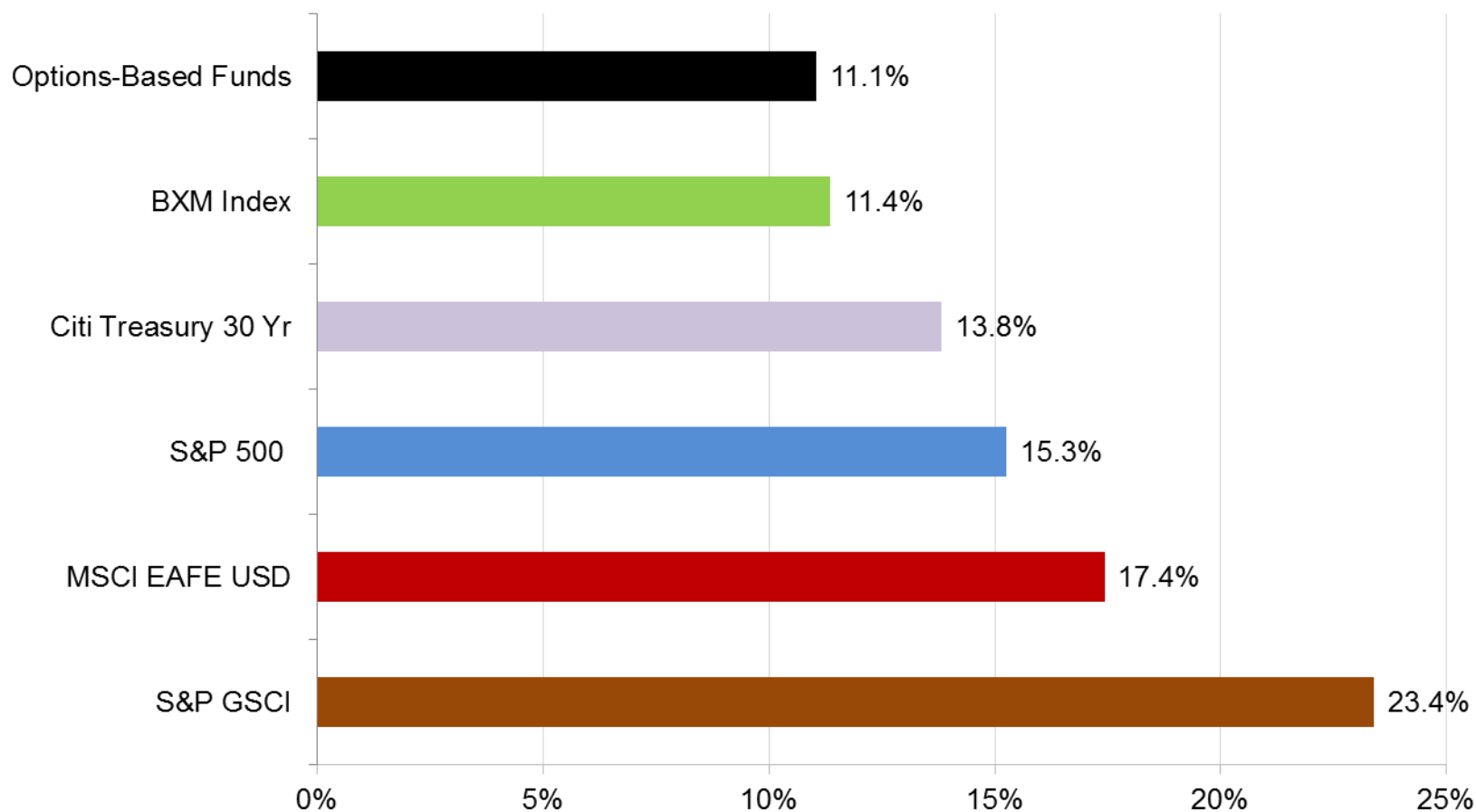


Exhibit 2: Cumulative monthly total return since January 1, 2000 for a monthly rebalanced equally weighted portfolio of Options-Based Funds, the BXM index and various traditional indices. Performance is scaled to represent a starting value of \$100 at the market close on December 31, 1999 for all indices. 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. Past performance is not predictive of future returns. www.cboe.com/funds
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. Past performance is not predictive of future returns. www.cboe.com/funds

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

Summary Statistics - Options-Based Funds and Benchmark Indices (Jan. 1, 2000 to Dec. 31, 2014)

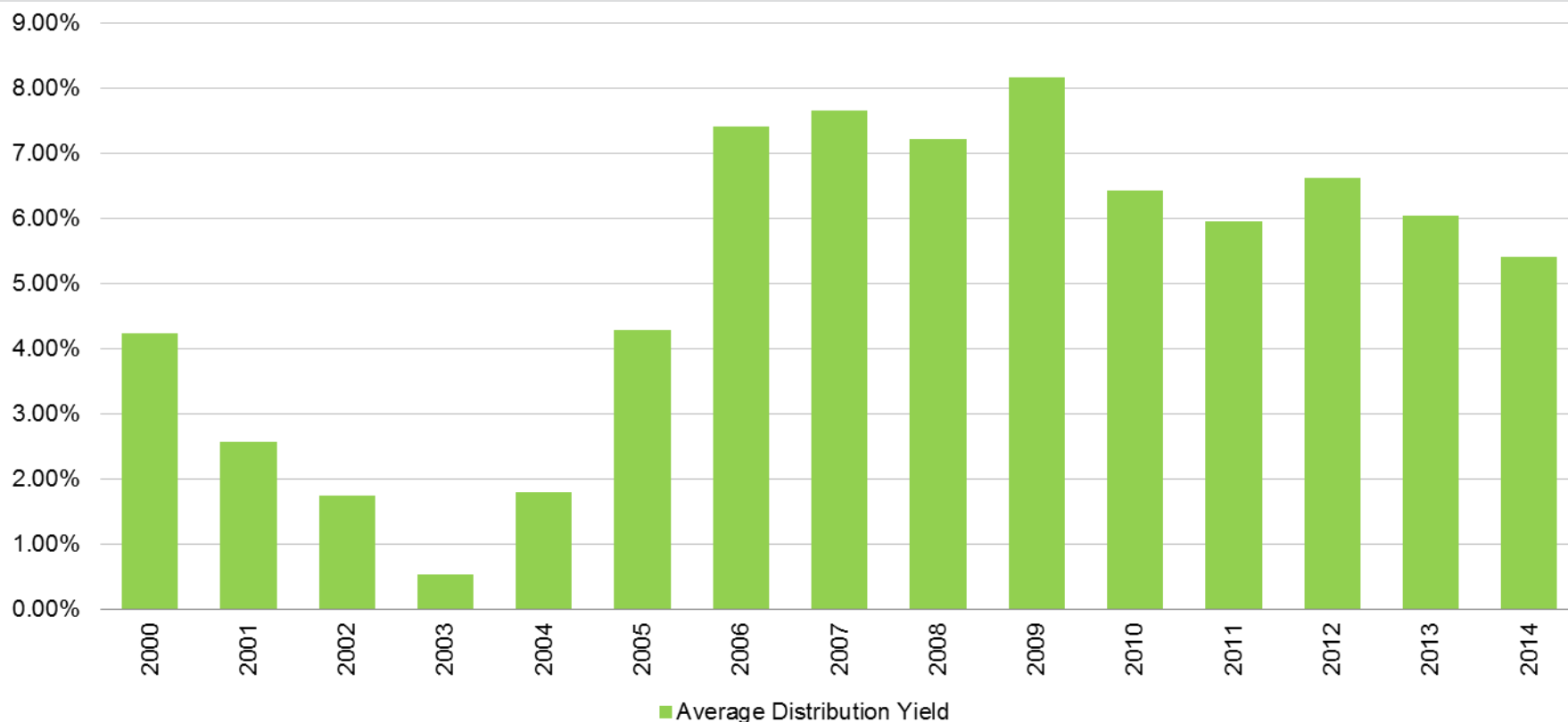
January 2000 to December 2014	Options-Based Funds	S&P 500	BXM - CBOE S&P 500 BuyWrite	S&P GSCI	Citi Treasury 30 Yr
Annualized Return	4.21%	4.24%	4.07%	1.04%	8.17%
Standard Deviation	11.06%	15.26%	11.36%	23.40%	13.83%
Semi-Standard Deviation	12.78%	17.70%	14.16%	24.95%	14.11%
Average Monthly Return	0.40%	0.44%	0.39%	0.32%	0.74%
Skew	-0.80	-0.58	-1.11	-0.46	0.27
Kurtosis	2.17	1.01	3.79	1.30	3.01
Auto-correlation	0.15	0.12	0.12	0.19	0.03
Maximum Drawdown	-42.24%	-50.95%	-35.81%	-69.38%	-25.96%
Beta to S&P 500	0.65	1.00	0.66	0.44	-0.27
Correlation with S&P 500	0.90	1.00	0.89	0.29	-0.29
Annual Sharpe Ratio	0.27	0.23	0.25	0.09	0.51
Stutzer Index	0.27	0.23	0.25	0.09	0.51
Sortino Ratio	0.23	0.20	0.20	0.08	0.50
Jensen's Annual Alpha	0.65%	0.00%	0.52%	0.46%	7.99%
Leland's Annual Alpha	0.65%	0.00%	0.48%	0.25%	7.90%
M-Squared	5.88%	5.34%	5.64%	3.11%	9.55%

- Exhibit 9: The return and risk of Options-Based Funds compare favorably to long-only equity indices. Stutzer Index and Leland's Alpha are alternatives to the Sharpe Ratio and Jensen's Alpha, respectively, that compensate for non-Normal return distributions. Past performance is not predictive of future returns. www.cboe.com/funds
- 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. Past performance is not predictive of future returns. www.cboe.com/funds
- 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.

Index Cumulative Growth of \$100 Since Mid-1988 – Benchmark Indices

(Jul. 1, 1988 to Dec. 31, 2014)

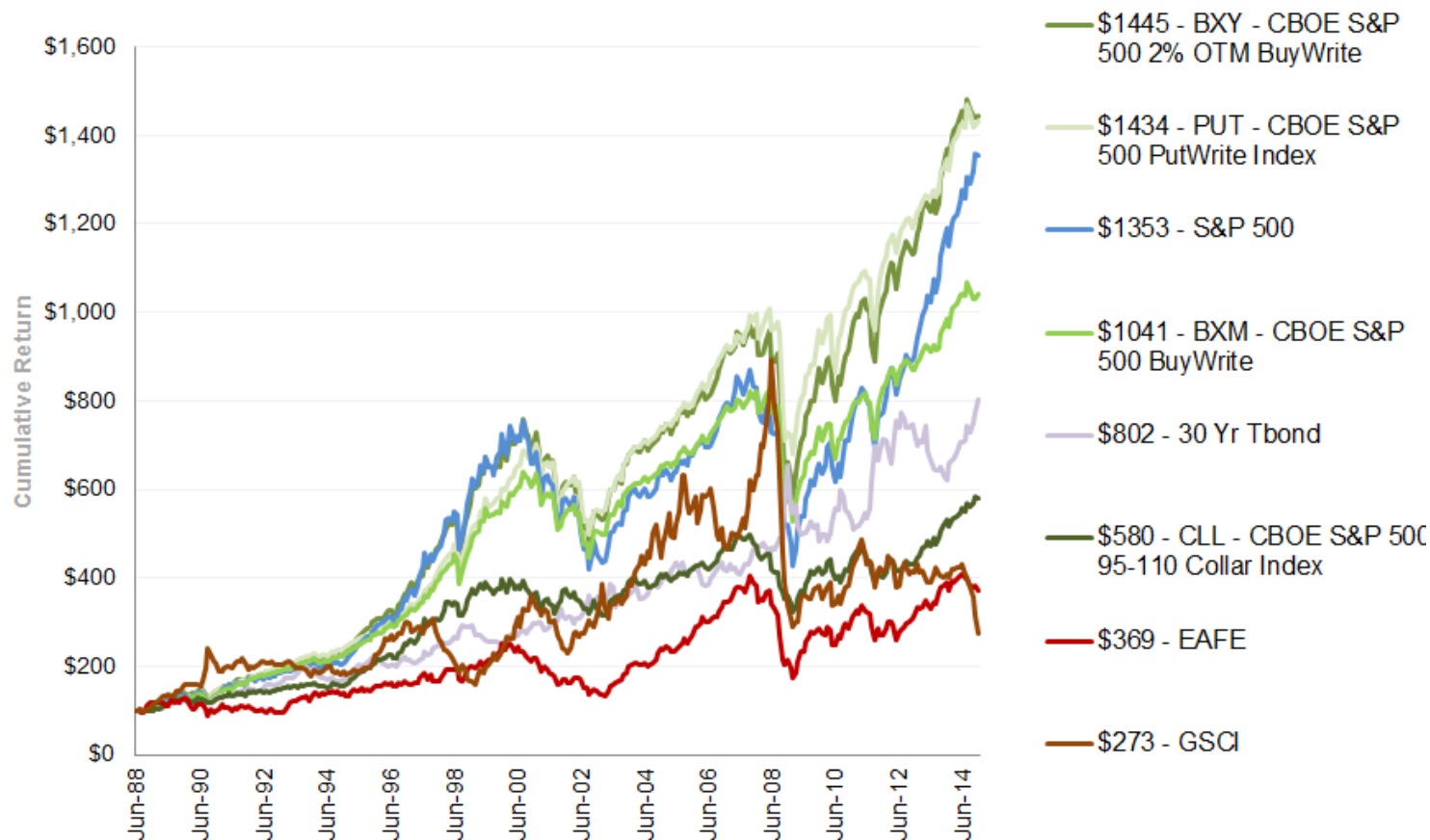


Exhibit 14: Cumulative monthly total return since July 1, 1988 for the BXM index and various traditional indices. Performance is scaled to represent a starting value of \$100 on June 30, 1988 for all indices. Past performance is not predictive of future returns.

www.cboe.com/funds Sources: Bloomberg and Morningstar.

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
Annualized Return	9.25%	10.57%	10.60%	6.86%	10.33%	3.87%	8.17%
Standard Deviation	10.26%	9.78%	12.05%	10.49%	14.49%	20.90%	12.15%
Semi-Standard Deviation Below Mean	13.23%	12.83%	14.37%	11.06%	16.61%	21.33%	12.20%
Average Monthly Return	0.78%	0.88%	0.90%	0.60%	0.91%	0.50%	0.72%
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
Beta to S&P 500	0.62	0.55	0.78	0.66	1.00	0.24	-0.07
Correlation with S&P 500	0.88	0.82	0.93	0.92	1.00	0.17	-0.09
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
Jensen's Annual Alpha	1.44%	3.13%	1.66%	-1.10%	0.00%	0.98%	6.03%
Leland's Annual Alpha	1.23%	2.85%	1.54%	-0.86%	0.00%	0.33%	5.99%
M-Squared	11.99%	14.17%	12.42%	8.75%	10.93%	5.13%	9.67%

- 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. Past performance is not predictive of future returns. www.cboe.com/funds

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

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

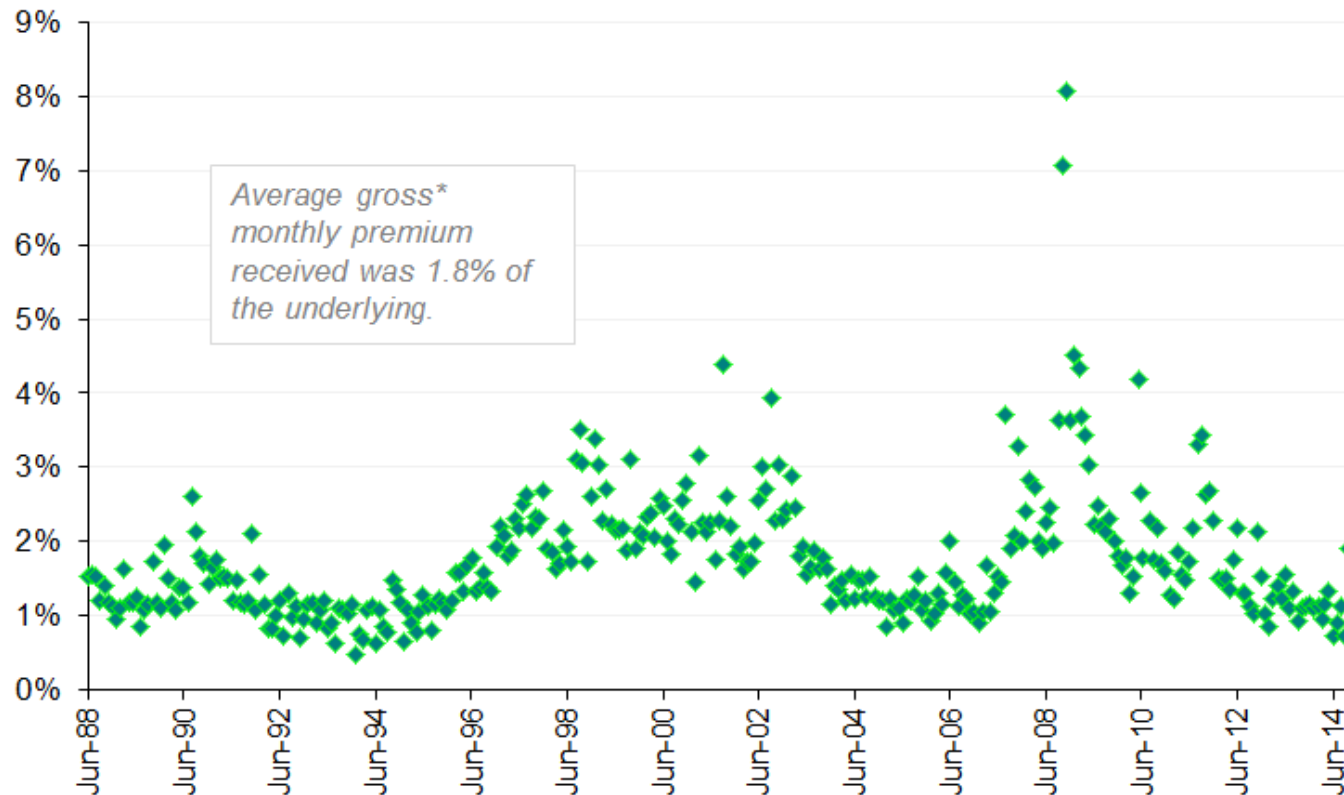


Exhibit 19: The BXM, BXY, and PUT strategies regularly sell S&P 500 Index options. The premium earned varies over time, but has averaged 1.8% per month for BXM. Premiums earned can support a high income yield for Options-Based Funds. Since mid-1988 the SPX call options monthly premium received per the 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. Past performance is not predictive of future returns. www.cboe.com/funds

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

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

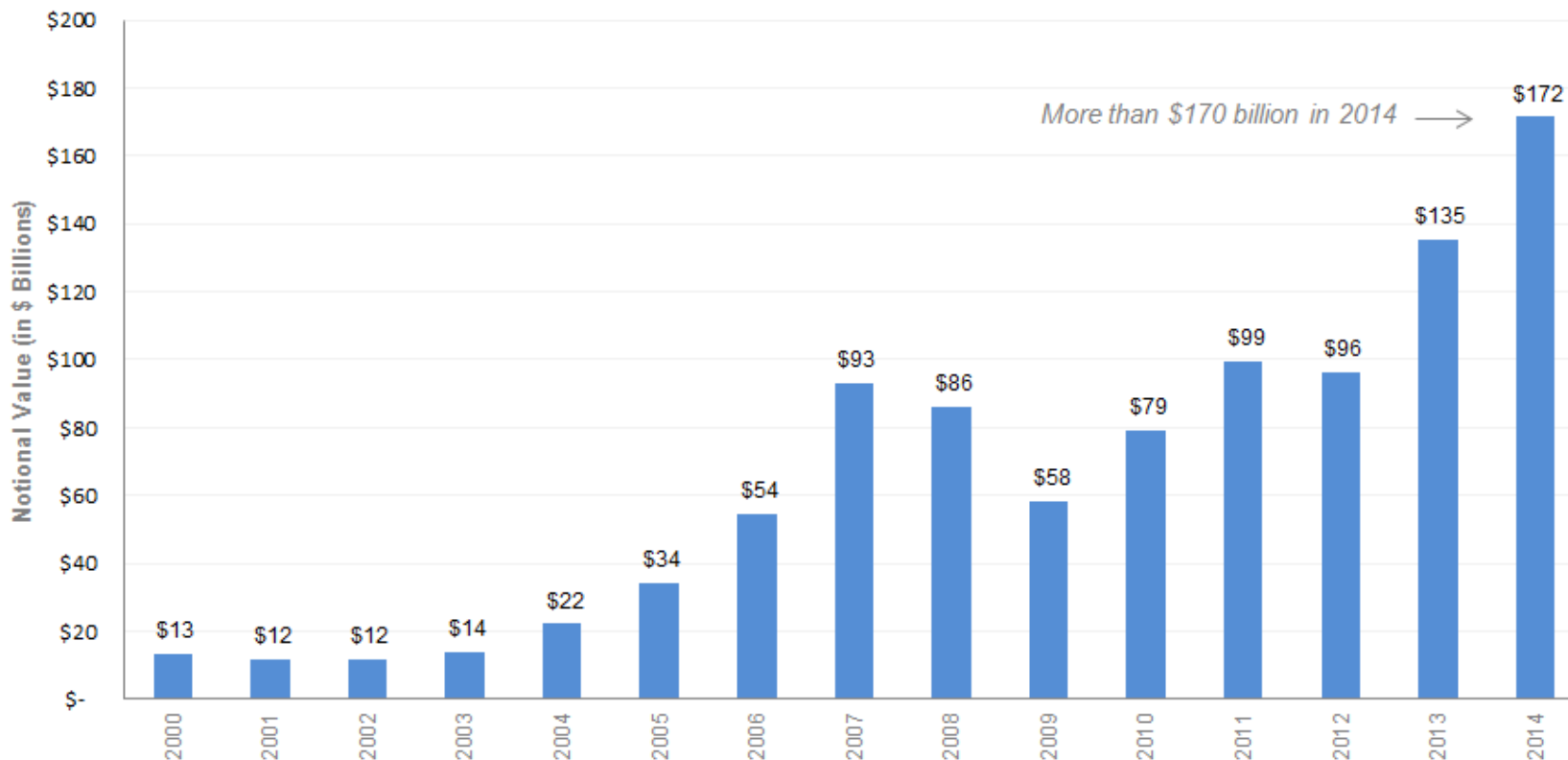


Exhibit 21: Fund managers examine trading liquidity and capacity when considering investment vehicles. The approximate daily notional value of trading in SPX options in 2014 can be estimated by multiplying the average daily volume (888,089 contracts) times the value of the S&P 500 Index (average of 1931) 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. . www.cboe.com/funds

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%		-2.6%		12.4%	5.3%	23.8%	-8.0%	24.6%
1988	21.0%		19.7%		6.1%	16.6%	27.9%	8.1%	28.3%
1989	25.0%		24.6%	32.6%	26.0%	31.7%	38.3%	20.3%	10.5%
1990	4.0%		8.9%	1.9%	-0.1%	-3.1%	29.1%	4.8%	-23.4%
1991	24.4%		21.3%	22.9%	13.6%	30.5%	-6.1%	17.3%	12.1%
1992	11.5%		13.8%	11.0%	4.3%	7.6%	4.4%	6.8%	-12.2%
1993	14.1%		14.1%	11.0%	6.2%	10.1%	-12.3%	18.3%	32.6%
1994	4.5%		7.1%	4.6%	-2.0%	1.3%	5.3%	-11.9%	7.8%
1995	21.0%		16.9%	33.2%	34.4%	37.6%	20.3%	33.5%	11.2%
1996	15.5%		16.4%	19.8%	18.5%	23.0%	33.9%	-4.4%	6.0%
1997	26.6%		27.7%	29.7%	23.9%	33.4%	-14.1%	15.4%	1.8%
1998	18.9%		18.5%	21.2%	18.8%	28.6%	-35.7%	16.5%	20.0%
1999	21.2%		21.0%	19.7%	9.0%	21.0%	40.9%	-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%	-1.5%	-10.6%	-11.4%	3.8%	-11.9%	-31.9%	3.4%	-21.4%
2002	-7.6%	-8.0%	-8.6%	-12.3%	-11.1%	-22.1%	32.1%	16.2%	-15.9%
2003	19.4%	22.5%	21.8%	24.9%	17.9%	28.7%	20.7%	0.8%	38.6%
2004	8.3%	4.6%	9.5%	9.7%	4.9%	10.9%	17.3%	8.7%	20.2%
2005	4.2%	-0.5%	6.7%	4.4%	2.0%	4.9%	25.6%	8.8%	13.5%
2006	13.3%	19.4%	15.2%	17.1%	11.7%	15.8%	-15.1%	-1.1%	26.3%
2007	6.6%	-4.3%	9.5%	6.1%	0.9%	5.5%	32.7%	10.2%	11.2%
2008	-28.7%	-29.1%	-26.8%	-31.2%	-23.6%	-37.0%	-46.5%	41.3%	-43.4%
2009	25.9%	32.5%	31.5%	32.1%	17.6%	26.5%	13.5%	-25.9%	31.8%
2010	5.9%	8.7%	9.0%	9.8%	4.1%	15.1%	9.0%	8.7%	7.8%
2011	5.7%	-1.5%	6.2%	7.2%	-8.8%	2.1%	-1.2%	35.4%	-12.1%
2012	5.2%	10.4%	8.1%	10.2%	6.8%	16.0%	0.1%	2.4%	17.3%
2013	13.3%	16.3%	12.3%	20.8%	23.8%	32.4%	-1.2%	-15.0%	22.8%
2014	5.6%	5.8%	6.4%	5.5%	9.2%	13.7%	-33.1%	29.3%	-4.9%

- Exhibit 22: Annual Returns for each year since 1987 of Options-Based Funds, options-based indices and traditional indices. Past performance is not predictive of future returns. www.cboe.com/funds
- 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.

Four New CBOE Eurekahedge Volatility Indexes

CBOE recently launched four new benchmark indexes in collaboration with Eurekahedge, a Singapore-based hedge fund research and data collection company, that measure the performance of hedge funds that employ volatility-based investment strategies.

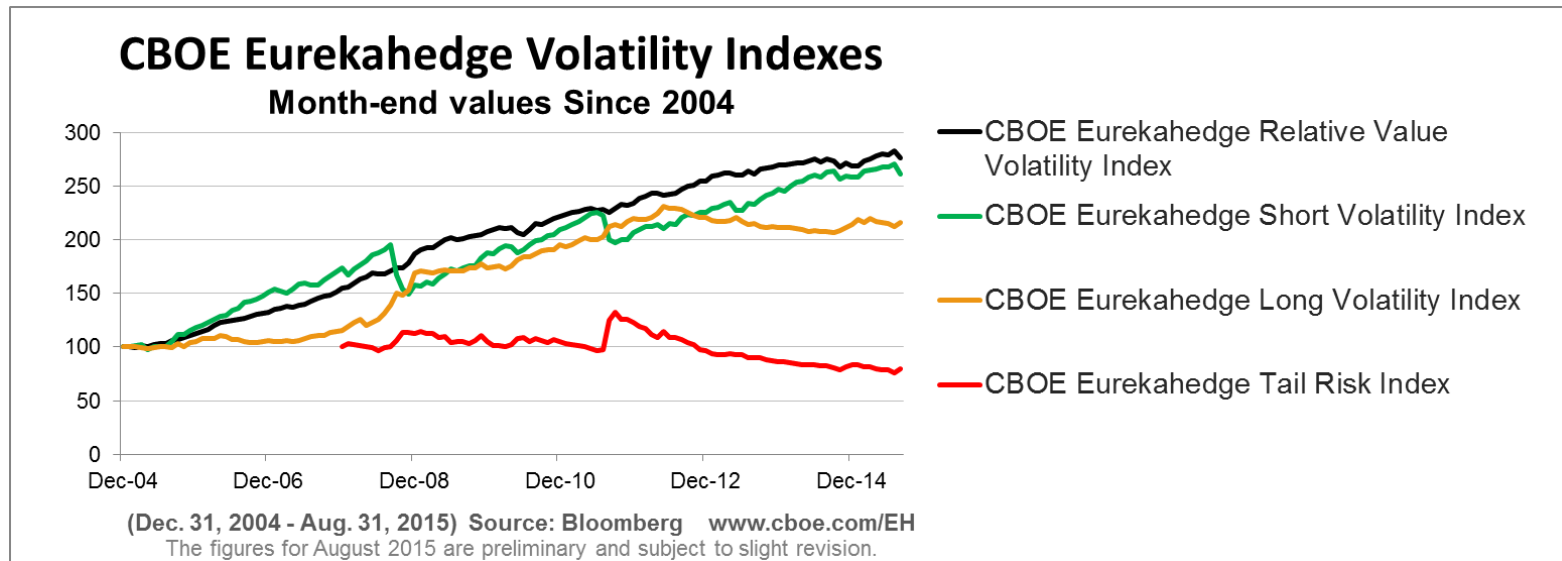
- 1. CBOE Eurekahedge Short Volatility Index** (Bloomberg Ticker: EHFI450) -- The short volatility index is an equally weighted index of constituent funds designed to provide a broad measure of the performance of underlying hedge fund managers who take a net short view on implied volatility with a goal of positive absolute return. The strategy often involves the selling of options to take advantage of the discrepancies in current implied volatility versus expectations of subsequent implied or realized volatility.
- 2. CBOE Eurekahedge Long Volatility Index** (Bloomberg Ticker: EHFI451) -- The long volatility index is an equally weighted index of constituent funds designed to provide a broad measure of the performance of underlying hedge fund managers who take a net long view on implied volatility with a goal of positive absolute return.
- 3. CBOE Eurekahedge Relative Value Volatility Index** (Bloomberg Ticker: EHFI452) -- The relative value volatility index is an equally weighted index of constituent funds designed to provide a broad measure of the performance of underlying hedge fund managers that trade relative value or opportunistic volatility strategies. Managers utilizing the strategy can pursue long, short or neutral views on volatility with a goal of positive absolute return.
- 4. CBOE Eurekahedge Tail Risk Index** (Bloomberg Ticker: EHFI453) -- The tail risk index is an equally weighted index of constituent funds designed to provide a broad measure of the performance of underlying hedge fund managers that specifically seek to achieve capital appreciation during periods of extreme market stress.

www.cboe.com/EH

CBOE Eureka hedge Volatility Indexes



Returns and Correlations



Correlations of Monthly Returns (Jan. 2008 - Aug 2015)

	CBOE Eureka hedge Relative Value Volatility Index	CBOE Eureka hedge Short Volatility Index	CBOE Eureka hedge Long Volatility Index	CBOE Eureka hedge Tail Risk Index	SPX - S&P 500	VIX - CBOE Volatility Index
CBOE Eureka hedge Relative Value Volatility Index	1.00					
CBOE Eureka hedge Short Volatility Index	0.41	1.00				
CBOE Eureka hedge Long Volatility Index	0.16	-0.27	1.00			
CBOE Eureka hedge Tail Risk Index	-0.25	-0.62	0.41	1.00		
SPX - S&P 500®	0.20	0.53	-0.32	-0.44	1.00	
VIX® - CBOE Volatility Index®	-0.51	-0.66	0.25	0.45	-0.67	1.00

Sources: Bloomberg and CBOE www.cboe.com/EH

Past performance is not predictive of future returns

Excerpts from Press Release by EurekaHedge

(18 August 2015, with emphasis added)

- In **2008** the global stock market went down **43%** but long volatility funds were up 46%.
- After 7 years without a major correction in developed markets, investors are increasingly looking at volatility and downside protection, so to that end EurekaHedge are delighted to have teamed up with Chicago Board Options Exchange to offer this new suite of indices to address investors' demands.
- The CBOE EurekaHedge Long Volatility and Tail Risk Indices were up 45.81% and 12.58% respectively in **2008**, while underlying markets floundered with the average hedge fund losing **9.77%** during the year.
- • A similar result was evident in **2011** when the Eurozone debt crisis came to the fore over fears that a Greek exit was imminent, with the average hedge fund declining **1.88%** during the year. In contrast, long volatility and tail risk funds were up 12.83% and 7.50% respectively.

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Excerpts from Press Release by EurekaHedge

(cont.) (18 August 2015, with emphasis added)

- In the relative calm that has since ensured in the markets on the back of active and coordinated intervention by various central banks, one volatility strategy in particular has been quite profitable. The **CBOE Short Volatility Hedge Fund Index** has consistently posted positive returns **since 2012** and has outperformed the main EurekaHedge Hedge Fund Index consistently over this period.
- However, one volatility strategy has produced results that have largely been agnostic to the overall direction of volatility. With the exception of 2014, the **CBOE EurekaHedge Relative Value Volatility Index** has consistently generated positive returns since 2005 with an annualised return of 10.33% afforded at an annualised volatility of only 3.75%.
- Among the funds listed in each index are funds offered by **well-known firms**: 36 South Capital Advisors, Argentiere Capital, Artemis Capital Management, Assenagon Asset Management, BlueMountain Capital Management, Capstone Investment Advisors, Dominice & Co Asset Management, Fortress Investment Group, Harvest Volatility Management, JD Capital Management, Man Investments, Mariner Investment Group, Parallax Volatility Advisers and Picton Mahoney Asset Management.

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CBOE Eurekahedge Volatility Indexes - Performance

(Source: Eurekahedge)

Summary Return Statistics since inception through July 2015:

Risk/Return Statistics (%) (as of Jul 2015)	CBOE Eurekahedge Short Volatility Index	CBOE Eurekahedge Long Volatility Index	CBOE Eurekahedge Relative Value Index	CBOE Eurekahedge Tail Risk Index
Annualized Return	9.87	7.40	10.33	-3.46
Annualized Standard Deviation	8.82	6.57	3.75	13.35
Sharpe Ratio	0.89	0.82	2.22	-0.41
Sortino Ratio	1.16	1.81	5.25	-0.80
Total Return	170.81	112.80	182.99	-23.43
Maximum Drawdown	-23.22	-10.49	-3.05	-42.36
% of Positive Months	76.38	58.27	81.89	29.67

Historical Yearly Returns: (* 2015 is as of July):

Year	CBOE Eurekahedge Short Volatility Index	CBOE Eurekahedge Long Volatility Index	CBOE Eurekahedge Relative Value Index	CBOE Eurekahedge Tail Risk Index	Eurekahedge Hedge Fund Index
2015 *	4.89	-0.80	5.08	-8.19	3.24
2014	4.47	1.58	-0.36	-3.22	4.41
2013	9.53	-4.44	6.04	-10.98	8.98
2012	9.07	0.27	8.81	-21.21	7.18
2011	-1.20	12.83	5.46	16.39	-1.87
2010	11.35	12.36	6.98	0.10	11.48
2009	19.10	2.98	10.97	-6.33	21.24
2008	-9.41	45.81	20.56	12.58	-9.76
2007	14.97	9.30	17.01	N/A	13.61
2006	28.63	0.69	17.75	N/A	13.82
2005	17.86	5.21	12.66	N/A	11.25

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

No. American Pension Funds

- 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.

Important Disclosures

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